

A mixed methods approach for addressing issues of  
consent in sexual assaults.

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## Abstract

The area of sexual offences and consent is an overly complex area, with governmental reviews and the police aiming to tackle why is there an increase in reports of sexual offences and rapes year on year. The End-to-End Rape Review states that it is imperative that research is carried out to reduce the rates of attrition in such cases (End to End Rape Review, 2021). According to the 2021 Crime Survey for England and Wales (CSEW) there were 170,973 reported cases of sexual offences in the last year, with 63,136 of those being associated to rapes. The CSEW also highlights that although these cases are reported, only 6.1% of all sexual offence cases lead to a conviction. The Crown Prosecution Service state that roughly 50% of cases that make it to court, lead to an acquittal of the defendant and approximately 8% of cases lead to the victim retracting their statement. Sleath and Bull (2017) emphasise that some victims have a fear that they will not be believed as to the act that occurred, or that they did not give consent as it is usually their word against another.

The overall aim of this thesis was to explore the issues of consent in sexual offence cases and identify strategies to overcome these issues. A multi-disciplinary approach was used to develop strategies that may potentially address some issues with and surrounding consent. The first phase of the research was to utilise a survey to identify the views of the public on the issues that surround consent. The survey generated 290 useable responses from participants with sections spanning generic questions on consent and UK sexual offence statistics, rape myths, misconceptions surrounding consent and indicators of and influences on consent. The results of the survey highlighted some key issues, firstly rape myth acceptance within society and secondly the concept of marital and acquaintance consent.



The next phase of the research aimed to develop studies that could tackle the two key issues raised in the survey. These issues being rape myths associated with stereotyped beliefs about rape and the prevalence of sexual offences in society. These beliefs and misconceptions an individual own may appear in court proceedings and therefore influence the opinions regardless of the evidence being presented (Willmott, 2016). This study sought out to develop and validate a tool that could be used to measure the attitudes and views of potential jurors before they sit on a jury. A 42-item Pre-Jury Screening Tool (P-JST) was developed split into 4 subscale sections and analysed for reliability and validity. Each subscale presented participants with several statements and asked participants to what level they agree or disagree with each statement within the measure. The measure highlighted that some participants were considered extremely likely to endorse myths about rape and those participants whose country follow a threat and violence rape law rather than a consent-based rape law held strong negative beliefs.

According to the Crime Survey in England and Wales in 2019, it shows that the majority of sexual offences that occur are committed by people already known to the victims, roughly around 90%, with 56% of these being committed by partners or ex-partners. In these cases, the defence is that their DNA will be present because they are in a relationship or were in a prior relationship. To challenge this defence, the degradation of RNA in semen stains could potentially supply information regarding when a stain was deposited. The degradation pattern of a several semen specific mRNA genes and housekeeping genes were evaluated over different periods. These semen stains were extracted periodically and quantified using qPCR generating real-time levels of RNA which were compared to the levels of fresh semen. This study showed that different semen specific primers will degrade at different rates over

several different time periods and therefore could be used to figure out the time since deposition of biological fluids.

Ultimately the research encompasses multi-disciplinary approaches to tackle issues with consent from a forensic stance using stain age prediction to corroborate testimonies, but also a legal view looking at the impact of bias and misconceptions on consent and rape cases.

This research if taken to an operational level could potentially impact the attrition rates in sexual offence and rape cases by providing a tool to which negative beliefs could be highlighted. The research could also support ongoing policy changes surrounding consent such as the terminology used but more importantly this research could provide additional weight to the corroborations of testimonies regarding consent. Finally, the research highlighted in the thesis could affect how evidence recovery of biological samples are collected at crime scenes of a sexual offence nature with determining the age of a deposited stain becoming an additional priority along with body fluid identification.

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## Abbreviations of technical terms

TABLE I: A TABLE SHOWING THE ABBREVIATIONS OF TECHNICAL TERMS.

AC – Appeal Cases	ACTB – Beta-Actin
All ER – All England Report	BFID – Body fluid identification
Bp – Base pair	cDNA – Complementary Deoxyribonucleic Acid
CH – Law Reports, Chancery Division	CJ – Criminal Justice
CJA – Criminal Justice Act	CJPOA – Criminal Justice and Public Order Act
CPS – Crown Prosecution Service	Cq – Quantification cycle
CR – Criminal Law Review	Cr App R – Criminal Appeal Reports
Cr App R (s) – Criminal Appeal Reports Sentencing	CSEW – Crime Survey for England and Wales
DNA – Deoxyribonucleic Acid	ECHR – European Convention on Human Rights
EWCA – England and Wales Court of Appeal	EWHC – England and Wales High Court
Fam – Law Reports, Family Division	FSS – Forensic Science Service
GAPDH – Glyceraldehyde 3-phosphate dehydrogenase	HMCPS – Her Majesty’s Crown Prosecution Service Inspectorate
KB – Law Reports, King’s bench Division	MCA – Mental Capacity Act
miRNA – Micro Ribonucleic Acid	MM – Master mix
mRNA – Messenger Ribonucleic Acid	NDNAD – National DNA Database
Nm – Nanometres	OAPA – Offences Against the Person Act
PCEA – Policing and Criminal Evidence Act	PCR – Polymerase chain reaction
PRM – Protamine	PSA – Prostate specific antigen.
QB – Law Reports, Queen’s bench Division	qPCR – Quantitative polymerase chain reaction
RNA – Ribonucleic Acid	RP – Ribosomal protein
RT – Reverse transcription	Rt-PCR – Reverse transcription– Polymerase chain reaction

RT-qPCR – Quantitative reverse transcription polymerase chain reaction	RTS – Rape trauma syndrome
SARC – Sexual assault referral centre	SC – Supreme Court
SCCR – Scottish Criminal Case Reports	Sg – Semenogelin
SO(A)A – Sexual Offences Amendment Act	SOA – Sexual Offences Act
SOP – Standard operating procedure	STR – Short tandem repeats
TGM – Transglutaminase	TNP – Transition protein
UKHL – United Kingdom House of Lords	WLR – Weekly Law Reports
TSD -Time since deposition	dNTPs - Deoxyribonucleotide triphosphate
PPE – Personal protective equipment	μL – Microlitres
KLK – Kallikrein	RT-qPCR - Reverse Transcription-Quantitative Polymerase Chain Reaction
dNTPs - Deoxynucleotide triphosphates	



## Publication List

Research from this thesis has been published in the following journal article:

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## Chapter One: Introduction.

The issue of consent may seem like a simple 'yes' or 'no' scenario of either consent is given, or it is not, however it is much more complicated than that (Archard, 1998). The issue of consent only appears to be associated with sexual offence cases, specifically, those of a non-consensual nature. These mainly consist of four acts; rape, assault by penetration, sexual assault and causing a person to engage in sexual activity without consent. McGregor (2005) explains this point by stating, 'if a case of physical violence occurred, then when the victim is cross-examined, either in an interview by the police or in court it is very unlikely that they would be asked the question of 'Did you consent?'.

There are three lines of defence that are used in sexual offence cases; 1) that intercourse never took place, 2) intercourse took place but not by the accused or took place and consented or 3) the accused believed that the victim consented (Baird, 1999). The first two lines of defence can be addressed relatively easily by forensic science, however the third is more challenging. When an individual is sexually assaulted or raped, it may be incredibly overwhelming and difficult to decide what they should do next. Some victims will report immediately, and others take their time, and it is imperative that it is their decision when to report (RASASC, 2021). Unfortunately, due to the nature of the offence, time can be of the essence to obtain as much evidence as possible such as DNA that can be incredibly useful to a police investigation. Some types of evidence depending on the type of act can be recovered up to varying times, for example vaginal intercourse within 7 days, anal intercourse within 3 days and penile swabs to collect DNA needs to be recovered within 3 days due to the degradation nature of the samples (Faculty of forensic and legal medicine, 2023). However, some evidence such as photographs of

injuries and hair samples if they believe they have been drugged can be taken afterwards (CPS, 2021). If reported immediately, and if the individual is able to, a forensic medical examination can take place. This will gather traces of bodily fluids, skin, hair left by the perpetrator, a blood sample will be taken and an examination of any injuries as well. All this evidence will then be used to develop a case for the victim. However, investigations are not as simple as suggested and in fact are exceedingly difficult processes. Due to the traumatic event that has occurred, the victim could potentially want to be rid of all the traces of the event and shower, go to the toilet, or wash their clothes. Unfortunately, this would affect evidence collection and make the investigation more challenging (RASASC, 2021). Ultimately, evidence such as this does not prove that an offence took place, but instead shows a sexual act/activity and in some cases place the burden on the victim to inadvertently not hinder the investigation process.

For many cases of sexual offences, whether that be rape or sexual assault, victims are likely to be the only witness. Therefore, it is usually one person's word against another (Temkin and Krahé, 2008). In cases where the victim and the alleged rapist "are known to each other, with little sign of violence" it is recognised that these cause the greatest difficulty to the justice process (Edwards, 1996). Ramon (1997) stated that while many rape laws have expanded, "consent is still presumed unless the victim can prove otherwise". Ultimately, Elliot and Quinn (2008) suggest that due to sophisticated forensic methods, the issue of consent naturally becomes the obvious line of defence. As stated earlier, it is highly likely in a case of sexual assault or rape that both the victim and perpetrator are interviewed as they are the two witnesses involved. The End Violence against Women and Girls Coalition (2017) believe that the interviews for victims and suspects are completely different, and the onus is on the victim to supply all

the evidence to show that they were non-consensually sexually assaulted rather than the perpetrator who can state that they honestly believed that the victim consented. Gentleman (2013) stated that a lot of victims believe that they are going through the whole ordeal repeatedly as they are pressed for answers by police as to “why they were raped”, “were you drinking” or “what were you wearing”. Rather than “did you consent?” “no”, okay now let’s see if the perpetrator can provide evidence to help their case that suggests otherwise. The BBC (2022) found that a number of victims believe that they are the ones who end up being investigated when questioned about their assault, as one woman said “you a stripped just right down” referring to personal records and digital data being taken in order to take the case forward.

Research has shown that there are a number of issues with consent such as problems with the definition of consent, the associated sections, and the complications with the wording of the law (Elvin, 2008). Archard (1998) determines that the obvious issue surrounds whether consent is given or not. Such issues on consent are the influential factors that affect consent prior to, at the time and after an act has occurred (Temkin and Ashworth, 2004). Although there is published research around consent, a number of articles suggest that “consent is an elusive and under-researched topic and requires further expansion” (Schulhofer, 2015; Beres, 2007). Therefore, this thesis aims to expand and explain the issues surrounding consent, find what issues affect consent and, identify potential strategies to address these issues.

## 1.1. Sexual Offences

The act of rape was first seen in the Offences Against the Person Act of 1828 and stated that “every person convicted of the crime of rape shall suffer death as a felon” and in

the same century the first issue arose with Lord Hale remarked on the fact that “In rape cases, it is the victim, not the defendant, who is on trial”. In 1841 the punishment for rape changed from death to transportation (relocation), before once again being changed to penal servitude in 1861. It was not until the Criminal Justice Act 1948 that punishment changed to what it is currently, imprisonment for life. However, it was not until the Sexual Offences Act 1956 that a statutory definition of rape was given.

(1) For the purposes of section 1 of the Sexual Offences Act 1956 (which relates to rape) a man commits rape if—

(a) he has unlawful sexual intercourse with a woman who at the time of the intercourse does not consent to it; and

(b) at that time, he knows that she does not consent to the intercourse, or he is reckless as to whether she consents to it (Sexual Offences Act, 1956).

However, the term “unlawful” was questioned in the R v R case in 1991, and therefore a new and broader definition of rape was provided in the Criminal Justice and Public Order Act 1994 which stated.

(1) It is an offence for a man to rape a woman or another man.

(2) A man commits rape if –

(a) he has sexual intercourse with a person (whether vaginal or anal) who at the time of the intercourse does not consent to it; and

(b) at the time he knows that the person does not consent to the intercourse or is reckless as to whether that person consents to it.

(3) A man also commits rape if he induces a married woman to have sexual intercourse with him by impersonating her husband (Criminal Justice and Public Order Act, 1994).

This remained the law until the definition used today was included in the Sexual Offences Act 2003.

The introduction of the SOA 2003 was the result of a fundamental review which consisted of several consultation papers; '*Setting the Boundaries: Reforming the Law on Sex Offences document*' (Home Office, 1999) and the Sex Offenders Act (SOffA) 1997 cumulating with the white paper in 2002, '*Protecting the Public: Strengthening protection against sex offenders and reforming the law of sexual offences*'. The law regarding sexual offences and especially the law surrounding consent before 1999 was a "patchwork quilt of provisions, ancient and modern, that works because people make it do so, not because there is coherence and structure" according to the Home Office. Furthermore, the government considered existing law in the '*Protecting the Public*' document as "archaic, incoherent but also discriminatory". Therefore, the white paper aimed to provide guidance of changes to the laws prior to the 2003 act and subsequently incorporate new laws such as the introduction of marital rape and male rape from the Criminal Justice and Public Order Act 1994 (CJPOA) which the government would then legislate on. However, there are disagreements over the new 2003 act, especially the review preceding it. Lacey (2001) implied that the review on sexual offence law was too limited, whereas Spencer (2004) believes that the review was too broad. Nevertheless, the Sexual Offences Act of 2003 came into force on May 1<sup>st</sup>, 2004. Since then, it has become clear that the aims of the act have created a series of difficulties (Simpson, 2016). According to Temkin and Ashworth (2004) the "act in its final form does not seem to have achieved the objectives that were set out by the government".

Firstly, for offences such as those in the SOA 2003, the term 'sexual' needs to be defined. Section 78 of the SOA 2003 does this by stating that; 'for the purposes of this part

(except section 71), penetration, touching or any other activity is sexual if a reasonable person would consider that-

- (a) Whatever its circumstances or any person's purpose in relations to it, it is because of its nature sexual, or
- (b) Because of its nature it may be sexual and because of its circumstances or the purpose of any person in relations to it (or both) it is sexual'

According to Card, Gillespie, and Hirst (2008), Section 78 gives guidance on what is sexual behaviour, however it is not a full definition. Temkin and Ashworth (2004) also agree that this section does not provide a definition, but instead aims to determine whether an act is sexual where it previously may have been in doubt. Temkin and Ashworth do acknowledge the limitations of s.78 suggesting that it is "vague" and "unclear" but do also state that a superior alternative remains to be found. In their article, they state that Section 78(a) is relatively straight forward to apply to court cases as it is an objective test to determine if the act is sexual. Section 78(b) though is more ambiguous, as it is a two-part section. The first part (i) is to establish whether the act 'because of its nature' may be 'sexual'. Part (ii) questions whether because of the circumstances and/or the purpose deems it sexual. There are not many court cases that only deal with this section. Card, Gillespie, and Hirst (2008) write of a case R v H in 2005, where the defendant grabbed the victims' tracksuit bottoms in an attempt to engage in sexual touching, however in doing so said the statement "do you fancy a shag?". Under Section 78, the jury have to determine whether grabbing of the tracksuit bottoms may be 'sexual'. By the saying of the statement, this subsequently infers that the grabbing was indeed 'sexual'. Therefore, this individual can be convicted under s.3 of the SOA

2003, sexual assault. Once an act is deemed as sexual, all other sections in part 1 of the act can be applied. For example, the Sexual Offences Act 2003 defines rape as.

(1) A person (A) commits an offence if.

(a) he intentionally penetrates the vagina, anus, or mouth of another person (B) with his penis,

(b) B does not consent to the penetration, and

(c) A does not reasonably believe that B consents.

(2) Whether a belief is reasonable is to be determined having regard to all the circumstances. Including any steps, A has taken to ascertain whether B consents.

(3) Sections 75 and 76 apply to an offence under this section.

(4) A person is guilty of an offence under this section is liable, on conviction on indictment, to imprisonment for life (Sexual Offences Act, 2003).

According to the Metropolitan Police, if a report of rape or sexual assault is made, they follow a series of steps. Firstly, they obtain the initial account from the victim, then based on the victim's wishes and if they deem it in the public's interest (should they be able to identify the suspect) they will arrest them. However, what is deemed as being in the public's interest is a highly topical debate (Rusbridger, 2021). According to Rusbridger being in the public's interest could fall into both protection of the public but also whether the cost to the taxpayer (going through the Criminal Justice System) is worth the act conducted. Any individual regardless of the offence is entitled to some form of justice and for there to be a test determining the severity of the act and how much it is going to cost seems immoral. As sexual offences/rape is a heinous crime, the likelihood of it not being taken forward due to there being no need to protect the public is unlikely. At this point, the suspect will be interviewed, and evidence collected before all this



information is passed onto the CPS and it is then determined whether there is enough evidence to proceed to trial. It is at these points where research such as Temkin and Ashworth (2004) imply that the onus is on the victim to prove that they did not consent, rather than the suspect “bearing the evidential burden of adducing sufficient evidence to raise the issue of consent or reasonable belief in consent”. The Guardian (2021) highlighted a case regarding this. Miss Araniello was a young woman who had to disprove messages with her perpetrator which may have been interpreted as “encouraging sex” once again placing the burden on the victim to plead their case rather than the perpetrator.

Literature like that above seems to indicate that the victim should not be put themselves in dangerous situations like being out alone at night or to go home with people that they have recently met, that cause the most problems. Ultimately, this leads to some victims being cross examined in depth about their actions rather than the perpetrator, and in some cases this information will influence the decision making of the jury rather than the fact that consent was not given.

The law in England and Wales sees rape as only an act a male can do as it is the penetration of the vagina, anus, or mouth by a penis. This therefore excludes acts where there is a female perpetrator-male victim scenario such as acts of ‘forced penetration’. These sorts of acts would fall under Section 3 or 4 of the 2003 Sexual Offences Act; Sexual assault or causing a person to engage in sexual activity without consent. Unlike the two preceding acts in the SOA 2003 that are indictable, Section 3 and 4 can be either triable summarily or on indictment meaning some sexual offences of a non-consensual penetrative nature can be deemed as ‘less serious’. Although an act relating to a sexual offence, is an incredibly serious offence, the way in which it is tried suggests differing

levels of seriousness. An indictable offence such as rape can only be tried in Crown Court with a jury present to determine guilt or not, therefore is the most serious of crimes with punishments of up to life in prison. However, a triable summarily or on indictment offence such as a sexual assault by touching can be tried in a Magistrate's Court with the case only heard by a judge and magistrates, not a jury with fines and small prison sentences given (CPS, 2021).

The law sees rape as a violation of the autonomy instead of violence and because of this and the lack of force will make it much harder to prove (Leahy, 2014). It is not just harder for the prosecution to prove, it is getting the jurors to believe the act without the evidence of a struggle and disproving the rape myths that are rife in society of all sexual offences involve violence (Clough, 2018). However, it is not just force that provides an issue. What action is inherently sexual, potentially sexual, and inherently nonsexual? Behaviour may be considered sexual if a reasonable person would consider it to be sexual, but the question is then what might a reasonable person deem sexual (Card, Gillespie, and Hirst, 2008). The non-consensual acts in part 1 of the Sexual Offence Act 2003, once deemed sexual then have the issue of the prosecution showing a) an absence of consent and b) that the absence of consent is of a reasonable belief (Simpson, 2016).

## 1.2. England and Wales sexual offence statistics

Sexual offending has been increasing year on year since the Crime Survey for England and Wales (CSEW) was first published annually rather than every two years since its inception in 1982. There are four main sources that give statistics on sexual offences. The statistics come from the CSEW, the Crown Prosecution Service (CPS), the Home Office and the Ministry of Justice (Office for National Statistics, 2021). The CSEW estimates that the two years preceding the 2021 publication of the survey, there was

approximately 700,000 reports of sexual offences. These ranged from rape, unwanted touching to attempted acts of a sexual nature. From this approximation, the survey suggests 560,000 or 3.4% of the female population were a victim of a sexual offence and 140,000 or 0.9% of the male population in England and Wales were subjected to a sexual offence.

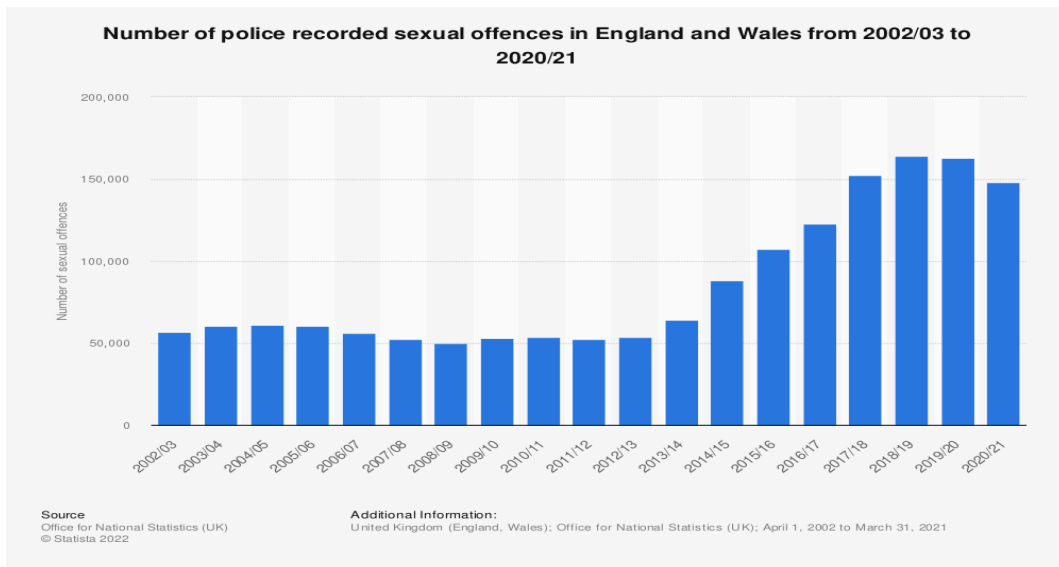
According to the Crime Survey for England and Wales (CSEW) there has been a 180% increase in sexual offences from 60,924 in 2004 to 170,973 recorded offences year ending September 2021 (Office for National Statistics, 2021). 46,911 in 2004 and 107,854 in 2021 being associated with all other sexual offences excluding rape (displayed below). According to the Office for National Statistics, the increase of recorded offences over the last 20 years may be due to a number of factors. These include the impact of high-profile incidents such as the Sarah Everard case, media coverage of historic cases such as Jimmy Saville, people's willingness to report incidents based on the factors above, and finally a potential increase in the number of victims of sexual offences (ONS,2022)

Sexual offences are profoundly serious crimes. Rape is at the top of the list of serious crimes and are investigated intensely by the police only second to that of murder (Cybulska, 2007). Although rape, and sexual offences in general, remain as one of the most under reported and under recorded crimes in the UK, rape offences has also increased according to the Survey for England and Wales (CSEW). There has been a 413% increase in rape offences from 12,295 in 2002 to 63,136 year ending September 2021 indicating that just under 40% of all sexual offences are rapes (Office for National Statistics, 2021).

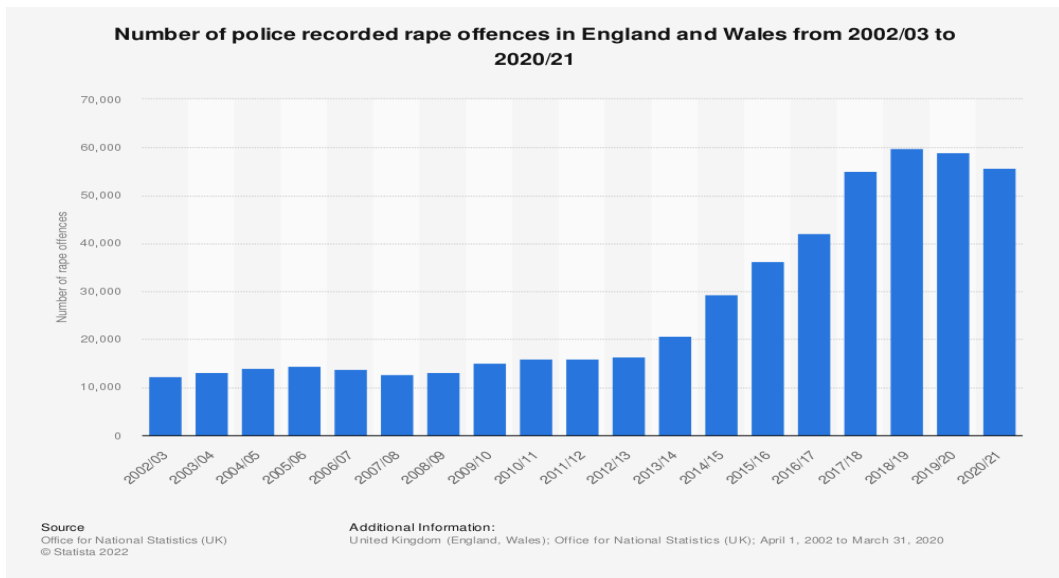
Although an act relating to a sexual offence, is an incredibly serious offence, the way in which it is tried suggests differing levels of seriousness. An indictable offence such as rape can only be tried in Crown Court with a jury present to determine guilt or not, therefore is the most serious of crimes with punishments of up to life in prison. However, a triable summarily or on indictment offence such as a sexual assault by touching can be tried in a Magistrate's Court with the case only heard by a judge and magistrates, not a jury with fines and small prison sentences given (CPS, 2021).

Literature such as Ministry of Justice (2013), Myhill & Allen (2002) highlight that victims of sexual assault and rape are most likely to encounter these at the hands of husband's partners or those that they have an intimate relationship with. However, according to Temkin and Krahe (2008) there is still this perception by most that "real rape" is a surprise attack by an unknown assailant, and because of this, acts that deviate from this stereotype are less likely to be deemed genuine. There are multiple theories regarding rape and sexual offences, the feminist theory views rape as a "pseudosexual act" that is used by males to intimidate and/or dominate women. Whereas the social learning theory suggests that rape results from attitudes and learning experiences that are favourable to males behaving aggressively towards women (Ellis, 1989). Victimisation is the process of becoming a victim of sexual assault or rape. Secondary victimisation is being blamed for becoming a victim, and as a whole researching this falls under the umbrella term of victimology (Turvey, 2011). A lot of rape myths that are prevalent in society place blame on the victim, that it was their fault that they were sexually assaulted or raped. It is these ideas that prevent victims firstly from coming forward to report their assault but secondly obtain justice at court due to misconceptions within the jury, a theory that is explored throughout this research.

The graph below (Figure 1.1) shows the overall increase of sexual offences between 2003 to 2021 and Figure 1.2 shows the recorded rape offences in England and Wales from 2002/03 to 2021 (Statista, 2021).



**FIGURE 1.1: THE OVERALL INCREASE OF SEXUAL OFFENCES BETWEEN 2002 TO 2021. (STATISTA, 2021).**



**FIGURE 1.2: THE TOTAL NUMBER OF POLICE RECORDED RAPE OFFENCES IN ENGLAND AND WALES FROM 2002/03 YEAR ENDING MARCH TO 2021 YEAR ENDING SEPTEMBER (STATISTA, 2021)**

The above figures follow similar trends with an increases from 2013. This is indicative of the development of the Jimmy Savile case, with potentially a number of historical victims coming forward to report. The slight decrease from 2019 onwards coincides with COVID and the fact that the population were not able to leave the house to put themselves in

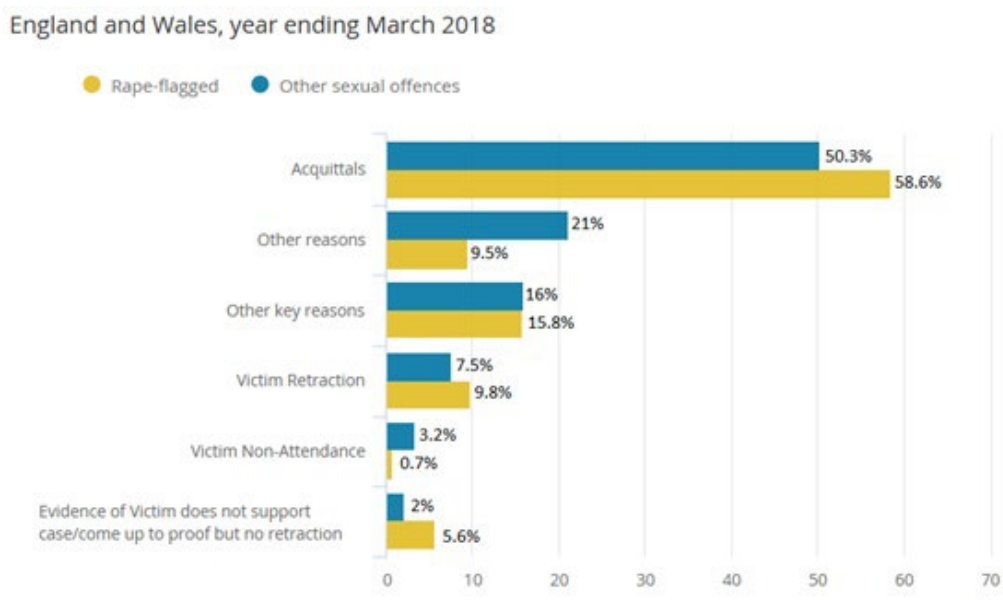
situations similar to that of the “real rape scenario” and ultimately a lot of reports who have been placed under domestic abuse rather than sexual offence or rape.

In the definition of sexual assault and likewise for rape, there is a reference to “all the circumstances.”. According to several articles, this reference allows the jury to scrutinise the victims’ behaviour, own circumstances, or personal characteristics to determine whether there was anything which may have “induced a reasonable belief in consent” by the perpetrator (Temkin and Ashworth 2004, Scutt 2012, Temkin and Krahe 2008). Scutt also questions how “all the circumstances” is interpreted and whether the interpretation is different between a man and woman.

Although it is stated by the Office of National Statistics in 2018 and the article ‘Sexual Offending: victimisation and the path through the criminal justice system’ that only 17% or (around 1 in 5) victims who experience sexual violence chose to report them to the police, it is expected that this number will improve due to an “improvement in recording” and an “increased willingness of victims to come forward” (Crime Survey for England and Wales, 2018). This article also states that high profile media coverage of sexual offences such as the ‘#MeToo’ movement plays an influential role in the trends of police recorded sexual offences.

However, as the number of reported sexual offences increases, as seen in Figure 1.1, the Home Office show that the number of cases referred to the CPS for sexual offences has decreased to 14,071 compared to the 17,571 in March 2016. This is also echoed in the number of rape cases brought by the CPS decreasing by 9% to 6,012 between March 2016 and the year ending March 2018. The CPS state that of those 6,012, 43% resulted in a decision to charge, with the remaining 53% failing to progress through the criminal

justice system due to; a no prosecution decision, a decision to be administratively finalised or to be ended with an out of court disposal. The Crown Prosecution Service show that approximately 58% or 2,635 of rape-flagged prosecutions resulted in a conviction, with 80% of all sexual offences also resulting in a conviction. According to the 2020 victim’s commissioners report “some police officers made fewer referrals to the CPS as they knew that the CPS were prosecuting fewer cases” and ultimately, it is the CPS that decides whether there is enough evidence present to charge a suspect. Once this is determined, only then can it go to court (Victim’s Commissioners Report, 2020). However, the End Violence Against Women and Girls Coalition, believe that the CPS changed their approach without disclosing regarding decision making in rape cases leading to those cases with a high likelihood of a conviction being taken forward by the CPS and others being dropped entirely (EVAWG, 2022). Those cases that did not result in a conviction were placed by the CPS placed in one of these categories seen below in Figure 1.3.



**FIGURE 1.3: REASONS FOR PROSECUTIONS NOT RESULTING IN A CONVICTION FOR RAPE-FLAGGED CASES AND OTHER SEXUAL OFFENCES (SOURCE: CROWN PROSECUTION SERVICE)**

The Crime Survey for England and Wales (2020) identifies the reasons as to why prosecutions are not reaching a conviction and subsequently shows the number of rapes that were reported, the number of rapes which were taken to court and those which ultimately obtained a conviction. For example, in 2006 the number of rapes reported was 14,443. Of these, 2,567 were taken to court and of those only 863 obtained a conviction. Comparing that to 2017, the number of rapes reported were 41,150, 5,190 were taken to court and only 2,991 were convicted. Overall, between these years, the total number of rapes totalled 244,363, 38,553 of those reported were taken to court and only 14,936 obtained a conviction. These statistics show around 6.1% of reported rapes obtain a conviction, a slight increase on number suggested by Kelly (2005), who stated 5.7% lead to a conviction.

According to Jehle (2012), the “loss” of cases between reporting and conviction is known as attrition; the values above show that rape cases have a high rate of attrition. One reason for this high rate of attrition as seen in Figure 1.3 is due to victim retraction. This reason results in between 7.5% and 10% of all cases not resulting in a conviction. This may be due the time taken between the initial offence and the outcome at court. According to the Ministry of Justice for sexual offences it takes on average 470 days for a completed case, whereas for rape cases this time increases to 672 days which is likely due to “complexity of sexual offence cases” (Office for National Statistics, 2018). There is also the fact that some victims have a fear that they will not be believed as to the act that has occurred (by police at the time of reporting, but also by jury members in court) which leads to some victims retracting their statement. This is an issue that is explored in a later chapter.



### 1.3. Sections 74, 75 and 76

#### 1.3.1. Section 74 – “Consent”

In the Sexual Offences Act 2003 (SOA), there are three sections; sections 74, 75 and 76 which aim to define consent and clarify those scenarios which vitiate consent. Section 74 provides the statutory definition of consent as “for the purposes of this part, a person consents if he agrees by choice, and has the freedom and capacity to make that choice” (Sexual Offences Act, 2003) and is used in combination with sections 75 and 76. The dictionary definition of consent is different with terms like ‘comply and yield’ being used in conjunction. The issue of these terms like ‘comply and yield’ in a definition of consent is that they both imply willing but not wanting to engage in an act. Therefore, the word ‘consent’ is problematic in a sexual consent context. However, Section 74 aimed to address this (Brook, 2019) by outlining that for consent to therefore be valid, consent must be voluntary, the person consenting must have the capacity to consent and ultimately must be completely informed about the act they are consenting to (Archard, 1998).

The “for the purposes of this part” element to the definition includes Section 1 of the 2003 act up to Section 79 (Archbold, 2019). Section 75 provides six circumstances which give rise to rebuttable presumptions that consent was not present and that the defendant did not have reasonable belief in the victim’s consent. Under Section 76 of SOA 2003, conclusive presumptions that consent was not given are applied if the following circumstances are deemed present; “the defendant intentionally deceived the complainant as to the nature or purpose of the relevant act” and “the defendant intentionally induced the complainant to consent to the relevant act by impersonating a person known personally to the complainant” (Sexual Offences Act, 2003). According

to Temkin and Ashworth (2004), it is suggested that prosecutions aim to disprove consent in descending order of these sections due to the irrebuttable and rebuttable circumstances associated with each. Likewise, with determining whether an act is deemed sexual, the sections involving consent are just as 'deeply ambiguous' according to Tadros (2006).

On closer reading of the sections, the aims of the Home Office have not come through with the definition of consent and the subsequent sections. The wording of the definition of consent is a prime example of the uncertainty surrounding consent that the Home Office documents wished to provide clarity upon. Elliot and de Than (2007) agree with this by implying that there are specific areas where the law's approach to consent is inconsistent. The first area is having a single statutory definition of consent for sexual offences but using old common law when regarding other criminal offences such as trespassing. Wallerstein (2009) supports this statement by writing "if the courts were willing to go into so much trouble to extend the law's protection of a person's property... they ought to take a similar approach when it comes to the more grievous harm entailed in rape". The second area is the approach to proving the existence or absence of consent with the introduction of sections 75 and 76 and finally the lack of guidelines on capacity to consent which leaves the judge and jury too much discretion.

The definition of consent can be taken almost word for word and have arguments as to an issue with it. The first word which is heavily debated is that of 'agree', articles such as Tadros (2006) and Harvard Law Review (2004) question whether the word agree can be used in context with consent. Tadros states individuals "Can agree to and agree with, however can only consent to but not consent with" implying that agreement is much broader than consent. For example, individuals can agree to have intercourse and they

can agree with the idea to have intercourse, however those individuals can only consent to intercourse not with. This indicates that the definition of a word cannot have a term in its definition which contradicts the meaning of the defined word, and this is the case for consent. There are also some schools of thought that this definition of consent is inadequate as it only describes 'agreeing' to participants in an act of intercourse rather than 'wanting' to participants and even wanting to enjoy it (Beres, 2007 and 2005; Peterson and Muehlenhard, 2007).

Smith, Hogan and Ormerod (2018), question the words 'freedom' and 'choice' in the definition. They suggest that the term freedom is very context dependant and usually means "freedom from something". According to the Oxford English dictionary the phrase 'freedom from' is defined as "the state of not being subject to or affected by something". If you have freedom, it means that there was something before which was stopping you from that freedom. It is then unclear what degree of freedom is enough to vitiate consent. Tadros (2006) also highlights the question of "what is constitutive of such a lack of freedom?" and then wonders whether another influence must be added to fear of violence for freedom to be undermined so that the victim does not consent. For example, a husband may tell his wife that she can go out on the weekend but only if she has intercourse with him the night before. Does the fact that she is able to go out but has to engage in intercourse vitiate consent or does demanding intercourse without the possibility of going out on the weekend immediately vitiate consent. The issues do not stop for the term freedom when physical pressure is applied, there are also the issues of religious and possibly economic freedoms or lack of, that vitiate consent (Simpson, 2016). On similar lines to Tadros, the article by Temkin and Ashworth "*The Sexual Offences Act 2003: Rape, Sexual Assault and the Problems of Consent*" indicate

that words such as 'freedom' and 'choice' are ill suited for use in criminal justice proceedings. They comment that "there is little doubt that to say we acted 'freely'... is to say only that we acted *not un-freely*", which links to the idea of having freedom from something which was previously hindering consent such as merely submitting. A concept explored in the following chapter.

The word 'choice' implies that the victim has options as to which choice they make. Smith, Hogan and Ormerod (2018) indicate that if the defendant possesses the adequate information regarding those choices and if they remove one of those choices does that vitiate consent? The issue with the definition of consent is that it fails to provide the guidance as to what information the victim needs to for their consent to be negated. Smith, Hogan and Ormerod (2018) use the example of a HIV positive individual to show this. In this case the individual does not disclose the fact that they HIV positive to who they are about to have intercourse with. Although this does not vitiate consent, it is assumed that once known that they have HIV, the consenting individual would not have proceeded to have intercourse. They also acknowledge actual cases where this has occurred, and HIV positive status has not been disclosed for example the cases of R v Konzani (2005) and R v Dica (2004). In the cases of Konzani and Dica, the defendant knowingly had unprotected intercourse while being HIV positive with the victims. Both defendants in these cases used the consent argument to avoid prosecution. However, in the R v Dica case especially the judge threw this argument out by refusing to allow the issue of consent to be part of the case, which had previously allowed a defendant to be acquitted in a similar case such as the R v Clarence (1889) as it was not good law. The choice of the victim was not taken into consideration because if they had known about the HIV status they would not have engaged in sexual intercourse, and subsequently in

both cases the defendant was convicted under Section 20 of the Offences Against the Person Act 1861. Archbold (2019) states being deprived of a choice relating to the fundamental feature of which a victim originally consents to intercourse, therefore means that their consent will accordingly be negated. Archbold (2019) also states that 'choice' is crucial to the issue of consent, and the evidence relating to that 'choice' and the 'freedom' to make said choice must be approached in a broad common-sense way. This therefore means that Archbold's comments suggest that the words 'choice' and 'freedom' should not be taken literally. If this is the case, when should they be included in the definition of consent? Should there be other alternatives?

Countries throughout the world and even individual states in the US have their own definition on consent regarding sexual offences and they vary significantly. For example, in New Zealand they define consent as "A person consents to sexual activity if they do it actively, freely, voluntarily and consciously without being pressured into it". Some states in the United States have their own definition of consent or do not have a definition entirely but provide a list of the acts that have a lack of consent. In California consent is defined "to mean positive cooperation in act or attitude pursuant to the exercise of free will. The person must act freely and voluntarily and have knowledge of the nature of the act or transaction involved". Whereas the state of Washington states "Consent requires that there are actual words or conduct indicating freely given agreement to have sexual intercourse or sexual contact at the time of the act" (RAINN.org, 2019).

It is clear to see that a single universal definition is needed. It is not just the United States that has this issue. Europe has a similar problem with only 8 countries (The UK and Ireland, Belgium, Cyprus, Germany, Iceland, Luxembourg, and Sweden) that state intercourse without consent is rape. All other European countries follow a law that if

physical violence, threats, or coercion are present during intercourse, that that is rape (Amnesty International, 2005).

The final word which is contentious and divides opinion is the word 'capacity'. Under Section 30 it is a criminal offence to engage in "sexual activity with a person with a mental disorder impeding choice" which implies that an individual lacks capacity. Although the term capacity is not defined anywhere in the Sexual Offences Act 2003. Elvin (2008) does state that in the explanatory notes which accompany the act, under Section 74; "consent" there is a definition albeit very brief. The explanatory notes state "a person might not have sufficient capacity because of his age or because of a mental disorder". This implied that there are other impediments regarding capacity that would not be protected under Section 74. Capacity or mental capacity is the ability for an individual to make their own decisions (Mental Capacity Act, 2005). According to the Section 3(1) of the Mental Capacity Act someone who is lacking mental capacity cannot do one or more of the following.

- Understand information given to them about a particular decision.
- Retain that information long enough to be able to make the decision.
- Weigh up the information available to make the decision.
- Communicate their decision.

In sexual offence cases, these decisions usually revolve around two questions according to Herring and Wall (2014), "do they understand sex, the nature and the consequences?" and "would they be able to make choices about whether they would choose to engage or not engage in sexual activity?". They go on to suggest that individuals may have the capacity to make some decisions but not others and that the

first point of “understanding the information” given to them provides the biggest issue. Herring and Wall also acknowledge the ‘capacity test’ which is set out in Section 2(1) that states “a person lacks capacity in relation to a matter if at the material time he is unable to make a decision for himself in relation to the matter because of impairment of, or a disturbance in the functioning of, the mind or brain”. Although Elliot and de Than (2007) suggest that the test for capacity should be phrased differently and should be “any person should be regarded as having the capacity to consent to an act only if he or she was capable at the material time of understanding the nature and reasonably foreseeable consequences of the act and was able to effectively communicate his or her consent”. Either way this test is the standard of which capacity is determined and in court cases can be deemed as subjective as to whether it is adhered to or not. Ultimately the concept of consent has no single clear ‘ordinary’ meaning (Elliot and de Than, 2007). A number of scholars have proposed other definitions, firstly Beres (2007) states that any definition of consent needs the comment ‘freely given’ in place as an individual cannot consent if they are coerced or threatened because it is not freely given. Other scholars define consent as the “free verbal or nonverbal communication of a feeling of willingness” or “the voluntary approval of what is done or proposed by another; permission; agreement in opinion or sentiment” suggested by Hickman and Muehlenhard (1999) and Hall (1998) respectively. Both of these definitions indicate that sexual consent can be given in two ways, verbal and nonverbal. However, research by Humphries (2004) that clear verbal explicit statements such as “Would you like to have sex?” are rarely found in the sexual script and that indirect ambiguous statements are more used such as “Are you in the mood?”.

Ultimately, this shows that the issue of consent starts and ends with the definition, whichever definition a person's goes by. It is not just the language in the definition of consent that has issues there are pre-conceptions in other elements of a sexual offence. One example of these pre-conceptions around language is the use of the term sexual violence. It is inferred that in order for sexual contact to be demonstrated as an offence that an act of violence must occur, when in actual fact this is not the case.

### 1.3.2. Section 75 – Evidential presumptions about consent

Section 75 provides a list of circumstances where if any are met then it is assumed that consent was not granted. Should a prosecution prove any of these circumstances, then the onus is on the defence to “bear the evidential burden of adducing sufficient evidence to raise the issue of consent or reasonable belief in consent” (Temkin and Ashworth, 2004). Whereas, as stated by Baroness Scotland “in order for these presumptions not to apply, the defendant will need to satisfy the judge from the evidence that there is a real issue about consent [or belief in consent] that is worth putting to the jury” (Home Affairs Committee, 2003). Simpson (2016) states that the circumstance in this section provide an adequate indication of when consent is not present. These circumstances were not present in the original 1956 act. However, there are problems with this section especially in practice when there is the possibility of establishing consent, this section becomes obsolete, and the general definition of consent is then used.

This list of circumstances was outlined in recommendation 6 of the *Setting the Boundaries* bill (2000), however during the drawing up of the act, which recommended list changed. According to Temkin and Ashworth, some were changed slightly, some were removed completely, and others were added in that were not in the recommended list. One presumption which was added that the bill did not suggest was Section 75(2)(f);



administering a stupefying substance. On the other hand, one circumstance which the bill did suggest was “where agreement is expressed by a third party not the victim”. This inclusion may have been a direct result of the DPP v Morgan (1976) case, where a husband told friends that his wife was consenting to intercourse with them, when she did not. However, this suggestion on third party consent did not make the list of circumstances in Section 75. Subsequently, cases like this must now fall under the general definition of consent. The *Setting the Boundaries* bill also indicated that there should be a circumstance where the victim is “too affected by alcohol or drugs to give free agreement”. Although this is partially adopted by the SOA 2003 in s.75(2)(f), Temkin and Ashworth suggest the actual circumstance used is “too narrow” and subsequently is only relatable to situations where the intoxication of the victim is blameless, and a substance has been administered. This, therefore, implies that the victim who voluntarily drinks would not be protected under these circumstances by the general definition of consent unless an involuntary substance was taken, under s75(2)(f), or is unconscious, under s75(2)(d).

Elvin (2008) and their article “*the concept of consent under the Sexual Offences Act 2003*” states that “s75(2) seems to be reasonably well drafted in terms of clarity”. Smith, Hogan and Ormerod (2018) praises the inclusion of the circumstances referring to threats of violence as ‘as welcome extension to the law’. As with most things, there are always issues and this is the same for s75(2)(a); “at the time of the relevant act or immediately before it began, using violence against the complainant or causing the complainant to fear that immediate violence would be used against him” and s75(2)(b); “at the time of the relevant act or immediately before it began, causing the complainant to fear that violence was being used, or that immediate violence would be used, against

another person”. Elvin (2008) questions as to what counts as ‘immediate or violence’ for s75(2)(a) and (b). They use the idea of a victim being wrestled to the floor, is that classed as violent? or does a violent action be something such as a punch or a kick. Then on the other hand, what if there are threats of non-immediate violence this would then require the jury to determine whether the victim agreed by choice.

### 1.3.3. Section 76 – Conclusive presumption about consent

Unlike Section 75 and the evidential presumptive circumstances where if one exists then it is said that consent was not given unless evidence proves otherwise. Section 76 gives conclusive presumptions if a circumstance is met. Contrary to Section 75 and the rebuttable presumptions, the circumstances in Section 76 are irrebuttable meaning if met, these cannot be contested in a court of law (Simpson, 2016). These circumstances revolve around deception (an issue explained below). The circumstances are that; (a) the defendant intentionally deceived the complainant as to the nature of purpose of the relevant act; (b) the defendant intentionally induced the complainant to consent to the relevant act by impersonating a person known personally to the complainant.

Elvin (2008) state that “the law on sexual offences has long had to deal with the issue of mistakes” and Spencer (2007) shows this problem. Spencer comments in their article “the rule at common law was that mistake as to the identity of the other person vitiated consent; but mistake about other matters only did so if the complainant failed to appreciate the sexual nature of the act, i.e., that the other party’s purpose was to gratify his sexual desires”. This statement by Spencer (2007), implies that the concept of mistakes, depending on the mistake on occasion did and did not vitiate consent. Spencer then goes on to write that “s.76 now provides a statutory test regarding mistakes”.

There are a number of court cases which fall into the two separate arguments put forward by Spencer; that mistakes to the identity of a person vitiates consent and that mistake as to other matters regarding the nature of the act. In the case of *R v Jheeta* (2007), the victim was extorted by their partner via a series of threatening messages, unknown to the victim they were coming from the defendant. She therefore confided in her partner and wished to tell the police, to which the defendant pretended to be a police officer using a fictitious number stating that she should sleep with the defendant or be 'criminally liable'. In this case the court found that although the text messages were deceptive, the act of intercourse was consented to, therefore 76(2)(a) was irrelevant. Elvin (2008) quotes Spencer who suggests that ultimately the 2003 act "fails to deal with this type of misbehaviour" and cases such as *Jheeta* reveal a "glaring and obvious gap in the law". However, the interpretation of Section 76 was once again up in the air in the case *R v Devonald* (2008). In this case the victim believed he was performing acts over the internet for the gratification of 'Cassey' when actually it was the father of the victim's ex-partner wishing to teach him a lesson. The court charged the defendant under Section 4 of the 2003 act, however appealed based on the result of the *Jheeta* case that Section 76(2)(a) "deals with a deception as to the nature of the act rather than a deception to the surround circumstances". Unlike the case for *Jheeta*, the court of appeal in this case concluded that the s.76(2)(a) was relevant to the facts of this case because of the act of providing sexual gratification was for 'Cassey' only and not for those who may have been watching. Elvin (2008) indicates that *Devonald* took a broader take on s.76, whereas *Jheeta* was more restrictive and subsequently these "conflicting approaches" to similar cases leave s.76 in an area of grey than black and white.

Whilst the Sexual Offences Act 2003 is an improvement on the previous acts, there are still issues surrounding the wording of certain laws and the area of consent according to Cybulska (2007). Beres (2007) implies that due to this there is a distinct “lack of literature around sexual consent”. The sections below aims to explore this literature and critique it to see whether this comment from Beres is supported.

#### 1.4. Current review of the literature

The issue of consent is of paramount importance when it comes to sexual offences and rape. With the major developments of DNA analysis, it is becoming increasingly less and less problematic whether intercourse occurred or not but instead whether there was consent (Lees, 2002). This literature review aims to critically evaluate the series of issues that arise with consent, and from this identify specific gaps in the knowledge and structure studies around those gaps. The review of the literature below is split into a number of sections. The first section addresses the concept of reasonable and mistaken belief in sexual consent and why a case being deemed to fall into one or the other may change the outcome. Following this, the next section focuses the issues surrounding consent. This section collated available information from a number of sources, both primary and secondary on the issues faced when the validity of a consensual agreement arises.

#### 1.5. Reasonable and Mistaken belief in consent

The laws surrounding rape and other sexual offences acknowledge that for an individual to be convicted of these acts, the defendant must not ‘reasonably believe’ that the victim consents. One of the questions to come from this is the difference between ‘reasonable belief’ in consent and a ‘mistaken belief’.

According to Elvin (2008), the leading authority pre 2003 regarding reasonable and mistaken belief in consent was the case R v Olugboja which questioned consent and submission. The case stated that there is a difference but implied that “submission is a part of normal sexual relations”. This statement then questions what is “normal sexual relations”. Each individual will have their own subjective view on what they class as ‘normal’ according to their own sexual tendencies. For example, R v Brown (1993), a defendant was convicted of causing actual bodily harm during sadomasochist activities and the House of Lords ruled “consensual infliction of harm on another person for sexual gratification was not an act the law should permit”. In this case, consent was agreed for the acts to occur which involved submission, which was perfectly legal. However, the victims thought the defendant took it too far. Now the question is whether the defendant thought that the acts they were performing was ‘normal’ to them? Then on the other hand, Smith, Hogan and Ormerod, (2018) write of a case involving a victim who was tied up and held underwater, and although protesting once penetration occurred stopped protesting and thought “just let him get on with it”. Consent was not given, but she submitted to the intercourse to take place and because the victim did this, does this give the defendant ‘reasonable belief’ that she was consenting. This then highlights the question of what is consent and what is a ‘reasonable belief’ in consent.

On the other hand, to the reasonable belief argument that consent was granted, there is the mistaken belief argument. According to Stone (2013), the prosecution to obtain a conviction must prove beyond all reasonable doubt that not only the victim was not consenting but also that the defendant does not reasonably believe that the victim consented. This acknowledges Section 1(2) of the Sexual Offences Act 2003. Therefore, a defendant must possess the *mens rea* (the intent behind the action) element to an

offence (McGregor, 2005). There are two parts to an illegal act, the *mens rea* and the *actus reus* (the guilty act that has occurred). “*Actus reus non facit reum nisi mens sit rea*” or an act does not make a defendant guilty without a guilty mind is a saying which applies to all crimes. For rape cases, both the *actus reus* and the *mens rea* need to be proved for a conviction. For example, Smith, Hogan and Ormerod state that the act of rape is not simply intercourse (the *actus reus*) but more specifically the penile penetration of the vagina, anus, or mouth of a person without honestly believing the individual consented (the *mens rea*). If the defendant honestly believed that the victim was consenting, they cannot be convicted because they do not possess the *mens rea*. This was originally known as the “mistaken belief” clause, which was first introduced in DPP v Morgan (1976).

DPP v Morgan (1976) was a case pertaining to the issue of third-party consent. In this case, the husband of the victim told friends that his wife was happy to engage in intercourse with them and it was suggested that he had told them “If there are signs of struggle, its not be seen as a lack of consent, but that she is enjoying it”. The friends were convicted of rape but appealed on the grounds of them having an honest belief that she was consenting to sexual intercourse. The judge focused on the *mens rea* element of the offence; the intention to commit the crime. The conviction was upheld based upon the victim clearly communicating her lack of consent even if the husband told them to ignore it.

To combat the ‘mistaken belief’ clause in rape cases, Tadros (2006) believes implementing a differentiated definition of rape, like that of manslaughter rather than a single definition would be beneficial. In Tadros’ article ‘*Rape without Consent*’ he

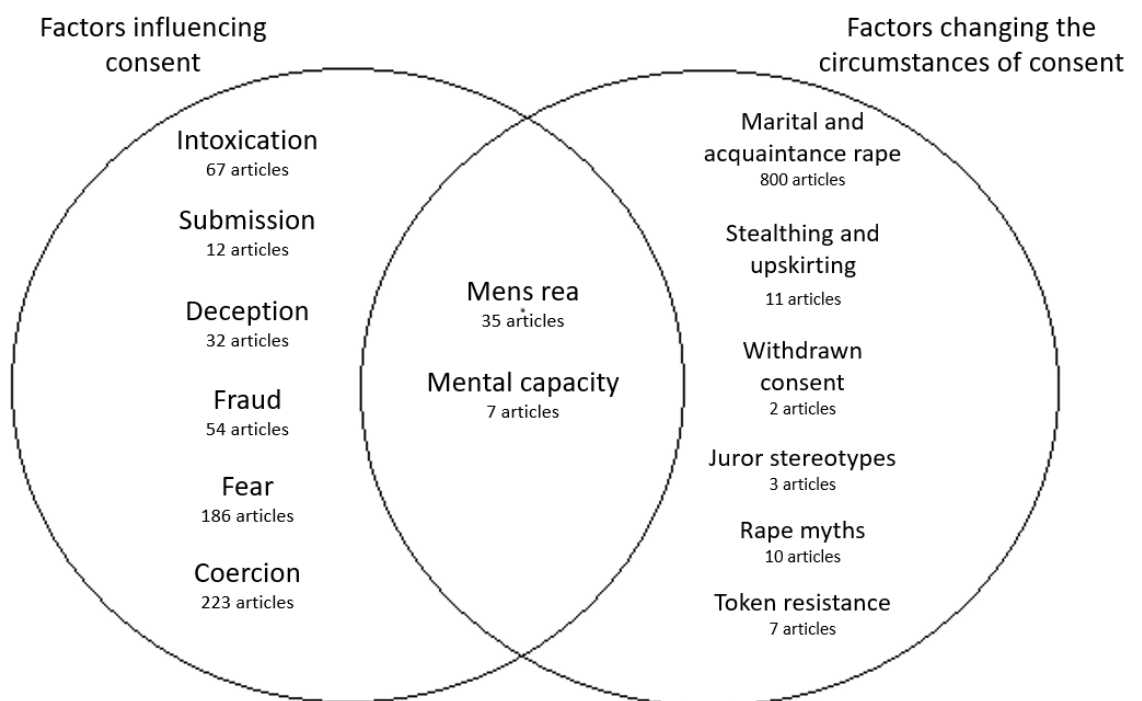
suggests a differentiated definition will “mark out violence used in cases of violent rape with excluding a conviction of rape in cases which do not involve violence, while it need not focus unduly on the conduct of the complainant”. He goes on to say that the definition of consent, has been the central concept of which the law of rape has been constructed is “unclear and paradoxical”. Tadros argues the law remains silent on the issue of whether ‘no’ always means no and that it allows for the possibility of ‘yes’ not always meaning yes. Tadros finishes his statement with “if the complainant says, ‘yes’ without choosing to, or where she lacks freedom or capacity, the definition suggests, that ‘yes’ will not vitiate a conviction on rape”. This statement is the paramount issue regarding consent according to Tadros. However, it is not just the law around consent that provides an issue, there are other factors. These factors are explained in Section 1.6 below.

## 1.6. Issues with sexual consent.

It is the absence of consent which converts sexual intercourse into an act of rape (Elliot and Quinn, 2008). Based on court cases from the mid-1800s to the present day, issues with consent can be split into two main categories; a category where factors influence consent, meaning that consent is obtained due to an external influence, i.e., where consent is given to intercourse due to a factor directly influencing the consent giving party, such as intoxication, fear, fraud, deception, coercion, and submission. The other category is where factors change the circumstances of the consent given. For example, in this section the concept of ‘stealthing’ (the non-consensual removal of a condom), ‘Upskirting’ (the taking of a photograph under the skirt of another without their consent), withdrawn consent, the mental capacity of the individual who is consenting was reviewed. Other issues which fall into this section is the idea of juror

stereotypes/bias of jury when the issue of consent is brought up in court linking it to the concepts of the ‘halo effect’ and rape myths and finally marital and acquaintance consent.

Since the first recorded court case where consent was used in a court of law, there have been numerous cases where the issue of consent has been at the forefront of whether a conviction is upheld or quashed. Prior to the R v Olugboja (1981) case, the court of appeal indicated that consent in rape cases could only have been vitiated by incapacity, physical force, threats of violence or fraud as to the nature of the act (Card, Gillespie, and Hirst, 2008). This case showed a key issue with consent, as before, courts accepted consent as either permission was or was not granted. In the R v Olugboja case the court of appeal stated it was a common word that “covers a wide range of states of mind



**FIGURE 1.4:** A VENN DIAGRAM TO SHOW THE ISSUES THAT WERE FOUND FROM LITERATURE FOR FACTORS INFLUENCING CONSENT AND FACTORS THAT CHANGE THE CIRCUMSTANCES OF CONSENT. A LITERATURE SEARCH WAS CARRIED OUT TO DETERMINE THE ARTICLES THAT POSSESSED THE TERM AND EITHER SEXUAL CONSENT OR RAPE IN THE TITLE. THESE ISSUES WILL BE REVIEWED AND CRITIQUED IN PART 1 AND 2.



between a man and a woman, ranging from desire to acquiescence” (R v Olugboja, 1981).

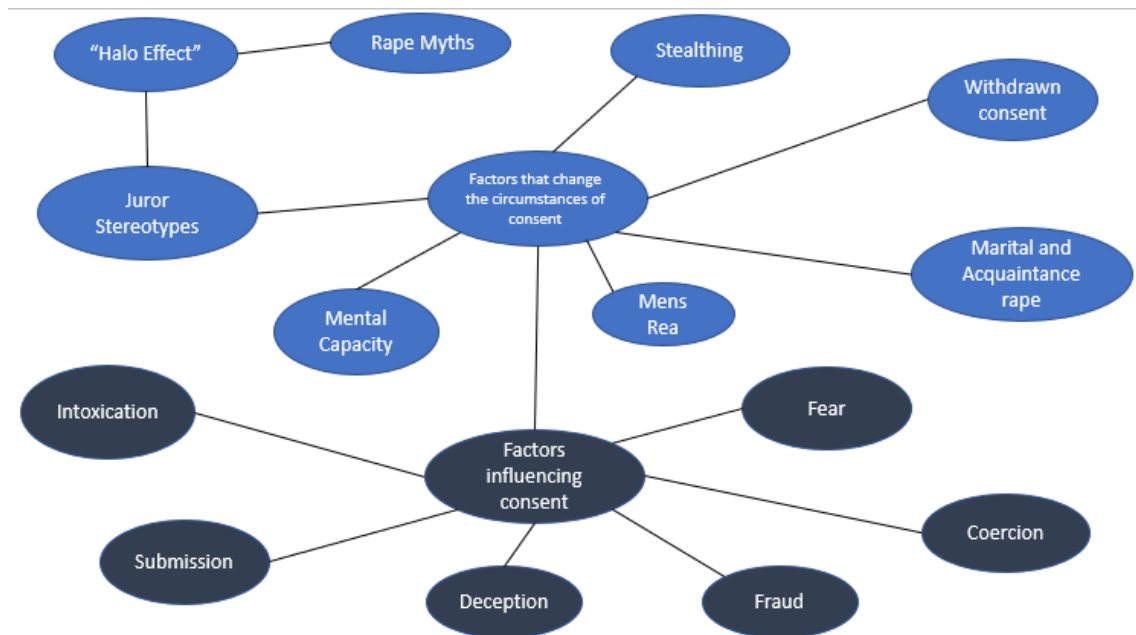


FIGURE 1.4: ISSUES THAT WERE FOUND FROM LITERATURE FOR FACTORS THAT CHANGE THE CIRCUMSTANCES OF CONSENT AND FACTORS THAT INFLUENCE CONSENT. THESE ISSUES WILL BE REVIEWED AND CRITIQUED IN PART 1 AND 2.

## Part 1: Factors influencing consent.

### 1.6.1. Intoxication – alcohol and drugs

Linking intoxication and drugs to sexual assaults has been increasingly recognised since the turn of the millennium. Being intoxicated at the time of a sexual assault and depending on where it takes place would fall under a number of different names. These include, drug-facilitated sexual assault, drug and alcohol facilitated rape, incapacitated rape or more commonly known as “date rape” (Butler and Welch, 2009). According to Abbey (2002); Mohler-Kuo, Dowdall, Koss & Wechsler, (2004) and Testa, (2002) around half of all sexual assaults that occur have alcohol involved whether it was taken by the victim or the offender. A study by the Forensic Science Service (FSS) highlights this. From the toxicology results of 1014 cases of claimed drug-facilitated sexual assault, alcohol alone was detected in 470 of all cases (46%), illicit drugs were detected in 344 (24%) and

in 21 cases or 2% there was a sedative drug detected i.e., a “date rape” drug (Scott-Ham and Burton, 2005). Alcohol which has been taken by the victim is associated more with completed rape (when penetration occurs) rather than attempted rape (Ullman and Brecklin, 2000). More importantly, as stated by Wolitzky-Taylor et al, (2011) those victims that are under the influence of alcohol at the time of their sexual assault are less likely to report their attack to the police than someone who was sober at the time of the attack. According to Song and Fernandes (2017) it is important to know what a sexual assault can occur proactively (where the perpetrator deliberately administers an intoxicating substance) and opportunistically (where the perpetrator waits until the victim voluntarily takes an intoxicating substance).

The effects of alcohol consumption are listed as ‘altering perception, decreasing reaction time and impairs decision making’ (Monks, Tomaka, Palacios, and Thompson, 2010). The effect of alcohol ‘impairing decision making’ links intoxication back to having the capacity to consent and whether intoxication affects the ability to adhere to Section 3(1) of the Mental Capacity Act and the circumstances which a person may not have the mental capacity. Clough (2019) state that due to these effects suggested by Monks, et al (2010) it is not surprising that courts have difficulty in accusations that involved intoxicated individuals. Due to this, it has been claimed that guidance on these cases where consent is not clear would help (Simpson, 2016). These effects have been termed ‘Alcohol Myopia’, where an individual who is intoxicated has lowered ability to assess inhibiting cues and compelling cues, but instead focus on cues that are deemed salient (Steele and Southwick, 1985; Abbey, 2002). Abbey (2002) goes on analyse what these cues are in an intoxicated female; an inhibiting cue for example is the fear associated with being intoxicated and an act occurring. Whereas a compelling cue is that of being

interested in a sexual encounter. Alcohol Myopia also affects the way intoxicated males perceive cues, especially friendly cues which are often misinterpreted as a sign for sexual activity.

Intoxication and sexual assault are often grouped together, and surveys completed by Amnesty International UK and YOUNGOV provide an idea of people's views on the matter. The Amnesty International UK poll showed that 30% of people questioned believed that a woman was partially or totally responsible for being raped if she was drunk and the YOUNGOV survey indicated that around 1 in 10 people are unsure or think that it is not usually rape to have intercourse with a woman who is asleep or too drunk to consent (Amnesty International, 2005; YOUNGOV, 2018). The views from the YOUNGOV survey fall under the Sections 76(2)(d) and (f) of the SOA 2003, those which correspond to intoxication whether that be by drugs or alcohol. Section 76(2)(d) refers to the victim being asleep or unconscious at the time of the relevant act, whereas s.76(2)(f) refers to a substance being involuntarily given to the victim, which enables them to be stupefied or overpowered at the time of the relevant act (Sexual Offences Act, 2003). These sections although deal with intoxication do not provide support to a victim who voluntarily consumes alcohol. Elliot and de Than (2007) explain this by saying that a person who is "involuntarily intoxicated or intoxicated to the point of unconsciousness, the rebuttable presumption that the victim did not consent will apply". For example, if an individual has their drink spiked it is assumed, they did not consent and therefore protected by s.76(2)(f). However, for an individual who is voluntarily intoxicated i.e., drinks their own drinks willingly but does not reach the level of unconsciousness would only be protected under the general definition of consent as the "facts will be outside the scope of presumptions under Sections 76(2)(d) and (f)" (Elliot and de Than, 2007).

Section 76(2)(f) only relates to situations where the complainant's intoxication is "patently blameless" (Temkin and Ashworth, 2004).

As said by Archbold (2018) under Section 74, "consent can only be said to have been absent if the effect of the alcohol was such that the complainant had temporarily lost the capacity to choose whether to engage in sexual activity". Archbold then goes on to suggest that in cases where the victim's only protection is Section 74 that "assistance would be necessary as to the meaning of 'capacity' than to merely read the statutory definition of consent". Canadian authorities in *R v Ashlee* (2006) and *R v J.A* (2011) stated that 'prior' consent is not a defence, and the consent should be given to a particular act, at the time of the act and consent does not remain operational after a person has become unconscious or incapable of consenting (Archbold, 2018).

### 1.6.2. Fear

Similar with many of the issues in this chapter the question of "What level (of the issue) is enough to vitiate consent?" continue to arise and the issue of fear is just the same. Fear and sexual offences pose 'problems' according to Scutt (2012). She writes that problems arise of the nature of the fear, "is fear limited to a threat of physical danger, or are threats of financials harm, loss of job, verbal harm or sexual blackmail relevant?". Hirtenlehner and Farrall (2014) discuss the fear from male superiority in terms of strength and those males are more like to rape than females, which subsequently leads to a fear of sexual assault among women. This fear then leads women to act/change their lives accordingly to minimise the risk of sexual victimisation. Alongside to the fear felt prior to intercourse which leads the victim to submit to these threats, the concept of fear continues both during and after the act. According to Munro (2010), many victims

do not fight back or resist their attackers as a result of fear, shock, or a calculation that to do so would generate further harm.

After the act of non-consensual intercourse, the fear is still present in two forms. The first form is the fear of repercussions should they come forward and report it. Both the repercussions to their own body and the repercussions the perpetrator may wish to pose. Cybulska (2007) indicates fear of STIs, and fear of pregnancy are the most common reasons as to why victims seek medical help after a rape. As the RAINN (Rape, Abuse, Incest National Network) statistics show, 20% of victims chose not to report to the police for fear of retaliation by the perpetrator. Alongside the fear of repercussions there is the fear of belief. This fear is a number of circumstances, either that they will not be believed at the time of reporting, later at court or believe nothing will come from reporting (Cybulska, 2007). This fear links to the concepts of jury bias/stereotypes, rape myths and the 'halo effect'. The Rape, Abuse, Incest National Network also provide statistics on the percentage of victims that fear this belief concept. According to RAINN as stated in Section 1.1, 8% of victims believe that it was not important enough to report to the police, with 13% believing it was a personal matter and 13% believe that the police would not do anything to help.

### 1.6.3. Fraud

Rape by fraud, rape by deception and to some extent rape by coercion but not as much are areas which are closely related when it comes to issues around consent (Falk, 1998). In sexual offence cases, these terms fraud and deception are often interchangeable. Fraud is defined as; wrongful or criminal deception intended to result in financial or personal gain. To have one term in the definition of the other shows how similar these terms are. It was put forward that rape law surrounding fraud should be similar to that

of fraud regarding money by stating “prohibit fraud to secure sex to the same extent we prohibit fraud to secure money and prohibit extortion to secure sex to the same extent we prohibit extortion to secure money” (Estrich, 1986). There is one case in recent years where this new idea of linking fraud to money occurred. In 1995, the case of R v Linekar, a prostitute had sexual intercourse with the defendant on the understanding that a payment of £25 would pay for her services. He ran after the act and did not pay her and was subsequently taken to court for rape. The defendant appealed on the grounds that although he defrauded her of £25, he did not deceive her of the nature of the act or purpose of the act. Ultimately the defendant’s conviction of rape was quashed because of this. However, under Section 3 of the 1956 act, “procurement of woman by false pretences” he would have been guilty; however, this option was not given to the jury. On the other hand, there have been cases where the concept of fraud had negated consent due to the nature of the act. In 2019, the case of Jason Lawrance who was found guilty of rape after lying about having a vasectomy to his sexual partners. Prior to meeting up Lawrance had told her he had undergone ‘the snip’ and then after the act texted her saying “I have a confession. I’m still fertile. Sorry.”. These messages were used as evidence that he knew that the woman had not consented to sex without contraception. Prosecutors told the jury that Lawrance had taken the woman’s freedom of choice away by this lie and therefore, negated her consent (BBC News, 2019).

#### 1.6.4. Deception

Deception before the introduction of the SOA 2003, was a grey area according to Munro (2010), Millum (2014) and Dougherty (2013) with some ways of deception vitiating consent and other ways which did not. The way of deception used and whether the actus reus and mens rea were met, defined whether consent was vitiated or not. In the case

of *R v Jheeta* (2007) where extortion of the victim occurred, the outcome may have been different prior to 2003. The Sexual Offences Act 1956 contained a law; “procurement of woman by false pretences” which essentially was the law around deception, however the 2003 act abolished this law. Instead, as stated above Section 76: Conclusive presumptions about consent provide the circumstances around deception.

One of the cases in recent years that falls between the sections rather than being specifically positioned into one of them is that of *R v B* (2007). In this case, the deception was by a positive HIV status. Archbold (2019) notes that the positive HIV status in this case is not relevant to the issue of consent under the s.74 definition, nor does, as Archbold state does it fall under s.75 and s.76. This is due to deception not being acknowledged in s.75 and having extremely specific acts of deception in s.76. Cases such as *Assange v Swedish Judicial Authority* (2011) and *R. (F.) v DPP* (2013) also fall into the gaps between sections, however, they have had an impact on how these cases are now dealt with. In the case of *Assange v Swedish Judicial Authority* (2011), the woman agreed to intercourse on the condition that Mr Assange wear a condom. In this case he did not. English courts had previously ruled that one cannot give conditional consent. The supreme court ruled his actions would constitute a crime under English law therefore allowing conditional consent to become valid in English law. The *Assange v Swedish Judicial Authority* (2011) ruling had a direct impact on the *R. (F.) v DPP*, where a conditional consent clause was granted on the basis the husband removes this penis before ejaculating. He did not and was found guilty of rape following the conditional consent law established in *Assange v Swedish Judicial Authority* (2011). The question that these cases highlight is what type of deception is classed a morally wrong and therefore, vitiates consent? (Clough, 2018). For example, saying that you had a one hair

colour over the internet but in real life it is a different colour or saying you like the same things when they do not, does these vitiate consent? Herring (2005) goes further to ask whether the act of deception should be based on if the victim knew what they were consenting to rather than did they say yes to the act for example, 'stealthing'.

Actus reus means the guilty act of the event that has occurred. Whereas mens rea is the criminal intent of the event. So therefore, in the case of R v Jheeta the actus reus is extorting the victim, and the mens rea is using extortion to have intercourse. According to Munro (2010), Millum (2014) and Dougherty (2013), should a case like R v Jheeta have occurred pre-2003, it may have been seen that the use of extortion to obtain consent was not a guilty act. Due to the confusion, the introduction of the SOA 2003 meant that to secure a conviction of rape it is necessary to provide beyond reasonable doubt. Not only that the defendant committed an act that meets the legal definition of rape (the actus reus) but that the defendant knew that the victim was not consenting (the mens rea) (Sexual Offences Act, 2003).

#### 1.6.5. Sexual coercion

Sexual coercion is understudied (Livingston et al, 2004). However, before coercion becomes sexual, there is the concept of coercive control, which refers to the "continuous implementation of abuse designed to limit a victims decision making ability" (Stark, 2006. 2007). Stark highlights that the defining aspect of coercive control is that a partner uses the privileged knowledge of the victim's vulnerabilities to control them. The constant use of these vulnerabilities leads the victim to feel a loss of control, powerlessness, stress and begin to self-blame, and therefore ultimately submit to what is asked of them (Korkodeilou, 2017; Worsley, Wheatcroft, Short and Corcoran, 2017).



According to Benbouriche and Parent (2018) who quote Abbey et al (2014) and Farris et al (2008) state that sexual coercion is defined as “the use of any tactic or strategy to engage another person in sexual behaviours despite the absence of free and informed consent, or the clear expression of a refusal”. However, this is not the only definition of sexual coercion. Sexual coercion has also been defined as “a continuum of tactics to elicit sexual activity from unwilling partners ranging from non-forceful verbal tactics to physical force, with taking advantage of women due to voluntary or administered alcohol and/or drug intoxication” (Pugh and Becker, (2018); Schatzel-Murphy et al, (2009); Livingston et al, (2004). Unlike the definition by Abbey et al, this definition shows some of the tactics used and Tedeschi and Felson (1994) in their book *‘Violence, aggression and coercive actions’*, list further tactics and strategies used to coerce individuals. Such tactics as manipulation, persistent touching, intoxication, or the use of verbal and physical force. Jeffery and Barata (2017) also state these tactics as key reasons as to why individuals are sexually coerced. According to Jeffery and Barata, who acknowledge this information comes from other sources that it is two times more likely for a man to report committing sexual coercion than a woman, and women are around 1.5 times more likely to report being subjected to sexual coercion than men.

#### 1.6.6. Submission

Consent is tricky and while it can be verbally expressed, there is also the non-verbal cues that either is taken as a yes or show an unwillingness to participate in an act of intercourse (Malm, 2016). The show of unwillingness albeit may signify the capacity to decide on refusing to verbally consent but submitting to an act removes the freedom needed in consent as the law requires (Kramer, 1994). ‘What is the difference between submission and consent?’ is the key question.

The case of R v Olugboja is a prominent case of this question. In this case Olugboja and Lawal had offered two girls a lift home to which they obliged. On the way back, one girl got out and the other was driven off and raped. Lawal then drove back to the house with Jayne and picked up Karen on the way. Jayne then went to the toilet and upon re-entering the living room saw Lawal dragging Karen into the bedroom, to which Olugboja told Jayne that he was going to have intercourse with her. Jayne replied with the fact that Lawal had already raped her, but Olugboja demanded that she take her trousers off, and Jayne reluctantly did because she was frightened. Olugboja then proceeded to have intercourse with Jayne who did not struggle, resist, or cry for help until she thought he was going ejaculate inside her, but he pulled out.

All three acts were reported to the police; however, Jayne did not tell the police about the intercourse with Olugboja until much later. Olugboja expressed in his defence that he did not rape Jayne because she consented by removing her trousers willingly and therefore, that was an invitation to engage in intercourse. The court stated all circumstances involving this case have to be taken into consideration such as, the fact that she had just been raped and the fact that she had just seen her friend being dragged into another room. The judge ended with to the jury “why and in what circumstances she removed her trousers, was it because she was consenting, or was it because she was giving in out of fear or constraint, so that she was removing her own trousers without consent?.” Elliot and Quinn (2008) suggest that the line between submission and consent is not an easy one to draw, suggesting that this area will continue to cause problems as to what is genuine consent and what is submitting under pressure. The court of appeal has said in court cases such as R v Kirk (2008) that the use of the

expression “willing submission” could not be commended for use in future cases, given then the term willingness is usually associated with consent (Archbold, 2019).

## Part 2: Factors that change the circumstances of consent.

### 1.6.7. ‘Stealthing’ (non-consensual removal of a condom) and ‘Upskirting’ (non-consensual taking of a photograph under an individual’s clothes).

In the context of sexual offences ‘stealthing’ is a relatively new term to the area of sexual offences. Brodsky (2017) article *“‘Rape-adjacent’: Imagining legal responses to non-consensual condom removal’*, was one of the first articles to pen this term to the non-consensual removal of a condom. The “rape-adjacent” term was established in the article by an interviewee who had previously been raped, they do not see the act of removing the condom during intercourse as equivalent to sexual assault, but more adjacent to rape. Before this article, research had been studying the noncoercive and coercive methods to condom resistance; avoiding use of a condom with a partner who wishes to use one (Black et al, 2011; Davis et al, 2014b). The article by Brodsky revolves around a series of interviews to a rape crisis hotline and online chatrooms. From these interviews/chatrooms Brodsky explains the individuals view while also critiquing the view. The first poignant point in the article is the acknowledgement from one of the interviewees suggesting that stealthing is ‘rape-adjacent’ and that the removal of the condom is often overlooked as rape because of the lack of violence. The main issue which survivors as they are known as in this article state is that the non-consensual removal of a condom is a clear violation of their bodily autonomy and the trust that they had mistakenly placed in that sexual partner. The BBC (2017) also conducted interviews and the responses from those also indicated that “the harm mostly had to do with trust”.

This then highlights the consent element to intercourse. Brodsky states that there are two arguments as to why 'stealthing' vitiates consent; the victim consents to touch by a condom not by the skin of a penis and secondly the different risks which are associated to intercourse with and without a condom.

Taking the first argument Brodsky implies that for a 'stealthing' act to occur two separate acts of intercourse take place, intercourse with a condom and intercourse without a condom. Therefore, consent is needed for both acts. Ultimately, if consent is granted to intercourse with a condom, there is the first action and when the perpetrator "withdraws, removes the condom and then re-penetrates", it creates a second action. A second consent is then needed otherwise this second act vitiates the consent of the first act. The second argument, like the first acknowledges the concept of two separate acts. This argument suggests that consent is vitiated because consent is granted when the risk of transmitting a disease or getting pregnant is low when a condom is used. However, the removal of the condom completely changes the risk and therefore, consent is vitiated. According to Clough (2018) who states that without the comments by Herring (2005) "that acts of deception should be seen as whether the victim knew what they were consenting to, rather than did they say yes to the act, 'stealthing' would not fall under the s76 circumstances of deception". Instead, the act removes the victim's freedom and capacity to choose to consent or not and would only fall under the general definition of consent.

Although the Brodsky article explains the issues with 'stealthing,' the conviction rates of those who perform these acts are virtually non-existent. In the United Kingdom, 'stealthing' is not a specific criminal act under the Sexual Offences Act 2003 but would be convicted under the rape act. The first conviction of 'stealthing' happened in

Switzerland (Independent, 2017 and the Guardian 2017). In what seems to be the first landmark conviction, the defendant had asked the victim multiple times whether he was able to remove the condom. After being that he could not, he changed position such that she was not able to see whether or not the condom was present and only knew he had removed it after he had ejaculated inside her.

Since the article by Brodsky more articles and studies have been published, such as the studies by the End Violence Against Women Coalition study in 2018 and a study at Arizona State University in 2019. The EAW study focused on attitudes towards consent with a number of areas explored including 'Stealthing' which 40% of the 4000 respondents think it is never or usually not rape to remove a condom without the partner's consent. The Arizona State University study consisted of a survey, where 626 male responses were collected. This study assessed male sexual aggression history, sexually transmitted infection history and non-consensual condom removal experiences. Davis's study found that nearly 10% or 61 participants reported that they had engaged in the non-consensual removal of a condom since they were 14 years old. Of those 61 participants, 23 stated only one occurrence, 12 had two occurrences of 'stealthing' and 26 stated they had engaged in this behaviour more than three times (Davis, 2019). Prior to this study and the Brodsky study there had been little to no research into 'stealthing' even though it has been widely reported in media outlets.

Media outlets describe the difficulty regarding cases regarding cases of 'stealthing' because of the removal and potential discarding of the condom during intercourse or normally after intercourse (BBC, 2017; Guardian 2017). The obvious defence for a case of 'stealthing' where a condom is present at a scene, is that the condom was removed

after intercourse had finished, however, forensic analysis has an answer for this defence. If that is the defence, a forensic examination of the High Vaginal Region using intimate swabs could potentially show the presence of semen, meaning the condom was removed or intentionally damaged during intercourse and not removed after as the defendant suggests (Carney, 2015).

'Upskirting' or the taking of a photograph under the skirt of another without their consent until the 12<sup>th</sup> of April 2019 was not illegal. This act now forms part of the Voyeurism Offences Act 2019 and has since been added to the Sexual Offences Act 2003 under Section 67A and 68 (Sexual Offences Act 2003). Prior to the introduction of these sections, the law of voyeurism or 'the practice of watching others when they are getting undressed, naked or engaged in sexual activity for sexual gratification' was the only section that protected victims of 'upskirting' (Marshall, 1998).

However, as McGlynn and Rackley (2015) state 'upskirting' usually occurs in public, with the victim clothed. Therefore, the section of voyeurism does not cover this act. A case of this occurring and victims not being protected prior to 2019 is a case in Northern Ireland. In this case, schoolteachers had photographs taken under their skirts by a number of students. The students were reported to the police and the following was stated "The complainants who were photographed were not observed doing a private act and therefore the evidential test in respect of the offence of voyeurism is not met" (Belfast Telegraph, 2017).

#### 1.6.8. Withdrawn consent.

Withdrawn consent is a tough area to manage because as it is an intimate act between two individuals and is ultimately one word against another and because of this there are not many cases that have made it to court (Temkin and Krahé, 2008). One of the more

prominent cases of withdrawn consent is *R v Kaitamaki* (1985), where the defendant raped the victim twice, honestly believing she was consenting. However, on the second occasion the victim became aware that the victim was not consenting but refused to stop. This resulted in the defendant being charged with rape as rape is defined as intercourse without consent and the defendant did not desist from continuing the act once he knew of the lack of consent. The concept of withdrawn consent is not mentioned in the Sexual Offences Act 2003; however, it is mentioned in the explanatory notes which accompany the act. Section 79; Part 1: general interpretation provides definitions relevant to offences in part 1, Section 1 to Section 79 as stated earlier. The explanatory notes state “a person consents at the time of entry to penetration, but then withdraws his consent and the penetration continues, the person penetrating may be guilty of rape or assault by penetration.” However, withdrawn consent does not solely focus on withdrawing consent midway through or after an act, it also covers the autonomy of the act. For example, withdrawn consent can also refer to the concept of consent to one activity but not to subsequent acts, i.e., consent to vaginal intercourse but not anal intercourse.

Withdrawn consent is an area that prompted a survey of 1000 people around sex and consent. A study by StudySoup.com (2017) found that 96.5% and 96.6% of men and women respectively believe that consent can be withdrawn before intercourse with 85.8% of men and 87.8% of women believing consent can be withdrawn during. However, 16.2% of men believe that once sex has finished, consent cannot be revoked, with 22.1% of women also sharing this view. In researching this survey an article was found which highlights a case where consensual intercourse was taking place until the defendant began to pull the victim’s hair out at which point, she demanded him to stop

and did so. However, he proceeded to carry on a while later. When explaining her account to the police, she was interrupted with a question of “at any time after you said no, did he stop before proceeding to penetrate you again?.” The victim responded with “yes,” to which the police said, “that is important” (The Guardian, 2017). The article explains why it is important, because since 1979 a person is not able to withdraw consent for intercourse once it is taking place and it cannot be considered rape. Therefore, in this case the pause between the victim demanding “no” and the defendant proceeding to penetrate her again meant that her consent should have been legally withdrawn in the state of North Carolina under the law but was not seen as so.

#### 1.6.9. Mental capacity

Mental capacity as stated earlier is the ability of an individual to make their own decisions (Mental Capacity Act, 2005). Mackenzie and Watts (2015) state that “the capacity to make decisions about intimate relationships has been... in relation to general rather than specific decisions”. For example, they propose that courts decide whether (A) has or lacks the capacity to marry or engage in sexual relations in general, rather than the capacity for a specific decision such as the capacity to marry a certain person or engage in sexual relations with that person.

The *Sheffield City Council v E and Another* is a key case that takes an all-or-nothing approach to the capacity of someone to enter a marriage. In this case a mentally and physically disabled woman wished to enter a marriage with a known sex offender, and it was suggested that she was being abused. The courts then had to decide whether the individual had the capacity to consent enter any marriage (or no marriage) or understood the risks of this particular marriage (Benedet and Grant, 2013). The judge of the case implied that if the woman did not have the capacity to marry the known sex



offender, then she did not have the capacity to enter any marriage stating “The nature of the contract of marriage is necessarily something shared in common by all marriages. It is not something that differs as between different marriages or depending upon whether A marries B or C... Whether A marries B or marries C, the contract is the same, its nature is the same, and its legal consequences are the same.”

The Law Commission in the United Kingdom published a discussion paper; *Criminal liability: Insanity and automatism* that recommended introducing the concept of capacity to the insanity defence. This paper wished to include the defence of being “not criminally responsible by reason of recognised medical condition” (Law Commission, 2013). This inclusion in the Law Commission paper follows the M’Naghten Rules in England and Wales that have been present for centuries. These rules imply a defendant will be acquitted of an act if there is a “defect of reason;” either they are unaware of the nature and quality of the act or that they did not know what they were doing was wrong. There are a number of major cases surrounding the issue of capacity regarding the mental aspect of capacity, R v Cooper and IM v LM. In R v Cooper, the case concerned the “unable to communicate” element of Section 30(2)(b) of the Sexual Offences Act of 2003. The defendant was charged with intentionally touching the victim by penetrating her mouth with his penis, with the victim unable to refuse due to a mental disorder. The defendant then appealed on the basis of there being no evidence that she was physically unable to communicate any choice she made. However, the appeal was quashed due to “for any other reason” element to Section 30(2)(a) of the Sexual Offences Act which narrows a person’s protection regarding mental capacity.

The case IM v LM involves consent and capacity after incurring a brain injury. It was advised to LM by her GP to not continue in sexual relations with a long-standing partner

for fear of contracting sexually transmitted infections or get pregnant. The judge in this case then concluded that in “relation to the test for capacity (as seen in Section 1.2.1 – “consent”) and consent to sexual relations, LM did have this capacity,” even though she could not “weigh up the information” and “understand information”. Ultimately, the test inferred that she lacked capacity (Herring and Wall, 2014). Other than determining whether an individual has the mental capacity to consent, individuals may lack capacity due to other influences such as lacking capacity because they are heavily intoxicated with alcohol or drugs (Scott, 2010). This concept is explained further on in the chapter.

#### 1.6.10. Juror stereotypes/bias

The issue regarding consent does not stop at whether consent was given or not given, it remains an issue during court proceedings with the problem of juror stereotypes. Juror stereotypes seem to disregard whether consent was given but involve other aspects. These aspects include the behaviour of the victim in the lead up to the incident, the physical attractiveness of the victim, the level and fact of intoxication, what the victim was wearing, the victims and defendant’s personal life and the relationships to one another (Lees, 1996; Finch and Munro, 2007; Schuller and Stewart, 2000; Abbey *et al*, 1987; Whatley, 2005; Rumney and Fenton, 2008; Yescavage, 1999).

Other articles such as Ellison and Munro, (2013), Rose, Nadler, and Clark (2006) and Taylor and Joudo, (2005) comment on other stereotypes. Lack of visible injury meant that the jury implied that the victim did not try had enough to resist, therefore the victim must have consented (Ellison and Munro, 2013). Delay in reporting the incident to the police or inconsistencies between statement and cross-examination in court meant the report was false (Rose, Nadler, and Clark, 2006). Lack of distressed behaviour or those

who were not 'too' upset meant that they were less credible in the eyes of the jury (Taylor and Joudo, 2005).

When it is one person's word against another, the jury have to decide but they have to do that within the context of the law. If a jury finds that the defendant reasonably believed in the victim's consent, they must then find the defendant not guilty. It is only if they are sure beyond all reasonable doubt that the defendant knew that the victim did not consent, that the jury have a duty to find the defendant guilty. To do this the jury must decide the case fairly within the confines of the law, in light of the evidence and nothing else. However, the nothing else element is an issue. Boeschen et al, (1998) state that in cases "it is clear to see that in rape cases, the victim's accuracy of the allegations is often on trial at the same time as the defendant's culpability".

Amnesty International UK (2005) conducted a study which emphasises the types of stereotypes that may arise during a cross examination of the victim that should not bias the jury. A poll was carried out of 1,095 participants about the blame culture in the United Kingdom. The study showed some interesting results. The poll indicated that 26% of participants thought the woman was partially or fully responsible for being raped if she was wearing revealing clothing. 22% of participants thought she was responsible for being raped if she had many sexual partners. Whereas 30% and 37% thought the woman was partially or fully responsible for being raped if she was drunk or failed to clearly say no respectively. These findings may have dire consequences and a study by Huddersfield University highlights this. Huddersfield University found 43% of jurors chose a guilty verdict before deliberation and that percentage rises to 83% if the juror has firsthand experiences with sexual victimization (Rape crisis, 2017). This study shows that jurors

either come to a verdict based on the evidence present or prejudge due to other factors which bias the verdict.

One such court case where stereotyping was highlighted was the case *Barbour v HMA* (1982). In this case, the victim was being cross-examined about whether consent was granted or not and responded with “it depends on what you been by consent.” The Lord Justice Steward then summed up with the following statement “it is easy to see how the ambivalence in the concept in consent is exploited by the defence counsels in rape cases. It is also easy to see how the juries are very easily distracted away from the central question of whether she engaged in sexual intercourse freely by focusing on whether her words and actions indicated agreement.” The statement shows that there are a number of stereotypes and ‘rape myths’ which are pre-existing in a juror’s mind when they come to a verdict and on occasion ultimately decide their verdict regardless of evidence present.

#### 1.6.11. Rape Myths

The term ‘rape myth’ was first penned as such in Brownmiller’s 1975 book *Against our will: Men, Women and Rape*. Burt (1980) then defined rape myths as “prejudicial, stereotyped or false beliefs about rape, rape victims and rapists”. Similar to the generalised stereotypes as stated above regarding events prior to the action, rape myths also enter court rooms. According to Edwards et al (2011), rape myths are implicit rather than explicit and anyone “may unintentionally be influenced by rape myths to explain their beliefs, assumptions and actions”. A number of articles write of those sections of society that have been found to have endorsed rape myths to some extent; students (Bannon, Brosi & Foubert, 2013), criminal justice personnel (Smith, Wilkes & Bouffard, 2016) and jurors (Dinos, Burrowes, Hammond & Cunliffe, 2015).

There are several pieces of literature which give examples of rape myths. Only strangers' rape (Koss, Dinero, Seibel, and Cox, 1988). Rapists use weapons and cause physical injury (Schafran, 1993). Victims behave in certain ways, i.e., if they were being raped why did not, they fight back (Waterhouse, Reynolds, and Egan, 2014). Women routinely lie about rape and only 'certain women' are raped (Brownmiller, 1975; Rumney, 2006). Women ask for it and women 'cry rape' if they have got something to cover up (Burt, 1980). According to Temkin and Krahé (2008), there is a concept called the 'real rape' or 'classic rape' stereotype as suggested by Williams (1984). They acknowledge the scenario as when an individual is asked to describe a typical rape situation. Ryan (1988) and Krahé (1992) depict this scenario as an attack by a complete stranger on an unsuspecting victim, in an outdoor location where threats of violence are used by the perpetrator which subsequently leads to physical resistance by the victim. However, there is literature that research rape and sexual assault that suggests that a 'real rape' scenario is highly uncommon. According to the Crime Survey in England and Wales 2017, approximately 90% of victims knew their perpetrator prior to the offence taking place. Therefore, this 'real rape' stereotype involving a complete stranger could not be further from the truth. Myhill and Allen (2002) showed a similar sort of pattern in terms of the relationship between perpetrator and victim; they found 45% current partners, 16% acquaintances, 11% ex partners, 11% dates, 10% other intimates and only 8% strangers. This indicates that it has been known for more than a decade that the number of stranger rapes that occur is incredibly low, compared to those known to the victim and, yet the myth of rapes being carried out by strangers is still prevalent. Although, it seems that the 'real rape' stereotype is true for a minute number of rape cases, Du Mont, Miller and Myhr (2003) suggest that victims who were sexually

assaulted similar to that of the 'real rape' i.e. by a stranger who used force are much more likely to report their assault to the police than those which stray further from the stereotype i.e. by someone they know but did not resist due to intoxication. Du Mont, Miller and Myhr document some rape myths in their study by giving percentages to some of these myths occurring for example they found that 15% of the time a weapon was used and up to 26% the victim was assaulted outdoors.

As studies have shown, the more a rape incident differs from the 'real rape' scenario, the smaller the number of people prepared to consider it as rape (Burt and Albin, 1981). Berliner (1991) takes this to a court setting by suggesting that when a stranger rapes a victim it is seen that jurors tend to assume a lack of consent, whereas acquaintance rape is more difficult to prove. As rape is the second most serious crime on the statute book after murder and the sentence for rape is up life imprisonment, and it is very possible that a jury could think that the seriousness of the crime does not warrant that sentence compared to murder (Archard, 1998). Ultimately, rape myths and generalised stereotypes can make their way into court proceedings where they may bias verdicts. Since the pioneering paper by Burt 1980 first looking at Rape Myth Acceptance (RMA) research into rape myths and the acceptance of those myths has surged with several scales looking at RMA. Payne, Lonsway and Fitzgerald (1999) presented the Illinois Rape Myth Acceptance Scale (IRMAS) and since the introduction of male rape to the 1994 Criminal Justice and Public Order Act there have been scales researching male rape acceptance (Hine, Murphy, and Churchyard, 2021). Once such reason for research into RMA is that of such low conviction rates and also high attrition rates in rape cases. According to Hohl and Stanko (2015) the UK has the lowest conviction rates in Europe for rape cases, with victim withdrawal a main reason (Parrat and Pina, 2017). This is due

to the idea of “Secondary Victimization,” a concept where victims are at an increased risk of their credibility being questioned due to negative beliefs and misconceptions seen at police and jury level questioning (Hackett, Day, and Mohr, 2008; Sleath and Bull, 2012). However, it is impossible to know who potentially holds these beliefs/misconceptions without the development of a tool to test (something that is explored later in the research)

#### 1.6.11.1. ‘Halo Effect’

The ‘Halo effect’ was first termed this in Edward L Thorndike’s 1920 paper on “*A constant error in psychological ratings*”. In Thorndike’s study, commanding officers were asked to rate their soldiers on a number of physical and personality traits. The study showed that the evaluation of one trait affected the rating of another trait. ‘Halo effect’ is best defined as “an error in reasoning in which an impression is formed from a single trait or characteristic is allowed to influence multiple judgements or ratings of unrelated factors” (Encyclopaedia Britannica, 2016). Asch (1949) said that people naturally form first impressions of others from the initial information they obtain, and like rape myths and stereotypes these ‘halo effect’ impressions can make their way into a court setting. Asch’s research now known as implicit personality theory was one of the first on the concept of forming first impressions on initial information. One of these first impressions can be seen by the Amnesty international UK (2005) poll that 26% of participants asked were of the thought that a woman was partially or fully responsible for being raped if she was wearing sexy or revealing clothing.

Mentioned by Taylor, Lui and Workman (2018), there are a number of studies where mock juries have been utilised and where both evidential and non-evidential information have been used. The information used ranges from the evidential of how

the alleged perpetrator might be linked to a crime to the non-evidential such as physical attractiveness, gender, ethnicity and what is being worn. This is to see if bias is prevalent. There are a number of studies since Asch's that take these non-evidential pieces of information to see how they affect an overall evaluation of an individual. Taking physical attractiveness there are studies such as Miller (1970); Castellow, Wuensche and Moore, (1990) that research this. Both of these studies concluded that more attractive people are assigned more positive traits.

Taylor, Lui and Workman also acknowledge two separate studies regarding the gender aspect of the 'Halo effect,' McCoy and Gray (2007) and Ahola, Christianson and Hellstrom (2009). In the study by McCoy and Gray they found that juries tend to show more leniency towards females in cases involving child abuse, which was also found in the study by Ahola, Christianson and Hellstrom. Ahola et al study also found that male defendants received more convictions for murder than females but also were deemed less trustworthy. Another non-evidential factor that has been seen to be an influence in mock jury trials is that of the individual's ethnicity. The study by Forster Lee et al, 2006 found that jurors in cases were most lenient in sentencing with white defendants who murdered white victims. Their article found also found that female jurors were more punitive toward black defendants than male jurors. This was also seen for female jurors who were more likely to engage in emotive responses when the victim was black, compared to male jurors.

#### 1.6.12. Token Resistance

'Token resistance' is the concept of resisting or refusing sexual activity while intending to engage in that activity and is a form of sexual miscommunication that may lead to a man's misunderstanding of consent (Muehlenhard and Rodgers, 1998; Shafer, 2018).



Muehlenhard and Rodgers suggest that there is a traditional sexual script that implies that women “are not supposed to directly indicate their sexual interest” and therefore, men are supposed to “take the initiative even when a woman indicates verbally that she is unwilling to have sex, as the presumption that the initial resistance is only a token”. Garcia (1998) conducted research into the perceptions surrounding ‘token resistance’ and similarly found that men are socialised that women who show resistance towards sexual activity are “playing hard to get”. The research also implied that a woman must fight back against a perpetrator during a sexual assault because the showing of resistance will increase the believability of victim. Garcia also showed that the most extreme resistance from a woman who was being subjected to sexual assault such as slapping, scratching, and screaming were deemed as a genuine resistance. Whereas changes in body language or repeatedly saying no, were not deemed as genuine resistance.

A belief in the concept of token resistance leads to greater misconceptions about sexual consent according to Muehlenhard et al, (1996). For example, they suggest that men believe that situations where women only wanted to kiss, actually wanted to engage in sexual intercourse because they originally agreed to sexual activity (the kiss). Due to this, men that believe in ‘token resistance’ are subsequently more likely to subscribe to rape myths which will assign the blame to the victim rather than the perpetrator (Shafer, 2018).

### 1.6.13. Marital and acquaintance consent

Marital rape is the term used to describe the sexual acts that are committed without the individuals consent and/or against their will by the husband. Acquaintance rape is identical to marital rape except it is non-consensual acts to a partner not in marriage

(RAINN, 2019). In the United Kingdom, the issue of marital consent first became a topic in law in 1736 due to a quote by barrister Sir Matthew Hale regarding marital rape. Hale stated, “the husband cannot be guilty of rape committed by himself upon his lawful wife, for by their mutual matrimonial consent and contract the wife hath given herself up in this kind unto her husband which she cannot retract” (Hale, 1736). Hale’s justification for such a comment was that upon marriage, the wife gives up her body and therefore gives her irrevocable consent to intercourse.

It was not until 1949 that there was a case in UK courts that rejected Hale’s statement which was *R v Clarke* (1949). This case a separation order was present between the couple which revoked the marital consent between the two. It was suggested by Archbold (1822) who agreed with Hale’s quote that a wife’s consent can only be withdrawn under certain circumstances and listed those as; death, an Act of Parliament, a separation order, a decree nisi (court order), an undertaking, a deed of separation or a family protection order. However, there are cases like *R v Miller* (1954) just a couple years after the Clarke case, where a husband was not convicted of rape even though the wife had filed a petition for divorce, but it had not got to the stage of a decree nisi, unlike the *R v O’Brien* (1974) case which did have a decree nisi present that effectively terminated the marriage and subsequently the consent.

It was not until 1991, and the decision in the case of *R v R* which expressed, “the law should declare that a rapist remains a rapist subject to the criminal law regardless of their relationship to the victim” (*R v R*, 1991), that the quote by Hale was now not deemed as the law and husbands were not exempt from prosecution of marital rape. Even after this stance, there were two cases in the same year that conflicted on marital rape. *R v C* (1991) reiterated the statement that there is no marital exemption to the law

of rape. However, the case of *R v J* (1991) argued based on the statutory definition of rape in the 1956 and 1975 amended sexual offences acts that included the word 'unlawful'. The use of 'unlawful' was taken in the context of being outside marriage and because of this confusion, Hale's quote was deemed not good law and the word 'unlawful' was removed from the definition of rape under the Criminal Justice and Public Order Act 1994 (CJPOA).

The Crime Survey in England and Wales 2017 shows that the majority of rapes that occur are committed by people already known to the victims, around 90%, with 56% of these being committed by partners or ex partners. This shows as stated by Willmott (2016) that the termed "acquaintance" and "domestic" rapes are much more prevalent than those committed by strangers. However according to a survey for the End Violence Against Women coalition almost a quarter of people (24%) believe that sex without consent in long-term relationships is usually not rape (YOUGOV, 2018).

This element is one that is explored later in the thesis, researching the possibility of determining when consensual intercourse occurred, and potential non-consensual intercourse occurred between previously consenting partners. This research can be carried out using gene expression. Gene expression is the process by which the information from a gene is used in the synthesis of a product, mainly protein (Taft, et al, 2010). To use gene expression for determining the ages of biological stains (consensual older stain compared to a potential non-consensual younger stain), the research investigates changes in gene expression levels which highlights increases and decrease of the abundance of that gene. The research therefore monitors the levels of gene expression of degraded mRNA markers over time to see whether it is possible to determine age since deposition. Chapter Five and Section 5.3 specifically focuses on

determining time since deposition and the specifics associated with RNA and mRNA degradation.

### 1.7. Literature review conclusion

All the preceding sections in this literature review aim to explain the issues regarding consent and sexual offences. However, very few articles cross over with another issue with exception of intoxication/mental capacity and coercion/deception. As the majority of the literature deal with a single issue, the literature only highlights that this is an issue, not whether it is more or less than an issue than other issues surrounding consent and sexual offences. This literature review which compiles the available literature shows the current gap in knowledge being firstly, a comparison of the issues to determine a definitive key issue and secondly from that develop studies in order to deal with that issue. The following chapter is the methods and materials chapter which explains how this gap in knowledge is explored via a public survey. Public opinion on the issues stated above would provide the means of determining what the overall consensus is on the key issue regarding consent and sexual offences. This public opinion would provide important data which can then be used for studies to counteract the issue (these can be found in chapters Three, Four and Five). The survey and data obtained from this can be found in Chapter Three.

## 1.8. Rationale

Other than acts of a sexual nature, there is only one other offence where the concept of consent is brought up, that being trespassing. In both cases, regardless of other evidence a guilty or not guilty usually hangs in the balance on whether consent was given or not. For consent to be determined especially in acts of a sexual nature it is usually only two individuals that are involved so therefore it is extremely difficult as it is one person's word against another. As can be seen in Figure 1.4, there are other factors that influence or affect the assumption that consent was or was not given, in some cases it is relatively easy to assume consent was not given for example if an individual consumes too much alcohol and passes out, it can be said that person did not consent to intercourse if they were unconscious. Despite there being several issues surrounding consent, as seen in above in the chapter, there is plenty of research that explains the issue, but little research tackling the issue. However, of those pieces of literature that explain, they only take one issue at a time and state that it is a key issue.

Therefore, this research firstly compares issues to one another and determine themes or issues that are deemed key by public opinion (Chapter Three). Secondly, using multi-disciplinary approaches to build on some of the challenges posed in Chapter Three (the stereotyping/bias found in court rooms over the granting of consent/lack of consent in sexual offence cases) and (marital and acquaintance rape) a mix of scientific and legal studies were developed, Chapters Four and Five, respectively.

## 1.9. Aims and objectives.

### 1.9.1. Aims

The overall aim of this thesis is to explore the interpretation of consent in sexual offence cases and identify strategies to overcome the issues. A mixed methods approach was

used to develop strategies that may potentially address some issues with and surrounding consent. From this overall aim, a series of sub-aims were devised.

1. Evaluate the public views on sexual offences and consent and to test misconceptions surrounding consent and rape myth beliefs of potential jury members.
2. To establish a model for determining the age of a biological stain using RNA degradation.

### 1.9.2. Objectives

The objectives of this thesis are.

- 1.1. To evaluate the themes generated by the general population surrounding consent and rape culture and determine key issues with consent.
- 1.2. Develop a tool to determine the prevalence of rape myths beliefs and misconceptions surrounding consent in society and evaluate the impact such a tool would have on court cases.
- 2.1. To determine whether RNA expression levels differ between time since deposition of the biological stain and investigate the effect mixed samples (semen and vaginal fluid), have on the RNA expressions levels of those biological samples deposited at separate times.

### 1.10. Original contribution to knowledge

This thesis embraced a holistic approach by utilising a combination of science but also a legal approach to challenging the issues that arise with consent and sexual offences but also the wider criminal justice sector. The research devised in this thesis could be the driving force behind other research adopting a mixed methods style to tackling problems. The findings of this research could really contribute to reduced attrition rates

in rape cases, changes in law, but also have a significant impact on evidence collection and analysis if time since deposition can now be determined.

Chapter Four developed and validated (compared to other rape myth acceptance measures) a tool to be given to potential jury members to indicate their levels of endorsement of rape myths prior to court. This research would impact the number of cases making it to court but also the victim themselves. Understanding the level of acceptance of rape myths of jury members, would reduce the fear in victims that they would not be believed if their case coincided with a potential rape myth. However, this tool can also be used at the beginning of a case, during the reporting stage. Research has shown that victims fear that the police would not believe their accounts, and ultimately would be put off reporting in the first place (Sleath and Bull, 2017).

Therefore, this tool could be given to police forces to understand the levels of police stereotyping and/or unconscious bias. Similarly, to above, while this tool focused of sexual offences and rape myths, using a comparable tool (by adapting the statements) other crimes can be researched. For example, the End Violence Against Women and Girls Coalition (2019) believe there is an agenda against women and girls, therefore a tool such as this could be used to determine whether this agenda is present in the police. Ultimately, providing a tool at the beginning of a case to identify unconscious bias would then have positive impacts further on.

The stain age prediction chapter could vastly impact sexual offence cases particularly those cases of alleged rape between previously consenting partners. While the alleged offence may have occurred at one time, there is the defence from the suspect that any physical evidence collected then came from earlier consensual intercourse (Williams, 2018). Predicting the age of a stain would negate this type of defence. Chapter Five

developed a method of determining the age of a stain using the various levels of gene expression of several semen specific mRNA markers for numerous time periods. An extended abstract for this research was published. It is therefore hoped that this research could lead to the development of a stain age prediction model for police use, in which sexual assault associated biological fluids such as semen and vaginal materials could be imputed into software and a potential time since deposition would be generated. However, it is not just cases pertaining to sexual offences that this research could be beneficial for, all markers in biological samples will degrade over time. Therefore, this research could be replicated with samples such as bloodstains and applied to assaults or murder cases.

### 1.11. Structure of the thesis

This section outlines the structure of the thesis by providing an overview of each of the chapter and their contents. This thesis has been split into 7 chapters and are explained below.

Chapter One introduces the topic area of sexual offences and consent. It explains the original contribution to knowledge and the need for research on sexual offences as there is a rising number of offences being committed. This chapter also outlines the issues surrounding consent specially the wording of sections 74, 75 and 76 of the Sexual Offences Act 2003, the changes in the act that differ from the recommendations in the *Setting the Boundaries* bill (2000) and the 'conflicting approaches' when applying Section 76. Chapter One also presents a review all the key literature that is associated with issues that affect or influence consent. A number of issues were highlighted ranging from intoxication to marital and acquaintance consent to rape myths. Section 1.6. took each individual issue and evaluated as to why this is an issue.



Chapter Two sets out the quantitative and practical methods that have been applied to the numerous studies carried out. The chapter depicts the overall method, before each individual chapter outlines the specific elements applicable to that chapter.

Chapter Three explains the need for further data in the area of sexual offences and consent and subsequently, why a questionnaire was developed for this research. The chapter delves into the views and opinions of the general public on topics such as consent and the factors that influence and indicate consent, the current state of sexual offences as seen in the UK statistics and rape myths and misconceptions.

Chapter Four builds on one of the challenges found in Chapter Three and developed and validated a tool (Pre-Jury Screening Tool) that can be used to test the misconceptions surrounding rape myths highlighted in chapter 4 in potential jurors.

Chapter Five explored the concept of marital and acquaintance rape and the debate between previously consenting partners over the validity when the last consensual intercourse occurred. The chapter highlighted factors which could affect the degradation profile of semen specific mRNA markers and evaluate why there is such variation in gene expression levels over different time periods. This chapter then developed a method predict the age of a semen stain by using a number of RNA markers that potentially degrade at different rates and by identifying enough degraded markers aim to estimate how old the stain is. The chapter explains the process of optimising the conditions for greater sensitivity and efficiency, the preliminary study to determine if the research is possible, the main study and a study that involves a mixed stain (of semen and vaginal fluid) to determine if it influences degradation rates.

Chapter Six is the overall discussion chapter and provides an overview of the key findings from the various previous chapters and also provides any recommendations that arise from the research.

Chapter Seven concludes the thesis, addresses the objectives while also discussing implications of the research and any further work that could be conducted to enhance the knowledge in this area.

References.

Appendix.

## Chapter Two: Materials and Methods

### 2.1. Qualitative and quantitative research

Both chapters Three (Misconceptions surrounding Sexual Offences and Consent survey) and Four (Pre-jury Screening Tool) focused on the use of surveys and measuring scales as the basis of the research. The following sections depict the methodology.

### 2.2. Survey design and layout

Qualtrics software enables the input of questions in whichever form is desired for example, multiple choice questions, essay questions or rank in order questions. After the questionnaire is finalised on the software the questionnaire can be published. Every time a participant takes the questionnaire, Qualtrics records the response and also shows if any response is currently in progress. Once the period of time the questionnaire is open has concluded the Qualtrics software closes the questionnaire and collates the responses ready for data analysis.

The layout of the surveys and the types of questions to utilise, '*Designing Surveys: A guide to decisions and procedures*' by Czaja and Blair (2005) was used. The questions for the questionnaire were determined using a number of ways. The broad questions about the participants were included to determine whether different demographics possess different views. For the statistical questions, the crime surveys for England and Wales (CSEW) were utilised. These questions were included in the questionnaire because although statistics on sexual offences are published regularly, the general public may be oblivious to them. Therefore, they were included to obtain a view of the public to see whether the opinion is that these offences are more or less rife in society than the statistical average.

The Chapter Three Survey Misconceptions surrounding Sexual Offences and Consent was split into a number of sections, those sections being generalised demographic questions, generic questions on consent and UK sexual offence statistics, rape myths, misconceptions surrounding consent and indicators of and influences on consent. These separate questions consisted of a number of multiple-choice questions, open ended and ranking questions for a mix of both quantitative and qualitative data. The mixture of questions provides an idea of the understanding of the topic of the participants taking part (multiple choice) but also allowing the participants to express a view or opinion on the same topic (open ended). A number of open-ended questions followed the multiple-choice questions to explain the thoughts behind their choices. Finally, the ranking questions allowed participants to show whether they place a particular view or belief above another. These questions focused on rape myths, reasons to report and to not report to the police but also the potential influences on consent. A full list of questions asked can be found in appendix B.

Similar to that of the Misconceptions of Sexual Offences and Consent survey. The Qualtrics software was used again for the Pre-Jury Screening Tool, this time utilising the 5-point Likert Scale question option akin to that of Burt (1970) Rape Myth Acceptance Scale. 42 statements were determined in order to measure an individual's attitudes towards sexual offences and consent scenarios. Each statement has a scale-based answer between 1 and 5 and participants have to choose the option that is most applicable to their view; 1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree or disagree*, 4 = *agree* and 5 = *strongly agree* with the statement. Participants can be scored between 42 points for example, they strongly disagree with all the statements or 210 points i.e., they strongly agree with all the statements. The screening tool comprises of 42 scale

questions split into sections; perceptions surrounding consent (11 questions), influences on consent (5 questions), beliefs about rape myths (23 questions) and the validity and need for biological evidence (3 questions). A full list of the statements found in appendix E.

### 2.2.1. Demographics

The multiple surveys were posted on social media and therefore, specific demographics were not targeted, other than the participants must be over the age of 18. A series of broad questions obtained non-identifying information on the participants who completed the questionnaire. These generalised questions were gender, age, occupation, do the participants possess any expertise in the field of sexual offences and what is their country of residence. These questions enabled to see whether gender, age or expertise had an effect on the subsequent questions answered. The country of residence allows the determination of whether participants from other countries have differing views to those from the United Kingdom and ultimately whether laws in those countries have an effect on answers given.

### 2.2.2. Survey Pilot

A study by Fisher and Cullen (2000) highlights the effects of question wording and the use of behavioural-specific language has on participant responses. They suggest that describing the incident explicitly but linking it to the legal definition of the crime draws a greater response than asking as respondent whether an act is rape of sexual assault. Fisher and Cullen go on to state that the latter requires a respondent to interpret an act as a crime. Some questions of this nature have been found in the CSEW and have showed that the population have much “narrower interpretation” as what is rape than that of the legal definition (Brunton-Smith et al, 2020).

Previous scales measuring rape myth acceptance also found issues with wording and clarity of the items. To determine whether the scale is reliable and valid, the wording of the statements made have to be clear and understood by those participating. In some cases of the existing scales the statements are too complex or consist of multiple statements in one. Therefore, for the development of a measure of misconceptions and rape myths the original statements must be carefully thought out and undertake pretesting to avoid issues with wording and clarity. The Pre-Jury Screening Tool therefore was trialled in a focus group beforehand, with feedback suggesting terminology needing to be more specific and some statements to be adapted in order to refrain from leading the participants towards specific answers. All questions were written in third person as jurors would be looking at other people and they might have differing opinions/answers to these questions when answering about themselves compared to when they are answering about others.

### 2.2.3. Ethics Clearance.

The ethical implications of the survey studies being carried out in this chapter have been considered and ethical approval has been obtained by Staffordshire University for research to be carried out.

### 2.2.4. Dissemination

Once the focus group feedback was included/removed from the surveys, it was distributed using the anonymous link on all personal social media platforms; Twitter, Facebook, and LinkedIn to get as many responses as possible. Qualtrics software offers a number of ways for the questionnaire to be disseminated; via anonymous link, via email or via the use of a QR code. The questionnaire link was left on social media for 5 weeks, the reason for this is explained below. An anonymous link was used as the

method of dissemination due to the fact that an email chain would not make the questionnaire anonymous, although the response may have been, it would be known who had taken it. The QR code was not used for the fact that it is used for mobile participation, and therefore would have disregarded computer participants. One issue highlighted in the data with this method of dissemination and that a prominent figure in the area of sexual offence research gave more exposure to the survey was that almost  $\frac{3}{4}$  of respondents were female. As the data shows that the majority of sexual offences occur to women, there is a possibility that bias towards women or against men may have arisen due to the high number of women undertaking the surveys.

#### 2.2.5. Response rate

A study by Survey Monkey (2019) of 500,000 individual respondents to surveys shows the average time after being sent a questionnaire for a participant to complete. The survey found that 41% of responses were collected in one day of the questionnaire being sent out, 66% of responses were collected after three days and 80% of all responses were collected after seven days. The survey also found that only an additional 11% of responses were collected in the second week of being sent the questionnaire and a further 4% of responses in the third week.

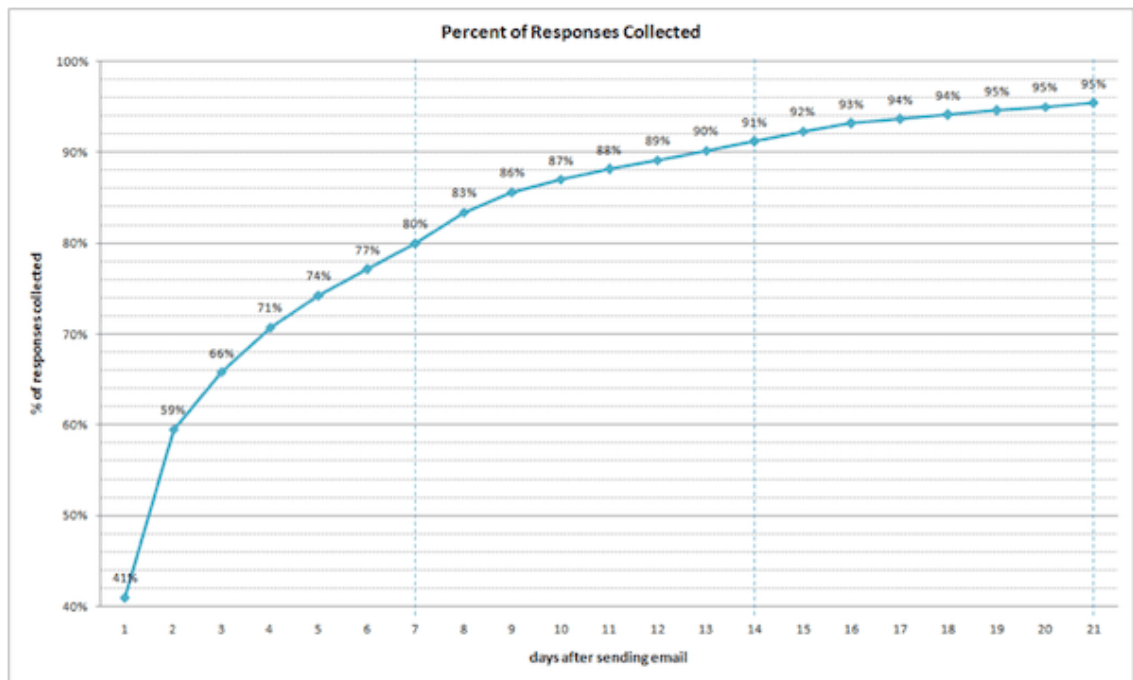


FIGURE 2.1: THE PERCENTAGE RESPONSES COLLECTED FROM THE FIRST DAY OF A QUESTIONNAIRE BEING AVAILABLE TO 21 DAYS AFTER BEING SENT TO PARTICIPANTS (SURVEY MONKEY, 2019).

Therefore, due to this study by Survey Monkey (2019) and Vehovar, Batagelj, Manfreda and Zaletel (2002) who suggest that 1 month generally is a reasonable time for a questionnaire to be accessible for participants to complete, the questionnaire originally was going to be displayed on various social media platforms for four weeks as the number of responses was declining. A targeted approach to asking other academics to also disseminate the survey aided with the response rate.

### 2.2.6. Analysis of results

Data analysis of the multiple surveys results used a mixture of different software, those software systems were Microsoft Excel, IBM SPSS Statistics v.25 and NVivo 12. For the quantitative questions such as the multiple choice and ranking questions, Excel and SPSS were utilised and for the qualitative open-ended questions NVivo was used. All multiple choice and ranking questions had graphs generated to aid in descriptive statistics such as mean, mode, percentages, and standard deviation and each had had further data analysis carried out depending on the question type. The series of multiple-choice



questions utilised in the survey had further analysis carried out using the Chi squared test, which allowed for the comparison of each question to the general demographic questions (gender, age, and expertise). All ranking questions further data analysis used the Friedman test and Wilcoxon Signed Rank Test to test for significance and correlation. Post-hoc corrections were applied if necessary. Post-hoc corrections like the Bonferroni corrections are carried out to reduce the chances of obtaining false positive results when multiple tests are performed on the same single set of data. This correction suggests that the p value for the test is equal to the alpha divided by the number of tests that are performed (Bland and Altman, 1995). For qualitative open-ended questions content analysis was carried out in NVivo 12, where themes and specific views of the participants were identified.

For the Pre-Jury Screening Tool alongside carrying out data analysis of the participants responses as a whole, individually, or cross tab analysis of the different demographics, the survey tool underwent scale reliability analysis, discriminative analysis and validity analysis compared to the Payne, Lonsway and Fitzgerald (1999) and the McMahon and Farmer (2011) updated Illinois Rape Myth Acceptance Scale.

### 2.3. Practical research

Chapter Five (Stain age prediction) study applied biological methods to developing the possibility of determining the age of a stain and the following sections provide the method for carrying out such a study.

Studies involving primers and the expression of primers require optimal conditions otherwise the primers may not bind. Therefore, the first element of this study aimed to determine the series of optimal condition for a number of semen specific markers. A number of proposed body fluid specific genes, and reference genes were selected from literature for this study. The proposed markers were subjected to a series of conditions to determine the optimal annealing temperature ( $T_A^{OPT}$ ) so that the corresponding primers would bind to the product. A series of biological fluids were used as the product to determine, whether the primers from literature were body fluid specific. Those body fluids were semen, saliva, and blood.

Figure 2.2. below shows a brief outline of the process carried out for the stain age prediction studies.

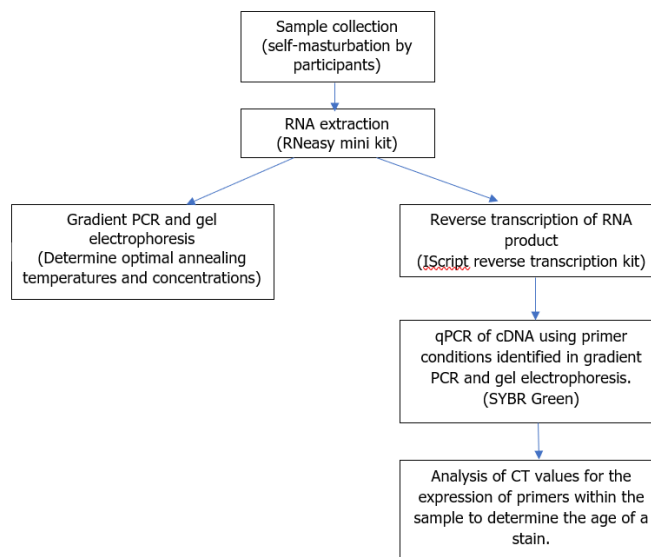


FIGURE 2.2: DIAGRAM HIGHLIGHTING THE PROCESS FOR CARRYING THE STAIN AGE PREDICTION STUDIES

A detailed method used for these studies is outlined below.

### 2.3.1. Semen specific markers

Research into the semen specific genes lead to the following table of potential primers to use.

TABLE 2.1: A LIST OF THE PRIMERS FOUND FOR THIS STUDY FOR SEMEN AND ALSO THE HOUSEKEEPING GENES TO BE USED AS REFERENCE.

Primer	Body fluid	Reference
GAPDH Glyceraldehyde 3-phosphate dehydrogenase	Housekeeping gene	Jedrzejczak et al, (2009) Haas et al, (2009) Sakurada et al (2009)
ACTB Beta-actin	Housekeeping gene	Glare et al, (2002) Juusola + Ballantyne (2003) Lindenbergh et al (2013)
RP s18 Ribosomal protein	Housekeeping gene	Connolly and Williams (2011) Lindenbergh et al (2013) Nussbaumer et al (2006)
PRM 1 Protamine 1	Sperm specific	Haas et al (08,09,13) Steger et al (2000) Juusola + Ballantyne (2003) Lindenbergh et al (2013)
PRM 2 Protamine 2	Sperm specific	Haas et al (08,09,13) Steger et al (2000) Juusola + Ballantyne (2003) Lindenbergh et al (2013)
TNP 1 Transition protein 1	Sperm specific	Albani + Fleming (2018)
KLK 3 Kallikrein 3	Seminal fluid specific	Haas et al (2013) Albani + Fleming (2018) Nussbaumer et al (2006) Gelmini et al (2001)
TGM 4 Transglutaminase 4	Seminal fluid specific	Fleming + Harbison (2010) Haas et al (2008)
Sem 1 Semenogelin 1	Seminal fluid specific	Haas et al (2013) Lindenbergh et al (2013) Sakurada et al (2009)
Sem 2 Semenogelin 2	Seminal fluid specific	Haas et al (2013) Lindenbergh et al (2013) Sakurada et al (2009)

Further research meant GAPDH was selected as the reference gene to use with PRM1, PRM2, KLK3 and TGM 4 as the two sperm specific and two seminal fluid specific primers, respectively. The primers above were chosen originally due to the literature stated in the table suggesting that they were sperm or seminal fluid specific. The genes were also

chosen due to the fact that they were the first to be used in a forensic context regarding time since deposition. As seen in the table above, there were a number of other genes considered to be used in this research, and analysis of the primers was carried out to determine the specificity of the genes using other body fluids and the primers to determine whether they would bind during PCR (if they had, then other primers would have been utilised in this research). Some of the research above referenced sections on the degradation of the primers for example both PRM1 and PRM2 (Semen specific) were seen to be the more stable primers out of those chosen, this is also seen by Sherier (2014). PRM1 and PRM2 were deemed as more stable due to the semen structure compared to seminal fluid with the presence of cell walls and membranes. Whereas the research surrounding seminal fluid markers varied depending on the sample type i.e., liquid or stain (Zaoh et al, 2019). The reference gene GAPDH was used because it is a very stable gene, with the expression levels found to be high and constant in several different cells and tissues (Sikand et al, 2012). This allows the potential development of a model to be applied to other cases not just those of a sexual offence nature.

### 2.3.2. Sample collection and deposition.

Semen samples for all stain age prediction studies were collected by self-masturbation and deposited into sterile collection pots. All samples were placed on ice immediately for transfer to the laboratory before being frozen to preserve them from degradation before extraction commenced the following day. Once defrosted, samples were homogenised via a series of pipetting motions to make the sample uniform prior to 20µL of the sample being extracted from the batch sample in the sterile collection pots using reverse pipetting and deposited into separate 1.5mL microcentrifuge tubes for analysis of a fresh, 7-day, 14-day, 21 day and 28-day sample for the preliminary study. For this

study only one participant was used to determine whether the concept of stain age prediction was possible, and because of this, biological replicates were carried out (3 in total).

For the extended study with 5 participants, 20 $\mu$ L of batch sample was extracted 28 times to simulate 1 months' worth of degradation, although only a 7-day period analysed. As with the previous study, biological replicates were taken from the participants and then technical replicates used from each biological replicate throughout the stain age prediction process.

For the mixed stain age prediction study, a single female participant was asked to produce vaginal fluid. They were asked to use nylon flocked swabs to swab the inside of their vagina a total of 9 times. One swab for analysis of a non-mixed sample to show the markers are indeed semen specific. Then 8 swabs to indicate a fresh up to a 7-day degradation sample. For the swab to determine whether the markers used were indeed semen specific at the stage at which RTL buffer is added, the 1.5mL centrifuge tube was placed in a 56°C shaking heating block for 15 minutes to improve cell lysis and the supernatant was removed to carry on with RNA extraction. For the mixed samples, the vaginal fluid swab was added into the 1.5mL microfuge tube containing 20 $\mu$ L of semen and repeated the process above.

All semen samples in the numerous studies were extracted as liquid samples to reduce the impact substrate has on the degradation process and were subjected to the same variables of in room temperature conditions (20°C - 23°C) and stored in a dark cupboard. These variables were chosen as research showed that sexual assaults occur predominantly at night and as Chapter Five shows temperature impacts degradation

rate, therefore wanted to keep the temperature regulated at room temperature (CSEW, 2021). As each individual deposition of semen would have varying amounts of semen/sperm, it was prior to reverse transcription that all samples were diluted to 1.0ng of RNA to make all samples uniform for the remainder of the process.

### 2.3.3. Extraction

RNA extraction using the process explained below is carried out to obtain as much high-quality purified RNA from the biological samples as possible, removing contaminants (via a series of wash stages) and reducing the possibility of extracting genomic DNA.

For extraction of the samples in the practical studies, two separate extractions were carried out using different methods. For the determination of optimal primer optimisation, samples were extracted using the Qiagen miRNeasy<sup>®</sup> mini kit, according to the manufactures protocol. 700µL QIAzol Lysis reagent was added to the sample and incubated for 5 minutes. 140µL of chloroform was added and shook vigorously for 15 seconds before incubated at room temperature for 2-3minutes. The sample was then centrifuged for 15 minutes at 12,000rpm. The upper aqueous phase was transferred to a new collection tube making sure to avoid transferring any interphase. 525µL of 100% ethanol was added followed by pipetting 700µL sample, including any precipitate, into a RNeasy Mini column in a 2mL collection tube. The sample was then centrifuged at 8000rpm for 15 seconds at room temperature. The flow-through was discarded and the previous step was repeated. 700µL Buffer RWT was added to the RNeasy Mini column before another centrifuge step for 15 seconds at 8000rpm. Pipetted 500µL Buffer RPE onto the RNeasy Mini column and centrifuged for 2 minutes at 8000rpm. A further centrifuge step was carried out at 14,000rpm for 1 minute to further dry the membrane. Finally, transfer the Rneasy Mini column to a new 2mL collection tube and pipet 50µL of

RNase- free water directly onto the RNeasy Mini column membrane before centrifuging at 8000rpm for 1 minute.

For all following studies after the primer optimisation step, the extraction technique used the Qiagen RNeasy<sup>®</sup> mini kit, according to the manufactures protocol as shown below:

350µL of Buffer RTL was added to the sample and centrifuged the lysate for 3 minutes at maximum speed. Carefully the supernatant was removed by pipetting. 350µL of 70% ethanol was added to the lysate and mixed well by pipetting. Transfer up to 700µL of the sample, including any precipitate, to a RNeasy Mini spin column placed in a 2mL collection tube, before centrifuging for 15 sections at 8000rpm and subsequently discarding the flow-through. 700µL Buffer RW1 was added to the RNeasy spin column and another centrifugation step was carried out, 15 seconds at 8000rpm. The flow-through was discarded again. The separated steps of 500µL Buffer RPE were added to the RNeasy spin column before centrifuging at 8000rpm for 15 seconds and 2 minutes, respectively. Once again, the flow-through was discarded. Finally, transfer the Rneasy Mini column to a new 2mL collection tube and pipet 50µL of RNase- free water directly onto the RNeasy Mini column membrane before centrifuging at 8000rpm for 1 minute.

#### 2.3.4. Quantification

The quantification of the extracted RNA product was carried out using the Jenway™ Genova Nano. To begin with 2 µL of sterile PCR water was placed upon the Nano stage as a blank, followed by 2 µL of extracted product to obtain a volume of RNA in µg/mL.

#### 2.3.5. Reverse transcription (RT)

Reverse transcription is the process to convert the RNA to cDNA (complementary DNA) using reverse transcriptase which catalyses DNA synthesis using RNA as the template.

The conversion cDNA prevents the sample being subjected to RNase degradation and therefore much more stable than RNA. The reverse transcription process used the iScript™ Reverse Transcription Supermix. For every sample, 4 µL of iScript RT supermix, 5 µL of RNA template and 11 µL of nuclease free water were amplified under the following conditions using the Biorad MyCycler™ Thermocycler; a priming step for 5 minutes at 25°C, the reverse transcription stage for 20 minutes at 46°C and finally, a stage of 95°C for 1 minute to inactivate the RT step.

### 2.3.6. Gradient PCR Amplification

Gradient PCR is a version of PCR that is usually involved in optimisation of the primers and process. PCR optimisation is the trial-and-error steps to determine the ideal concentrations and annealing temperatures for optimal amplification and gradient PCR is usually the first step. Polymerase Chain Reaction (PCR) is based on three steps, the first step is to denature the template DNA into single strands, usually a temperature around 95°C. Secondly, to anneal the primers to the original template strand. This varies for each primer, the annealing temperature for the primers used in this study can be found in the tables below. Finally, using the dNTPs extend the new DNA strands from the primers at a temperature approximately 72°C (Delidow et al, 1993).

Gradient PCR involves the generation of multiple samples of the same primer, for example, 5 separate samples of GAPDH, repeated for all the other primers. These samples per primer undergo the same conditions except the annealing temperature is slightly different, based on literature and the melting point of the primers. The temperatures were limited to 5 different temperatures, the value found in literature (Table 2.1), the 2 immediate temperatures above the literature value and the 2 temperatures immediately below.



To amplify the RT product to levels that can be detected, an Applied Biosystems Veriti 96 Well Thermo Cycler was used. This thermocycler was used instead of the Biorad version used in the reverse transcription step for the simplicity of choosing the gradient temperatures. For this a PCR mix of all the components to amplify the product is needed. The mix consisted of 0.5µL of GoTaq® G2 Flexi DNA polymerase, 1µL of a 200µM concentration of dNTPs, 5 µL volume of Colourless GoTaq® Flexi Buffer, 0.5µL volume of 0.5µM concentration of primers; both forward and reverse and 5µL of a 1.0ng concentration of the reverse transcribed product.

The following tables: 2.2, 2.3, 2.4 and 2.5 show an example of semen specific primers, annealing temperatures, PCR cycles and primer sequences and base pair lengths.

**TABLE 2.2: THE SEPARATE ANNEALING TEMPERATURES FOR A SELECT NUMBER OF SEMEN SPECIFIC PRIMERS, WITH THE ANNEALING TEMPERATURE IN BOLD BEING THE VALUE FOUND IN LITERATURE.**

Primer	Annealing temperatures
GAPDH	62°C, 63°C, <b>64°C</b> , 65°C and 66°C
PRM 1	58°C, 59°C, <b>60°C</b> , 61°C and 62°C
PRM 2	58°C, 59°C, <b>60°C</b> , 61°C and 62°C
TGM 4	56°C, 57°C, <b>58°C</b> , 59°C and 60°C
KLK 3	57°C, 58°C, <b>59°C</b> , 60°C and 61°C

**TABLE 2.3: THE PRIMER CONDITIONS OF EACH PRIMER USED IN THE AMPLIFICATION OF THE PRODUCT BASED ON THE OPTIMAL ANNEALING TEMPERATURE (TA<sup>OPT</sup>) FOUND IN THE GRADIENT PCR STEP.**

Primer	Initial cycle (x1)	Main cycle ( <u>underlined = annealing temperature</u> )			Final cycle (x1)	Number of cycles (main)
GAPDH Glare et al (2002)	94°C for 5 minutes	94°C for 1 minute	<u>64°C for 1 minute</u>	72°C for 1 minute	72°C for 10 minutes	40 cycles
OPRM 1 Jodar et al (2012)	94°C for 5 minutes	94°C for 1 minute	<u>60°C for 1 minute</u>	72°C for 1 minute	72°C for 10 minutes	40 cycles
PRM 2 Ostermeier et al (2005)	94°C for 5 minutes	94°C for 1 minute	<u>60°C for 1 minute</u>	72°C for 1 minute	72°C for 10 minutes	40 cycles

TGM 4 Fleming and Harbison (2010)	94°C for 5 minutes	94°C for 1 minute	<u>58°C for 1 minute</u>	72°C for 1 minute	72°C for 10 minutes	40 cycles
KLK 3 Meola et al (2006)	94°C for 5 minutes	94°C for 1 minute	<u>57°C for 1 minute</u>	72°C for 1 minute	72°C for 10 minutes	40 cycles

TABLE 2.4: THE PRIMER SEQUENCES FOR FORWARD AND REVERSE OF THE CHOSEN REFERENCE GENE AND THE FOUR SEMEN SPECIFIC MARKERS.

Primer	Primer sequences	Reference
GAPDH	Forward 5' – CTG-CAC-CAC-CAA-CTG-CTT-3 Reverse 5' – TTC-TGG-GTG-GCA-GTG-ATG-3	Jedrzejczak et al, (2009)
PRM 1	Forward 5' – AGA-GCC-GGA-GCA-GAT-ATT-ACC-3 Reverse 5' – TAC-ATC-GCG-GTC-TGT-ACC-TG-3	Jodar, et al (2012)
PRM 2	Forward 5' – TAT-AGG-CGC-AGA-CAC-TGC-3 Reverse 5' – GCC-TTC-TGC-ATG-TTC-TCT-3	Ostermeier, et al (2005)
TGM 4	Forward 5' – TGA-GAA-AGG-CCA-GGG-CG-3 Reverse 5' – AAT-CGA-AGC-CTG-TCA-CAC-TGC-3	Fleming and Harbison (2010)
KLK 3	Forward 5' – CAC-TGT-TTC-TTT-TTC-TCT-TTT-GGA-3 Reverse 5' – TAG-GGA-TGA-CTC-ACC-GAG-CA-3	Dawood, Khalaf and Suleiman (2017)

The primer conditions were found in the literature along with the primer sequences. The annealing temperatures were slightly changed from literature due to the melting temperature of primer and following the gradient PCR step. The steps before and after annealing temperature do not require changing and, therefore, they are the same for all, even though these steps are different for each primer in their corresponding literature, the annealing temperature is the key step.

### 2.3.7. Gel electrophoresis

Gel electrophoresis is the visualisation step following the gradient PCR to determine whether the PCR process has worked, and that the primers had bound to the product. The product was then run on an agarose gel. A gel is made by mixing 120mL of TAE buffer with 2.4g of agarose powder, heated until clear and then 12µL of ethidium bromide (binds to the DNA for visualisation when exposed to UV light) is added before setting in a mould. The gel is then placed into a tank containing TAE buffer. The process then works by passing a voltage through the 2% agarose gel, which the PCR product has been

pipetted into wells. As the PCR product has a slight negative charge, and the voltage being passed through is also negative it will repel the DNA through the gel. The small DNA fragments in base pair length will move through the gel quicker and further compared to the larger DNA fragments (Lee et al, 2012).

The gel was then loaded into the GelDoc-it™ TS Imaging System where UV light illuminates the loading dye, subsequently showing the different DNA fragments as bands. The analysis of the gel image produced involved the comparison of the known band size of the primer to that of the 100 base pair ladder.

**TABLE 2.5: THE BASE PAIR LENGTH OF EACH SEMEN SPECIFIC PRIMER, SO THAT A COMPARISON TO THE 100 BASE PAIR LADDER CAN BE MADE. PRIMER DIMER LENGTH HAS BEEN INCLUDED TO ENABLE THE DETERMINATION OF IF THE PCR PROCESS WORKED.**

<b>Primer</b>	<b>Base pair length</b>
GAPDH	105 base pairs
PRM 1	156 base pairs
PRM 2	149 base pairs
TGM 4	215 base pairs
KLK 3	683 base pairs
Primer Dimer	30 – 50 base pairs

Based on the lengths in the table above, bands should appear at approximately those lengths. To check each band can be compared to each band of the 100 base pair ladder ranging from 100 base pairs up to 1200 base pairs.

Depending on the brightness of the bands and if multiple bands are shown on the gel for each annealing temperature, this suggested that the annealing temperature is not optimal as there are primer dimers present. Also, the appearance of the bands may indicate that the concentration of the primers is either too high or too low and therefore will need to be adapted once the annealing temperature is optimised.

### 2.3.8. Quantitative Polymerase Chain Reaction (qPCR)

Following the determination of optimal conditions for the primers to bind, analysis of the samples from the different studies was carried out. This was carried out using qPCR (quantitative PCR). qPCR detects the amount of a specific target at each cycle in the PCR reaction. The components of the samples explained in 3.3.8.1. below provide all the necessary requirements needed for the cDNA to be amplified (replicated) every cycle. There are three main stages of qPCR, the exponential phase, the linear phase, and the plateau phase. For the first 15 cycles of qPCR, the reaction is beginning and starts to emit fluorescence, however this emittance cannot be distinguished from the background fluorescence. Stage 1, the exponential phase occurs once the emitted fluorescence passes a threshold, which is significantly higher than the baseline background fluorescence (Su, 2017). As the reaction progresses, some of the reagents are consumed, subsequently causing the reaction to slow, this is stage 2, the linear phase. The final stage, the plateau phase occurs when one or more of the components in the reaction become limiting.

Samples were run on the Applied Biosystems OneStep plus with OneStep software aiding the setup of a template for the system to follow. The series of samples undergo the same cycle conditions for amplification; a holding stage of 95°C for 10 minutes, the cycling stage consists of 95°C for 15 seconds, followed by 60°C for 1 minute. This stage is repeated for 40 cycles. Finally, the melt curve stage consists of a 95°C for 15 seconds step, a 60°C for 1 minute step and a second 95°C for 15 seconds' step. This melt curve stage is only carried out once. The melt curve is carried out to determine whether the amplification process has worked correctly. A typical melt curve will give rise to a single peak indicating that the primers have bound correctly, and the double stranded DNA

products are the only product present. However, if there is a second peak usually peaking at lower temperature, this indicates an issue with the sample. This could be the wrong annealing temperature, the primers are too concentrated or there is too little sample, and therefore, the primer bind to each other rather than the cDNA. Ultimately, showing two peaks (two distinct products) (Dwight, Palais, Wittwer, 2011). The results from the quantitative polymerase chain reaction were displayed on the Applied Biosystems OneStep V.2 software, in the form of a melt curve.

A relative standard curve is generated for precise analysis of the quantification data (another check for primer optimisation), this checked the efficiency of the primers. Unknown samples are quantitated compared to the set of relative standards for precise readings (ThermoFisher, 2021). The use of the standard curve checks whether the primers bound to the target effectively and efficiently. Ideally reactions should generate 100% efficiency meaning that the sample should double every cycle in qPCR, however this rarely happens and therefore, the acceptable efficiency ranges between 90% and 110% (Korenková, 2015). Lower efficiencies and higher efficiencies indicated inhibitor contamination and polymerase inhibition, respectively. The Applied Biosystems software auto calculates the efficiency alongside the  $R^2$  value (correlation of serial dilutions) and if the sample were not within the 90% to 110% range or above 0.99  $R^2$  value then changes were made to the sample.

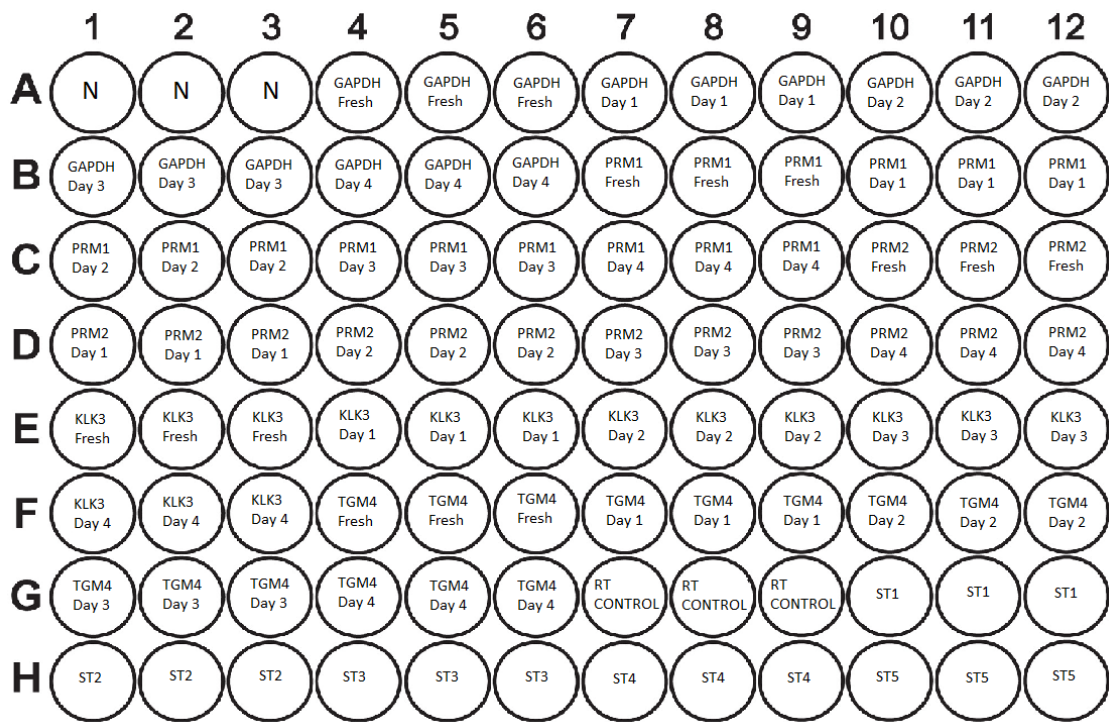
Templates for standards can be genomic DNA, cDNA, or total RNA. For this study 'pure genomic DNA' was used as a standard to get a concentration value of a cDNA sample. This was subsequently used in a separate dilution series for use as a standard for the succeeding studies. 1 $\mu$ L of each of these standards were added to a SsoAdvanced

Universal SYBR® Green master mix comprising of 10µl of SYBR® Green, 1µL of a stock GADPH solution containing both forward and reverse primers and 7µL of DNA free H<sub>2</sub>O.

### 2.3.8.1. Samples

Samples from the different studies undergo the processes outlined in this chapter. The reaction mix preparation and thermal cycling protocol for the SsoAdvanced™ Universal SYBR® Green supermix is as seen below.

On ice the mastermix contained (10µL of SYBR® Green, 1µL of a stock primer solution containing both forward and reverse primers and 7µL of DNA free H<sub>2</sub>O per reaction) The sample required to be mixed well before being pipetted into equal aliquots into each well of the 96 well BrightWhite qPCR Plate by PrimerDesign, enough for samples, standards, and negatives. 2µL of each sample was then added to the SsoAdvanced Universal SYBR® Green master mix, generating a final volume of 20µL. The plate was then sealed the plate with adhesive optical seals and centrifuged. The plate was then placed onto the Applied Biosystems One-Step plus qPCR system and run. The Figure 2.3 below shows an example of a 96 well plate that would be placed onto the One-step qPCR machine.



**FIGURE 2.3: THE POTENTIAL POSITION OF EACH SAMPLE IN THE WELL PLATE FOR qPCR FOR THE STAIN AGE PREDICTION STUDIES.**

- N = SYBR Green master mix only
- ST1 = Standard 1
- ST3 = Standard 3
- ST5 = Standard 5
- ST2 = Standard 2
- ST4 = Standard 4
- RT control = Reverse transcription control

### 2.3.8.2. Data analysis.

Relative quantification of qPCR is one of two ways to analysis data from quantitative PCR. Relative quantification was utilised as it describes to change in expression of target genes relative to a reference group (fresh, non-degraded sample). The  $\Delta\Delta Cq$  method as proposed by Livak and Schmittgen (2001) uses RNA degradation as an indicator of stain age prediction. The  $2^{-(\Delta\Delta Cq)}$  method was also calculated to show the relative fold changes in gene expression between individual data points. To determine the  $2^{-(\Delta\Delta Cq)}$ , first the differences between the experimental values and control values were calculated (this is the  $\Delta Cq$  value). Then the  $\Delta\Delta Cq$  value is calculated by the differences in  $\Delta Cq$  of the experimental and control conditions, before doing  $2^{-(\Delta\Delta Cq)}$  to get the

expression fold change (Livak and Schmittgen, 2001). The differences between 1 and the generated fold change value could then be used to determine whether the sample was upregulated or downregulated.

Statistical analysis was carried out to identify whether there is statistically significant difference between data points. Firstly, to determine normality, the Shapiro-Wilk test was used and based on the distribution of the data whether it was normally distributed or not. The Shapiro-Wilk test looked at how close the sample data was to that of a normal data set. Data that is not normally distributed the test predominately used was either an independent measures ANOVA or a Kruskal-Wallis test. The data generated was two-fold, firstly comparing the days of degradation within each marker, for example comparing a fresh sample to a day six sample (Appendix I) and secondly comparing the markers within each degradation day, for example comparing the data for each marker at day 3 (Appendix I). These tests were utilised to answer the question of is there a significant difference in gene expression rates of each individual primer over individual periods of time.

The data analysis carried out then provides foundations for the technique to be developed into a model, with unknown samples being analysed and gene expression values imputed into an equation/graph to determine the potential age of that sample.

#### 2.4. Ethical statement

The ethical implications of the biological studies being carried out in this chapter have been considered and ethical approval has been obtained by Staffordshire University for research to be carried out. Throughout the research the Body Fluids Policy and Human Tissue Act was complied with at all times and participants were made fully aware of the research and any implications.



## 2.5. Cleaning

During the experimental process, full personal protective equipment (laboratory coat, gloves, and face mask) was worn to prevent any cross contamination from occurring. All working areas were cleaned by using 2% Virkon before and after any experimental work. Pipettes were calibrated prior to the first study being carried out. All consumables such as pipette tips were autoclaved to remove any residual DNA/RNA and left to dry for 2 days before use. All consumables and biological materials were disposed of appropriately according to laboratory protocol. This cleaning protocol was repeated for all laboratory-based studies.

## 2.6. Method justification

Throughout this chapter methods have been used, and others that could have been used instead. This section explains reasonings as to why certain methods were chosen. There are a number of reasons why a questionnaire was utilised as the method of data collection over other mediums. Groves et al. (2009) states that there is extensive evidence in literature that the mode of administration of questions has an effect on survey estimates. For example, Holbrook et al. (2003) suggests face-to-face, and telephone surveys are more susceptible to social desirability bias. Whereas a self-completion survey is usually most effective for sensitive questions (Kreuter et al, 2008). A questionnaire enables the ability to collect both qualitative and quantitative data, which subsequently allows trends and differences to be found. The online dissemination of the questionnaire is a very quick and cost-efficient method which protects the anonymity of the participants taking the questionnaire (Jones, Baxter, and Khanduja, 2013). This anonymity allows the participants to provide their own honest views, without being uncomfortable like an interview scenario. Utilising an online

questionnaire allows both national and international participants to be reached with the click of a button (Stewart, 2003). Batagelj et al, (1998) suggests that participants are less likely to complete a questionnaire if it lasted longer than 20 minutes, therefore this questionnaire made sure to come under that time. However, the use of an online questionnaire may provide less in-depth answers and participants may search answers. Although, in this questionnaire, it is stated at the beginning that people's honest views and opinions are required.

The other reason for using a questionnaire is to obtain as much data as possible to; inform those carrying out the questionnaire but also once published that will be further data to be used to improve the knowledge of the public. Smith (2006) and the article on crime statistics provides reasons as for the need of data.

- To provide reliable quantitative measurements of criminal activity and views around crimes.
- To keep the public, media, academe, and relevant special interest groups informed about the state of crime in the country and to provide (access to) data that inform wider debate.
- To inform relevant aspects of short-term resource allocation, both within government and also for external related bodies – e.g., for policing and Victim Support.
- To provide an evidence base for longer-term government strategic and policy developments.

Another area is that of why specific kits were used. The main techniques that are used in forensic analysis for either RNA or DNA extract involves the use of silica-based or solid phase spin columns, which have been utilised in the stain age prediction studies. The

membrane found in the spin columns allow for the filtration of potential inhibitors to the subsequent PCR process via a change in pH (Chancon-Cortes and Griffiths, 2014; Cartozzo, et al. 2018). The pH change allows DNA or RNA to bind to the membrane, while potential inhibitors are discarded via the flow-through. The addition of various wash solutions proceeds to alter the pH, releasing the genetic material before being centrifuged alongside RNase free water to obtain a sample of RNA or DNA.

There was a change in the extraction kit from the Qiagen miRNeasy kit to the Qiagen RNeasy kit, respectively. This change occurred because of a slight change in the direction of the research from looking at both mRNA and miRNA genes in the stain age prediction study to just solely focusing on mRNA genes. The change in extraction method allowed for on-column digestion of genomic DNA, meaning sample eluted off the column is solely RNA. Therefore, additional genomic digestion was not needed. The change in extraction kit did not affect the quality and abundance of the RNA extracted from the various samples. The quality of the product extracted by both kits were determined on a Nanodrop machine which highlights the purity of the sample. Readings of between 1.9 and 2.1 on the 260/280 ratio suggesting that the RNA samples were as close to pure as possible. Control samples extracted by both kits were run on the Nanodrop to check purity and remained similar when repeated. It is unclear whether the kits had an impact on the abundance of RNA extracted from the samples as 20µL was added each time and a concentration value generated after extraction. However, if the purity was as close to 2.0 as possible and there was at least 1µg of total RNA present for reverse transcription, the sample was then used downstream.

Following on, both the RT and SYBR GREEN kits were from BioRad, the reason for this was due to both kits being one tube processes, meaning that all the components for

reverse transcription and qPCR were contained and mixed together in a single microfuge tube. According to BioRad there are a number of key features and benefits to using the iScript Advanced cDNA Synthesis kit and those being that there is an uncompromised sensitivity even with less input RNA from a limited sample. The kit reduces variability and improves reproducibility and therefore, eliminates the need for multiple cDNA synthesis reactions (BioRad, 2021). The use of the Sso Advanced Universal SYBR Green kits achieves superior real-time PCR results under varying conditions such as primer concentration and annealing temperatures. The kit improves qPCR sensitivity and efficiency from potential degraded samples (BioRad, 2021).

qPCR uses the fluorescence output from a real-time PCR reaction, and it is crucial that as much as the fluorescence is captured. Currently there are two types of well plates that can be used for qPCR, those that are transparent plastic and those that are white opaque plastic. In these studies, BrightWhite qPCR plates from PrimerDesign were utilised. These were chosen over the transparent plastic because the BrightWhite plates give brighter and better data as the white, opaque plasticware channel all of the fluorescence output back to the detector rather than the transparent plastic ware spraying the light in all directions. According to PrimerDesign, their plates have extreme uniformity of wall thickness and are truly flat to reduce well-to-well variability (PrimerDesign, 2021). qPCR uses the fluorescence output from a real-time PCR reaction, and it is crucial that as much as the fluorescence is captured, this aids with the efficiency of the sample. The Applied Biosystems provides an efficiency value, and should that value does not fall between 90% and 110%, then it is assumed there is an issue. Based on this all samples that fell within this range were carried forward, those that did not

were discarded and remade, therefore not needing a secondary efficiency test as the calibration of the instrument was trusted.

The final change that requires to be justified is the type of swab used in the mixed sample stain age prediction study. There are a number of articles that compare a number of different swabs on the volume of sample collected, but also the volume of sample released during extraction. Due to the study being self-collection, the aim of the swab is to retrieve as much as possible and then release as much as possible. A study by Viviano et al (2018) compared cotton and flocked swabs for vaginal self-sample collection. They found that the flocked swab achieved greater cellular retrieval than the cotton swab with more than 400,000 cells collected per millilitre compared to over 90,000 cells collected by the cotton swab. This shows that the nylon flocked swabs retrieve a lot more of the sample than the cotton swabs. However, it is not just retrieval that is beneficial to the swab type, the volume released is also important. A study by Vare, Hedman and Lappalainen (2008) also compared cotton to nylon flock swabs however they focused on the release of the sample. The study found that a cotton swab releases between 18% and 30% of the sample, whereas the nylon flocked swab releases between 70% and 80% of the sample. These studies combined provide the reasons as to why a nylon flocked swab was chosen as the swab of choice over a cotton swab.

## Chapter Three: Misconceptions of sexual offences and consent survey

### 3.1. Introduction

The aim of this thesis is to address issues with consent in sexual offences. A section found in Chapter One; the review of the literature highlighted a number of issues. Therefore, the purpose of this chapter is to build upon the literature and questions surrounding consent raised in Chapter One and identify those that the public deem as key issues and subsequently take a holistic approach to challenging them in future chapters.

As shown in Chapter One with numerous studies that have been conducted regarding different elements of this topic area, such as the RAINN study, the Amnesty International study and the study carried out by Huddersfield University, show the need for data but also a need for informing the public. The chapter explains why this questionnaire was produced, the questions asked and why those specific questions. There were no answers that were deemed 'correct' for this questionnaire; the survey was created to determine the overall views of the public and sexual offences and consent. The collected data was evaluated to determine the impact this data has on the area of sexual offences and consent and recognise themes and anomalies that were researched into further in subsequent chapters.

### 3.2. Existing sexual offence surveys

Measuring the prevalence of sexual offences falls under the Crime Survey for England and Wales, which is published a couple of times a year. However, there is much less data

on the views and beliefs the public have surrounding this data, consent, and sexual offences in general. The current existing surveys include the Crime Survey for England and Wales (CSEW) focusing on the prevalence, the End Violence against Women Coalition (EVAW) which focused on attitudes towards consent and the National Union of Students (NUS) survey researching sexual violence in further education (CSEW, 2020; EVAW, 2018; NUS, 2010 and 2019).

The Crime Survey for England and Wales (CSEW) reports on all crime in the last 12 months and via a survey that asks households about their experiences of a range of crime. The CSEW is regularly published in March, June, September, and December of each year, to get the most up to date data (CSEW, 2020). The aim of the CSEW is to highlight the prevalence of various crimes in the last 12 months. For example, the Crime Survey for England and Wales year ending June 2020 showed that the number of sexual offences recorded by the police had decreased by 7% to 152,977 offences compared to the previous year. Rape which accounted for 36% of all sexual offences recorded by the police also decreased by 7%. The CSEW is currently the primary source of local crime statistics and is a good measure of offences that are well reported to, and well recorded by the police, therefore depicting emerging trends in crime (CSEW, 2020).

The End Violence Against Women Coalition developed a survey to better understand the attitudes to rape and people's understanding on the law of rape as there is an increase of people reporting rape to police, but the rates of people being charged and convicted of rape are falling. The survey received almost 4,000 responses and according to the EVAW coalition showed a "worrying confusing both about rape and the harm rape does" (EVAW, 2018). Some key findings from the survey showed that a third of people in Britain do not think it is usually rape if a woman is pressured and there is a lack of

violence involved. The survey also found that around 1 in 10 people are unsure or think it is not usually rape to have sex with someone who is asleep or too drunk to consent. From the article by the EVAW coalition a number of questions asked did not follow up with asking the participant why they believe or have that attitude towards a certain topic. An issue that aims to be addressed in this chapter's questionnaire.

In 2010 the National Union of Students (NUS) conducted research named 'Hidden Marks' looking into students' experiences of harassment, stalking, violence, and sexual assault. The research reported experiences that students were subjected to ranging from verbal and non-verbal harassment to serious episodes of stalking, sexual assault, and rape. Over two thirds or 68% of respondents have experienced harassment, 12% reported they were subjected to stalking, 7% of respondents have been subject to serious sexual assault and 5% stated they had been raped during their time as a student. The study found that high numbers of students face "every day, low-level harassment" and that harassment is tolerated at university which therefore would lead to more serious forms of violence to be less likely dealt with effectively (NUS, 2010). The aim of the study was to develop various recommendations for universities to implement to address some of the issues outlined in the 'Hidden Marks' report.

A decade later the National Union of Students (2019) followed up with a study of students' experiences and perceptions of sexual harassment, violence, and domestic abuse in further education to see whether the levels compared to 2010 had dropped. The 2019 study showed that almost half (48%) rather than over two thirds of respondents had experienced sexual harassment a decrease on the study 10 years prior. The survey showed that serious sexual assault and acts of rape have actually increased in further education compared to the 'Hidden Marks' report. According to the report, 1



in 7 respondents (14%) had experiences unwanted attempts at sexual intercourse with 1 in 8 (12%) respondents having been subjected to rape. Unlike the original survey the concept of consent in terms of seeking, understanding and the giving of consent is a theme that emerges from this survey. The article reiterated the original report in that experiences of unwanted sexual behaviour is still commonplace in further education. However, respondents have developed an understanding of consent although find it difficult to put the knowledge into practice because of being “held back by fear of revenge or violence and on some occasions feel pressured” (NUS, 2019).

### 3.3. Misconceptions of sexual offences and consent survey

The survey in this chapter has a number of different elements; generic questions on consent and UK sexual offence statistics, rape myths, misconceptions surrounding consent and indicators of and influences on consent. Some of these elements were generated from some of the limitations of the existing sexual offences surveys. The Crime Survey for England and Wales provides a great scope of the issue of sexual offences and rape. However, unless specifically wanting to understand the number of sexual offences occurring or how many cases are reported to the police, the average person may be unaware, firstly of the CSEW but also the extent of the issue. Therefore, this survey aims to provide the public with an idea of the issue, see their response to how big or small they believe the issue to be, and then provide them with the data so that they are informed about the topic.

Another limitation that has been found in the previous surveys is the lack of understanding as to why there are specific beliefs and misconceptions surrounding consent and sexual offences. For example, the End Violence Against Women Coalition asked a question regarding sex and someone who is asleep or unconscious and whether

that is rape. The coalition found that around 1 in 10 people are unsure or think it is not usually rape to have sex with someone who is asleep or too drunk to consent, which is an interesting statistic, however why people believe that would have been interesting to know. This survey aims to question and understand beliefs of the participants who undertake the survey but asking those follow up questions and allow participants to explain their beliefs. The overall purpose of this study is to explore the misconceptions the general public has on sexual offences and consent as well as further exploring rape myth acceptance using an alternative method than rape myth acceptance scales (Spruin and Reilly, 2010).

This survey aims to answer the following research questions.

- Is there a misunderstanding of the prevalence of sexual offences and rape in the United Kingdom?
- If so, what are the possible reasons behind the lack of knowledge surrounding statistics regarding the prevalence of sexual offences and rape?
- Do the public understand consent and is there an issue surrounding consent that the public deem more significant than others.
- From this can future studies be devised to challenge these key issues.

### 3.3.1 Method

The measures included in this survey consisted of demographic questions and a series of generic questions on consent and UK sexual offence statistics, rape myths, misconceptions surrounding consent and indicators of and influences on consent. The appendix B contains a full list of all the questions. The questions consisted of a number

of multiple-choice questions, open ended and ranking questions for a mix of both quantitative and qualitative data.

### 3.3.2. Participants

Of the responses recorded by the Qualtrics software participants answered from a number of countries: United Kingdom (211, 65.7%), United States (46, 14.3%), Australia (14, 4.4%), Canada and New Zealand (8, 2.5%) and Ireland and Germany (5, 1.6%). There were a host of other countries that provided only a couple of responses. Participants were recruited online from all parts of the globe and all participants completed the survey voluntarily.

### 3.3.3. Analysis

Data analysis of the questionnaire results used a mixture of different software, those software systems were Microsoft Excel, IBM SPSS Statistics v.25 and NVivo 12. For the quantitative questions such as the multiple choice and ranking questions, Excel and SPSS were used and for the qualitative open-ended questions NVivo was used. All multiple choice and ranking questions had graphs generated to aid in descriptive statistics such as mean, mode, percentages, and standard deviation and each had had further data analysis conducted depending on the question type. The series of multiple-choice questions used in the survey had further analysis carried out using the Chi squared test, which allowed for the comparison of each question to the general demographic questions (gender, age, and expertise). All ranking questions further data analysis used the Friedman test and Wilcoxon Signed Rank Test to assess for significance and correlation (A full list of Wilcoxon comparisons can be found in the appendix C). Bonferroni corrections were applied if necessary. For qualitative open-ended questions

content analysis was conducted in NVivo 12, where themes and specific views of the participants were identified.

### 3.4. Results and discussion

This section depicts the data and discusses the misconceptions of sexual offences and consent survey. The aim of this study was to establish the level of knowledge that the public possess surround consent and sexual offences as a whole and whether there are any key themes that arise that the use of forensic analysis may help with. The results were split into sections with a number of subsections. The first section after the profiles of the survey participants, focuses on the multiple-choice questions that are based of the UK statistics. The sections following concentrate on the open-ended questions on the publics' understanding of consent, influences on and indicators of consent, reasons to or not to report to the police and finally rape myths.

Our findings found that there is a severe lack of knowledge surrounding the extent of sexual offences and rape that occur in the UK, a number of participants understood that these acts occur but not the level that they do. The research also found that there is an elevated level of rape myth acceptance and bias within the population of the participants of the study conducted, culminating with some believing that these views are present in police forces and juries. Finally, this study highlighted a distinct lack of understanding of consent in marital and acquaintance settings, specifically whether consent is required to be granted every time sexual acts occur, or whether being in a relationship/marriage equates to continuous consent.

#### 3.4.1. Profile of survey participants

In the questionnaire found in appendix B, the first 6 questions are generalised, this is to obtain some information about the participants of the questionnaire but still keeping

their anonymity. The questionnaire recorded 502 responses. However, of those recorded by the software 64% or 321 had usable data. The other responses were those that either opened the survey and closed it or, only answered the demographic questions which provide no data if no survey questions were answered to compare them to. The following data on the demographics emerged:

TABLE 3.1: DEMOGRAPHIC CHARACTERISTICS FOR THE TOTAL SAMPLE.

<b>Misconceptions of sexual offences and consent</b>		
<b>Demographic information</b>	<b>Number</b>	<b>Percentage (%)</b>
<b>Gender</b>		
Male	73	25
Female	213	72.9
Prefer not to say	3	2.1
<b>Age</b>		
Under 18	0	0
18-30	139	47.9
31-45	82	28.3
46-60	64	22.1
60+	5	1.7
<b>Expertise</b>		
None	214	74.8
Less than 5 years	42	14.7
5 to 10 years	13	4.5
11 to 20 years	8	2.8
21 to 30 years	7	2.4
More than 30 years	1	0.3

The table above shows that there was a wide range of expertise of the participants in the questionnaire, therefore a range of answers to the questions would inform the need to this data. The final response rate using the total number of surveys distributed as the denominator for this study was 60%, which is considered a good response rate for online survey administration (Nulty, 2008). In total the 502 recorded responses by the Qualtrics software came from a number of countries: United Kingdom (286, 57%), United States (50, 9.9%), Australia (14, 2.8%), Canada and New Zealand (8, 1.6%) and Ireland and Germany (5, 1%). There were a host of other countries that provided only a couple of responses.

As stated previously, this questionnaire consists of a number of multiple choice and open-ended questions. With the multiple-choice questions data analysis can be conducted to determine whether the variables (age, gender, and experience) have an effect on the options chosen. This data analysis used the Chi Squared test for association. Of the 16 multiple choice questions in the questionnaire the data analysis

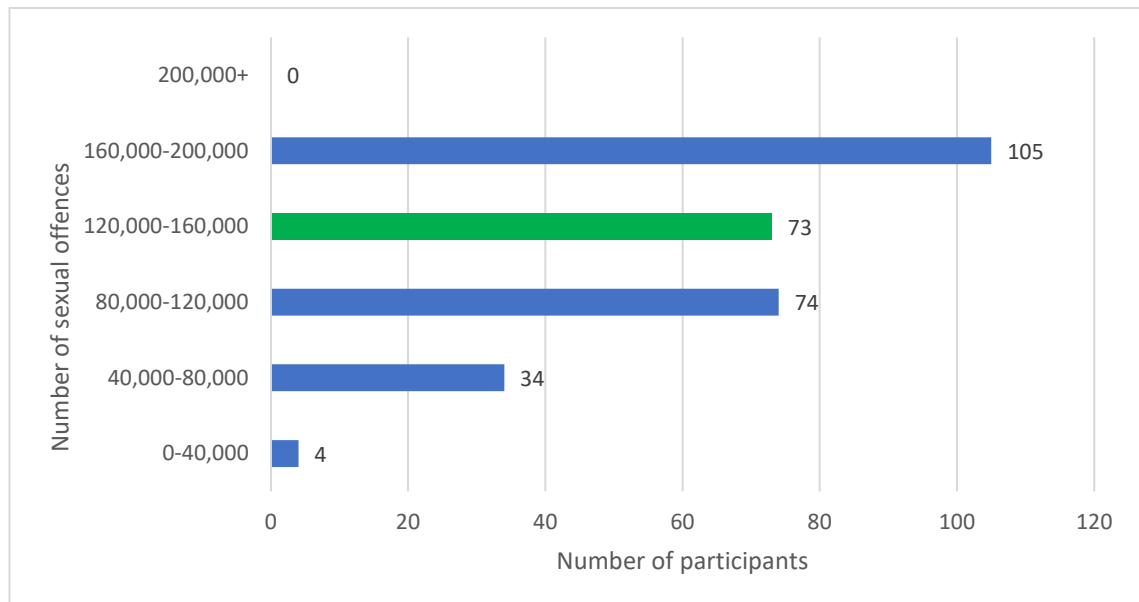
highlighted that only two questions would be affected by the gender of the individual answering the question. Those questions being “is sexual assault most likely to be prosecuted?” and “Do you know what rape myths are?.” According to the Chi Squared test for association gender has a small to medium effect on the answer given to these specific questions. Similarly, to gender, age also impacted the answers given to those questions, with two other questions affected, those being “Do you know how many sexual offences occur each year?” and “Can rape only be committed by a male?.” The four questions highlighted like gender would have a small to medium effect on the answers given depending on the participants age. The Chi Squared test for association was also conducted to determine whether the level of expertise an individual possesses would impact the answers given, the analysis showed that this not the case. The table showing the results of the Chi Squared test for association can be found in appendix D.

### 3.5. Statistical questionnaire data

After the generic demographic questions, there are 16 multiple choice questions intertwined with various open-ended questions and ranking questions. This section focuses on those multiple-choice questions and the statistical data that comes from them. Although, every year the Crime Survey for England and Wales is published stating the number of sexual offences and rapes that occur the previous year, not everyone would come across these statistics. Therefore, the first couple of questions in this questionnaire focus on those statistics to determine if the participants have a grasp on the issue of sexual offences, the number of cases, reports, or false reports.

The first multiple choice question that participants answer is the question ‘*On average, what number of sexual offences do you think happen in England and Wales each year?.*’

According to the CSEW there were 150,732 sexual offence cases year ending March 2018. The figure below shows the participants answers for this question.



**FIGURE 3.1: ANSWERS GIVEN BY THE PARTICIPANTS FOR THE NUMBER OF SEXUAL OFFENCES REPORTED TO THE POLICE IN ENGLAND AND WALES FOR YEAR ENDING MARCH 2018. (GREEN BAR IS THE OPTION THAT ENCOMPASSES THE CORRECT VALUE OF APPROXIMATELY 150,000 CASES). N=290.**

Figure 3.1 shows that the most common answer by participants in this study overestimated the number of sexual offences that occur every year in England and Wales. The following question in the questionnaire asked how many of those sexual offences were rapes, the same CSEW report stated that 53,977 rapes occurred in 2018. The figure below shows the responses.



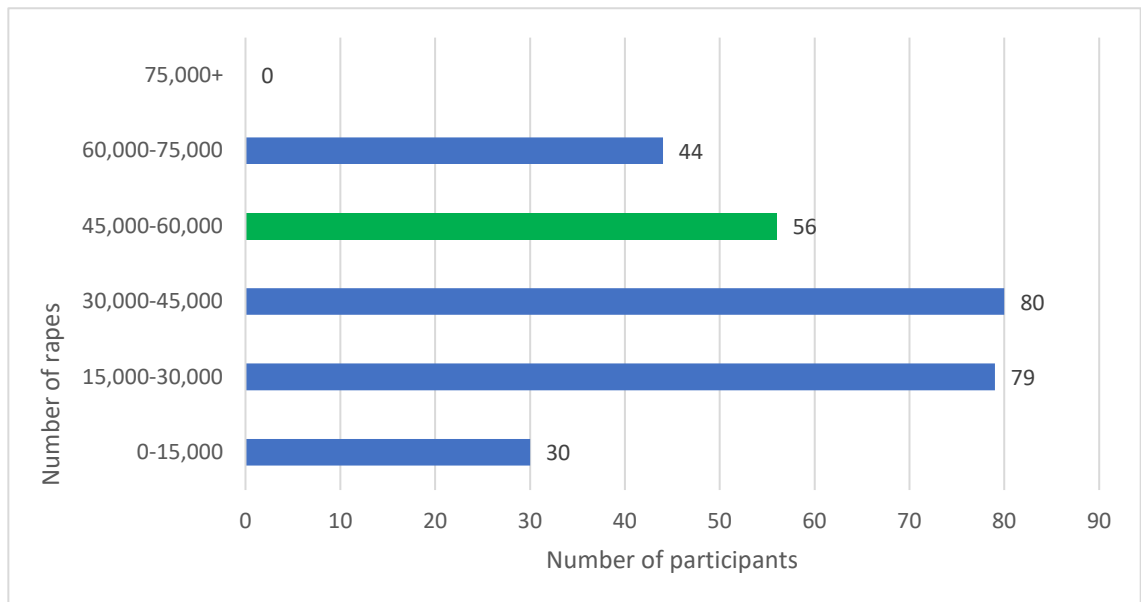


FIGURE 3.2: ANSWERS GIVEN BY THE PARTICIPANTS FOR THE NUMBER OF RAPES REPORTED TO THE POLICE IN ENGLAND AND WALES FOR YEAR ENDING MARCH 2018. (GREEN BAR IS THE OPTION THAT ENCOMPASSES THE CORRECT VALUE OF APPROXIMATELY 50,000 CASES). N=289

Contrary to the opinion of the number of sexual offences, the participants most populous answer underestimated the number of rapes that occur every year in England and Wales. As stated before, regarding the idea that not everyone would see the reports by the Home Office depicting the rise in sexual crimes, there is the question of where the participants gain their information to come to this conclusion. Research into the source of this information entailed using the search engines on various news outlet websites, searching for the terms sexual offences and rape to see how many results came up. The results seem to contradict the data shown in the two figures above.

TABLE 3.2: THE NUMBER OF RESULTS WHEN SEARCHING FOR THE TERMS 'SEXUAL OFFENCES' AND 'RAPE' ON POPULAR WEBSITES AND NEWS OUTLETS.

	Google	The Guardian Newspaper	The Independent	The Sun	BBC news website
<b>Number of sexual offences</b>	5,650,000 results	16,000 Results	10,000 Results	2,000 Results	24,400 results
<b>Number of rapes</b>	394,000,000 Results	78,000 Results	33,000 Results	6,500 Results	199,000 results

Based on the inference that the participants who completed this questionnaire generated their opinion on the number of articles they see with either the term 'sexual offence' or 'rape' then the most common answer for these two questions should be the

opposite. Table 3.2 infers it should be that the number of sexual offences in England and Wales should be underestimated and the number of rapes reported should be overestimated. However, there is also the argument that the offence of rape, is only one offence, whereas the blanket term of sexual offence covers a number of sexual acts which is potentially why it is overestimated.

Following these questions, there were several other statistical based questions for the participants to answer. These ranged from the number of reports to the police, how many lead to a conviction, how many are actually false and what percentage of rapes are committed by strangers or partner/ex-partners. The opinions to these questions varied for example, the majority of participants underestimated the number of cases they believe are reported to the police with 233 participants out of the 290 who answered this question putting the options lower than the correct option. Approximately, 41,000 (only 32 participants put this option) cases are actually reported to the police. This may also be due to the media, as a number of articles suggest that “many victims chose not to report their assaults” and the Office for National Statistics states more than 80% of victims do not report (ONS, 2018). Reasons for this can be found in Table 3.5.

The next three questions on conviction rates, false reports and those committed by strangers were all correctly answered by the majority of participants: 140, 226 and 228 participants respectively all putting the lowest percentage option. According to data, only between 0% and 10% of all cases reported to the police lead to a conviction, roughly 3,000 cases a year. The poll conducted by Amnesty international in 2005, although stated that it is “incredibly difficult” to determine false rape allegations believes that

there is no definitive number, however the crown prosecution service estimates it to be about 4% of all rape cases (Amnesty International, 2005).

The main question that arises from these questions and previous data is why is there such low conviction rates? As shown in Figure 1.3 (Chapter One), there are reasons why convictions are so low, and the figure put it at the feet of the victims issues with the system. However, there is literature that suggest sexual offence cases do not lead to a prosecution because of rape myths and state that police are influenced by them and subsequently, “draw upon rape myths in their beliefs, assumptions and actions” (Shaw et al, 2016). A number of articles suggest that sexual offence cases never make the transition between a police investigation to the process of prosecution (Campbell et al, 2014). Campbell et al, (2014) suggests that between 73% and 93% of sexual offence cases do not make that transition and therefore, are not prosecuted. Which is a little more than the value of 10% that the CSEW suggest do lead to a conviction. Prior literature singles out the main reason as to why cases start and finish with the police and do not progress any further. These articles term a phenomenon as ‘secondary victimisation’ or ‘second rape,’ this term is the experience a victim endures in interviews and questioning that they find “upsetting” (Campbell, 2005; Filipas and Ullman, 2005; Patterson, 2011). This term, although not included in the options found in Table 3.5 from the numerous studies, not all options would have been included. There would have been another reason option, and the ‘secondary victimisation’ concept could be a reason as to why victims refuse to report to the police. A study by Patterson (2011) found patterns to suggest that if the police engage in this kind of victimisation, cases are less likely to make the transition to prosecution. This concept could also be linked to the attrition

rates and as seen in Figure 1.3, a potential reason a percentage of cases are retracted by the victim (17%).

The last question on percentage of rapes committed by partners/ex-partners similarly posed a problem to that of previous questions. The majority of participants overestimated the number of rapes by people known to the victim, 136 participants suggesting between 60% and 80% of rapes being committed by partners/ex-partners. As Myhill and Allen (2002) show in terms of the relationship between perpetrator and victim; 45% of offences are perpetrated by current partners and 11% are by ex-partners with only 8% being stranger rapes.

### 3.6. Open ended questions

Within the questionnaire, there were a total of 12 open ended questions, two of these questions were designed to obtain a small amount of information about the participants. Those questions asked were about occupation and the expertise that participants may have in the area of sexual offences. For the question of occupation, there was a wide range of jobs from PhD researcher to childminder and from crime scene investigator to pilot, likewise with expertise in the field of sexual offences, those ranged from zero expertise to those that had spent 20 years working in the criminal justice sector as a probation officer. This wide range allows an overview of the general public's view on all areas associated with consent and sexual offences. Content analysis was conducted to determine key themes and words that arise from participants answers.

#### 3.6.1. Understanding of consent

The following open-ended questions involve the generation of quantitative data. This was conducted by determining the number of participants that put certain themes as

seen below in Table 3.3. To support the quantitative data, some key unedited direct responses from participants were included in the relevant sections to further evaluate the data. Question 7 of the questionnaire asked, *'What is your definition of consent?'*. This question was asked to see whether a participant's definition of consent matched up with the definition of consent found in Section 74 of the Sexual Offences Act 2003. The table below shows the top 5 words that participants put in their definitions and the number of times that word was used by all participants compared to the words found in the actual definition of sexual consent.

**TABLE 3.3: TOP 5 WORDS USED BY PARTICIPANTS FOR THEIR DEFINITION OF CONSENT COMPARED TO THE ACTUAL DEFINITION OF CONSENT FOUND IN SECTION 74 OF THE SEXUAL OFFENCES ACT 2003.**

<b>Top words used by participants for a definition of consent</b>	<b>Words found in the SOA definition of consent used by participants</b>
Agree – 175	Agree – 175
Permission – 58	Choice – 9
Parties – 53	Freedom – 3
Verbal yes – 52	Capacity – 16
Informed – 39	

As Table 3.3 shows only the word agree out of the definition of consent was found in the individual participants definitions of consent. The words choice, freedom and capacity did not make the individual definitions and only a few participants actually stated these. Using those top 5 words in their own answers, an alternative definition to “a person consents if he agrees by choice and has the freedom and capacity to make that choice” can be generated. A potential alternative according to Table 3.3 might be “A person consents if both parties agree, and the individual gives informed verbal permission for an act to take place.” However, there are issues that arise with a definition generated such as that above for example verbal consent is not always used. A number of studies have demonstrated that out of the two methods to signal consent, verbal and nonverbal the preferred approach is nonverbal cues: kissing, getting

physically closer intimately touching. Additionally, the answers to those nonverbal cues by the other party is to not respond or resist their partners advances (Hall, 1998; Humphries, 2004).

As seen in Chapter One, Section 1.6.9 the concept of capacity is an important and highly researched term in the definition of consent. In the proposed definition, there is lack of term capacity with only 16 participants having the term in their definition, with 10 of those stating the legal definition. Although the participant definition states both parties agree, they may agree to an act to occur, but may not have the capacity to understand what actually occurs and the consequences associated with intercourse.

Following on from a participant's definition of consent it was asked whether consent can be used in the same context as sexual consent. The majority suggested yes, as consent is used for the acceptance of an act to occur for example.

*'For consent to be consent, it needs to be informed and freely given. I compare this with medical consent. If I am to consent to a medical procedure, I need to know what is being done, what the risks are, and be under no pressure to do it. To give consent for sex, you must know that you are having sex, with who, and the risk of having sex and completely happy to do so.'*

The majority of responses from other participants echo this comment in that they liken sexual consent to other times consent is needed such as when borrowing someone's car. Consent and sexual consent are the same based on the fact that definition in the Sexual Offences Act falls under the term 'consent' not sexual consent and is applied to acts of a sexual nature (Sexual Offences Act, 2003). So therefore, as the majority of participants believe that consent and sexual consent are interchangeable, any subsequent answers regarding consent such as factors influencing or affecting consent will be due to a definition that can be used in both contexts.

As the definition of consent has been defined by participants and all have the same view that agreement should take place with preferably a verbal acknowledgement of consent occurring, the next question which arises is when can consent be withdrawn? Of the 274 participants that answered this question, 272 of them suggested that consent can be withdrawn at any point with varying reasons as to why as seen below.

- Consent is not binding.
- People have control over their own body and actions.
- May be feeling uncomfortable.
- They have the right to change their mind.
- Consent is time and context specific.

These options show the overwhelming response, that consent can indeed be withdrawn due to a number of reasons. However, there were 2 responses that were unsure whether consent could be withdrawn. Both responses link to the reason of consent being time and context specific.

*'I'd like a middle option. I'm unsure what "during" means. If it is during foreplay then withdrawing consent is valid, if sex is almost done then you can't take it back'.*

This response effectively comments on the specific acts that occur during the act of intercourse and until penetrative sex occurs the act can stop. However once penetrative sex happens then consent cannot be withdrawn, almost suggesting there is different weights of acts that occur (similar to 'stealthing' and 'upskirting' scenario) and subsequently the different punishments that are associated to varying acts. For example, as the other participant alludes to this in their response.

*'It is a difficult situation because of the act that is occurring and the person I am engaging in the act of sex with. For example, if there was touching of the private areas above the clothes and I got uncomfortable, then I would say stop. However, if that same act occurs but this time without clothes, I would feel I could not withdraw as if I felt uncomfortable then I should have stopped it at the time I started to get undressed not part way through an act.'*

The overall opinion of the responses from this question is that consent can be withdrawn at any point, however it is very time and context dependent and under no circumstances can consent be 'withdrawn retroactively' i.e., withdrawn after the act (Kipnis, 2017). Which is where there are issues of consensual sex becoming rape because they regretted it. According to the *National Community Attitudes towards Violence against Women Survey Youth Report (2017)* one in three men believe that women who say that they were raped actually had consensual intercourse and regretted it later.



### 3.6.2. Indicators of and influences on consent.

#### a) Indicators of consent

Following on from the questions surrounding consent. These next questions in the survey asked participants *'what indicates to you that consent has been granted?'* and *'what factors do you think influence a person's ability to consent?.'* The second question of the two precedes a question that was explored further in the chapter. The responses given for indicators of consent provide the views of the public on what they believe constitutes as consent, for example is consent a verbal or a non-verbal cue. The responses emphasised that there needs to be a clear and verbal 'yes' as a way of establishing the granting of consent (167 out of 262 participants). A number of participants believe in a "question asked and answered" concept, which sets in stone that consent is granted, and the act of intercourse is reciprocated by both parties involved. However, not all participants indicated that verbal confirmation is needed with participants stating physical indicators are enough to imply consent. These indicators can range from the active engagement in a sexual act, to facial expressions to positive body language (Hall, 1998; Humphries, 2007; Humphries and Brousseau 2010).

Although, the majority of participants stated a verbal 'yes' would indicate consent, it is clear that the participants involved would prefer a clear and verbal 'no' to determine the granting or lack of consent as seen in some responses below.

*'This also means that the absence of NO, does not equal yes, and if there is any uncertainty as to how either party feels about the encounter, it should stop.'*

*'Giving verbal consent.*

*Not saying no/making it clear that the interaction is not wanted.'*

These comments show the issues surround consent as it is clear that for consent to be granted participants are happy with either a verbal or physical cue. Whereas there is an idea amongst the participants that a "lack of consent must be communicated clearly and

explicitly” (Stewart, 2009). This leaves the door open to the defence of an accusation of sexual assault or rape of “they did not yes, but they also did not say no.”

#### b) Influences on ability to consent.

The previous section focused on the question that asked participants what indicates the granting of consent, this section then focuses on what factors may influence an individual to grant consent. Participants were asked ‘*what factors do you think influence a person’s ability to consent?*’ in total 25 varied factors were given ranging from drugs and alcohol to age to the individual being forced or pressured to consent. Of these 25 factors, drugs and alcohol and the individual having the mental capacity were the most populous factors given by the participants as to influences on the ability to consent, 223 and 130 participants, respectively. A number of articles found in the literature review also see either intoxication or mental capacity as a key factor, and in some cases coincide with each other. According to Monks, Tomaka, Palacios, and Thompson, 2010, being intoxicated alters perception and impairs decision making. The effect of alcohol ‘impairing decision making’ links intoxication back to having the capacity to consent and whether intoxication affects the ability to adhere to Section 3(1) of the Mental Capacity Act.

Following gaining the views of the public on the influences that affect the ability to consent, the study aimed to determine whether varied factors are more influential than others. A number of factors were taken from the literature review search and in-depth explanation and evaluation of these factors can be found in Chapter One. Participants for this question were required to rank a number of different potential factors that may influence the granting of consent as seen in Table 3.4 below.

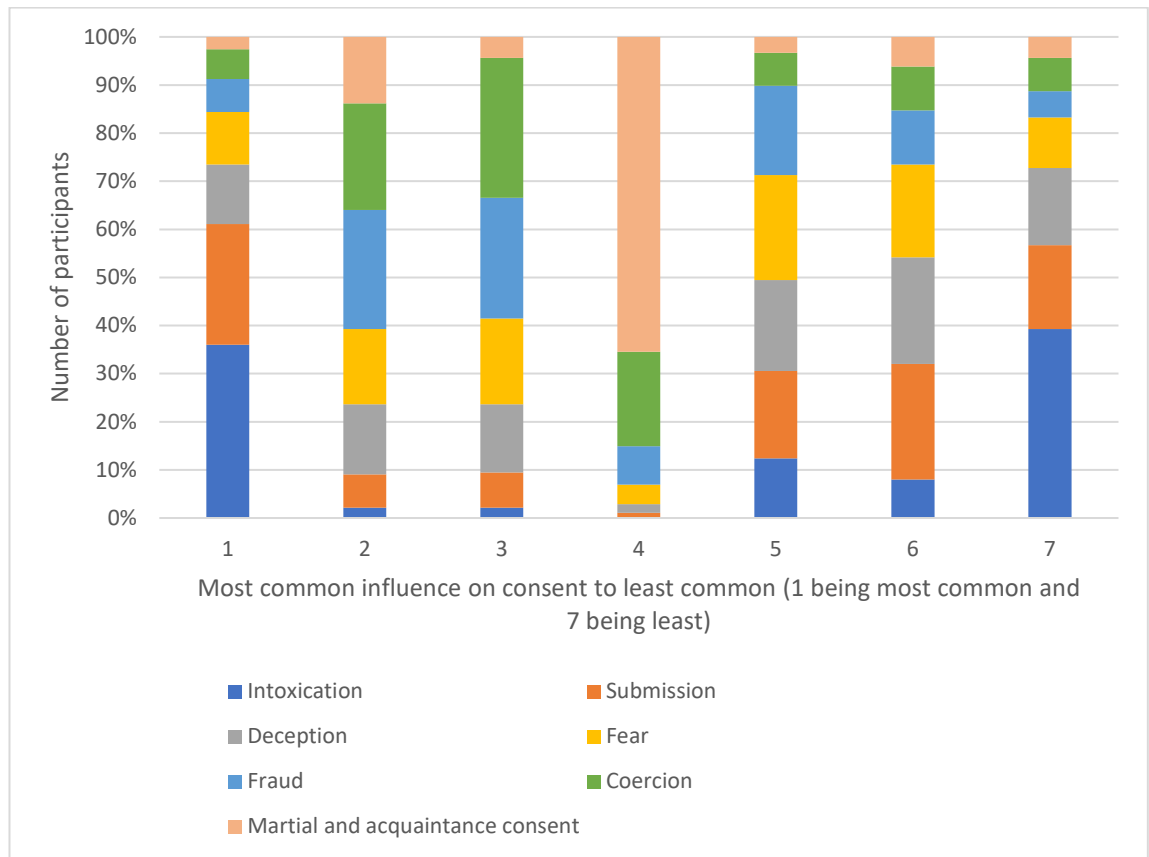
Influence on consent														
	Most common 1		2		3		4		5		6		Least common 7	
	N	%	N	%	N	%	n	%	n	%	n	%	n	%
<b>Intoxication</b>	99	<b>36.0</b>	6	<b>2.2</b>	6	<b>2.2</b>	0	<b>0.0</b>	34	<b>12.4</b>	22	<b>8.0</b>	108	<b>39.3</b>
<b>Submission</b>	69	<b>25.1</b>	19	<b>6.9</b>	20	<b>7.3</b>	3	<b>1.1</b>	50	<b>18.2</b>	66	<b>24.0</b>	48	<b>17.5</b>
<b>Deception</b>	34	<b>12.4</b>	40	<b>14.5</b>	39	<b>14.2</b>	5	<b>1.8</b>	52	<b>18.9</b>	61	<b>22.2</b>	44	<b>16.0</b>
<b>Fear</b>	30	<b>10.9</b>	43	<b>15.6</b>	49	<b>17.8</b>	11	<b>4.0</b>	60	<b>21.8</b>	53	<b>19.3</b>	29	<b>10.5</b>
<b>Fraud</b>	19	<b>6.9</b>	68	<b>24.7</b>	69	<b>25.1</b>	22	<b>8.0</b>	51	<b>18.5</b>	31	<b>11.3</b>	15	<b>5.5</b>
<b>Coercion</b>	17	<b>6.2</b>	61	<b>22.2</b>	80	<b>29.1</b>	54	<b>19.6</b>	19	<b>6.9</b>	25	<b>9.1</b>	19	<b>6.9</b>
<b>Martial and acquaintance consent</b>	7	<b>2.5</b>	38	<b>13.8</b>	12	<b>4.4</b>	180	<b>65.5</b>	9	<b>3.3</b>	17	<b>6.2</b>	12	<b>4.4</b>

TABLE 3.4: SHOWS THE RANKED ORDER BETWEEN 1 AND 7 (1 BEING THE MOST COMMON INFLUENCE ON CONSENT AND 7 BEING THE LEAST COMMON INFLUENCE ON CONSENT) OF A SERIES OF INFLUENCES ON CONSENT AND THE NUMBER/PERCENTAGE OF PARTICIPANTS WHO PUT EACH INFLUENCE IN WHICH POSITION.

The table indicates that for intoxication as an influence on consent 99 (36%) participants said that it was the most common influence on consent, whereas 108 (39.3%) also said it was the least common influence on consent. As the question was a ranked question, a scattering of participants thought that intoxication either did or did not influence consent, but it was not the most common or least common and therefore placed intoxication in positions; 2-6. According to a number of studies such as those by Amnesty International (2005) and YOUNGOV (2018) around 1 in 10 people are unsure or think that it is not usually rape to have intercourse with a woman who is asleep or too drunk to consent. This finding confirms the reason as to why 108 participants placed intoxication as the least common influence on consent, if as much as 1 in 10 people do not see the issue with engaging in intercourse with an individual who is under the influence of alcohol or drugs.

As seen in the Table 3.4 69 participants believe that submitting to intercourse is the most common influence on consent being granted, whereas only 7 participants believed that

marital and acquaintance consent is the most common influence on consent being granted. To depict this better the graph below was generated.



**FIGURE 3.3: THE POSITIONS PARTICIPANTS PLACED THE INFLUENCES ON CONSENT IN A RANKING SYSTEM BETWEEN 1 AND 7 (1 BEING THE MOST COMMON INFLUENCE ON CONSENT AND 7 BEING THE LEAST COMMON INFLUENCE ON CONSENT) N=275.**

Further data analysis was conducted using the statistical tests Friedman and Wilcoxon Signed Ranked test to determine if there was a significant difference in the position of the influence on consent in the ranking system by gender. The Friedman analysis showed that there was a significant difference between genders and the most common influence on consent generating a p-value of .000. However, this test generates a value for the ranking question as a whole, not specifically to each individual rape myth, therefore a Wilcoxon signed rank test was conducted using a Bonferroni corrected p-value of 0.00238. In appendix D, table 1 shows the comparisons between influences on consent and whether gender impacts the position of those influences in comparison to each other based on the new Bonferroni significance value. A value in the table above

0.00238 shows that there is no significant difference in answers given between the genders when comparing the commonality of rape myths, whereas a value under 0.00238 shows that there is a significant difference. It is noticeably clear based on the Wilcoxon signed ranked test that gender does indeed have an impact on which influence on consent they believe is the most or least common.

One of the standout data points from this question which can be seen clearly in the table above and the graph below is the position to which the majority of participants (180) placed marital and acquaintance consent. Participants placed it in position four, meaning they do not believe it is a common issue on consent or it is not an influence on consent. Literature around the subject suggests it is an issue (Willmott,2016; RAINN, 2018). This implies that the general public are confused about this issue or do not understand this issue.

As a considerable proportion of participants made this decision, it is clear that further research is needed to determine whether any strategies can be devised to overcome the issue. Research emphasised that the issue of marital and acquaintance rape comes down to the time when consensual intercourse occurs in the relationship and the time where non-consensual intercourse occurs. The case of R v R (1991) was a landmark case regarding marital and acquaintance rape. Prior to 1991 a wife's consent could not be withdrawn in marriage unless a number of situations occur; death, an Act of Parliament, a separation order, or a decree nisi (court order) granted. In the case of R v R (1991) a husband rapes his wife even though they were separated, divorce proceedings had not officially begun therefore would not have been convicted of rape. However, this was the first case where "the law should declare that a rapist remains rapist subject to criminal law regardless of their relationship to the victim."

This case revealed the question of prior to 1991 how an individual would prove that intercourse occurred non-consensually after a separation, when consensual intercourse happened recently before the separation. This very question is explored in chapter Five to determine whether it is possible to develop a test to determine the age of a stain i.e., before separation (consensual intercourse) and after separation (non-consensual intercourse).

### 3.7. Rape myths

Rape myths have been defined several times throughout this thesis, however they include beliefs about the victim's character, appearance and behaviour including that of the offender and the motivation of the offender to commit such an act (Burt, 1980; Sleath, 2011). Rape myths and rape myth acceptance has been researched heavily, and usually some myths and consent (or lack of) coincide. The question in this survey asked participants similar to that of the influences on consent to rank which myths they believe to be the most prevalent and the least prevalent in society. Table 3.5 below shows the responses with Figure 3.4 also depicting the responses.

**TABLE 3.5: SHOWS THE RANKED ORDER BETWEEN 1 AND 8 (1 BEING THE MOST COMMON RAPE MYTH AND 8 BEING THE LEAST COMMON RAPE MYTH) OF A SERIES OF RAPE MYTHS AND THE NUMBER/PERCENTAGE OF PARTICIPANTS WHO PUT EACH MYTH IN WHICH POSITION.**

	Rape myths															
	Most common 1		2		3		4		5		6		7		Least common 8	
	n	%	N	%	n	%	N	%	n	%	N	%	n	%	n	%
<b>Women routinely lie about rape</b>	47	16.8	71	24.8	12	4.2	15	5.2	10	3.5	83	29.0	11	3.8	37	12.9
<b>Rapes committed by strangers</b>	28	9.8	65	22.7	19	6.6	38	13.3	33	11.5	27	9.4	30	10.5	46	16.1
<b>Rapists use weapons and cause physical injury</b>	46	16.1	38	13.3	41	14.3	32	11.2	25	8.7	35	12.2	31	10.8	38	13.3
<b>Rapes occur outside in a dark alley</b>	36	12.6	36	12.6	25	8.7	30	10.5	32	11.2	41	14.3	41	14.3	45	15.7
<b>Women "cry rape" to cover up something</b>	30	10.5	19	6.6	31	10.8	38	13.3	61	21.3	27	9.4	38	13.3	42	14.7
<b>They ask for it</b>	37	13.0	33	11.5	37	12.9	31	10.8	55	19.2	23	8.0	42	14.7	28	9.8
<b>Only certain women are raped</b>	31	10.8	17	5.9	48	16.8	50	17.5	44	15.4	25	8.7	48	16.8	23	8.0
<b>If they were raped, why didn't they fight back</b>	31	10.8	7	2.4	73	25.5	52	18.2	26	9.1	25	8.7	45	15.7	27	9.4

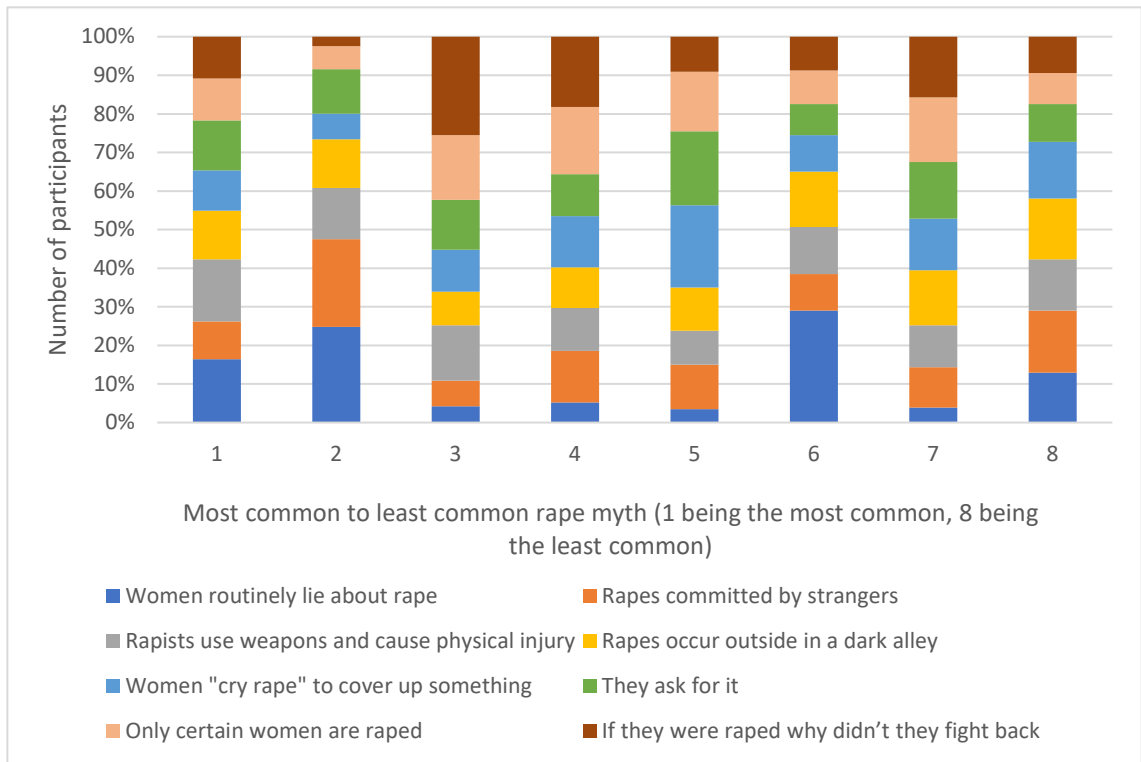


FIGURE 3.4: THE POSITIONS PARTICIPANTS PLACED RAPE MYTHS IN A RANKING SYSTEM BETWEEN 1 AND 8 (1 BEING THE MOST COMMON RAPE MYTH AND 8 BEING THE LEAST COMMON RAPE MYTH) FOR THE PREVALENCE OF THE MYTHS IN SOCIETY. N=286.

Similar to that of the previous question on influences on consent, further data analysis was conducted using the same statistical tests. The Friedman analysis showed that there was a significant difference between genders and the commonality of the rape myth generating a p-value of .000. A Wilcoxon signed rank test was conducted using a Bonferroni corrected p-value of 0.00179. Table 2 found in the appendix E shows the comparisons between individual rape myths and gender. Like the previous section the table in the appendix clearly shows that gender does have an effect of the commonality of rape myths in comparison to other myths. Although Table 3.5 and Figure 3.4 highlight that according to the participants in this study that there is no rape myth that is dominant as the most common or least common in society. As a result of this data showing no dominant rape myth, the next logical study was to explore the acceptance



of these myths and the impact that may have within the criminal justice system. This study can be found in Chapter Four.

The next sections revolve around some of the rape myths that had a separate question dedicated to them within the survey, those being ‘rape can only be committed by a male’ and ‘only strangers’ rape.’

a) Rape can only be committed by a male.

One of the questions asked in the survey which was not included in the ranking question regarding rape myths was a simple true or false answer to “do you believe the statement ‘rape can only be committed by a male’ to be.” Figure 3.5 below shows the responses for participants overall (left graph) and those that have some expertise in the area of sexual offences (right graph).

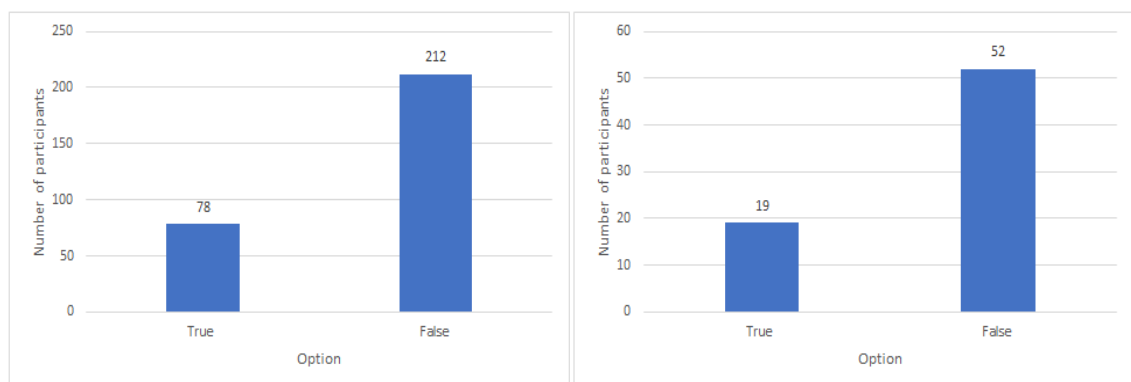


FIGURE 3.5: THE NUMBER OF PARTICIPANTS AS A WHOLE (N=290) AND THOSE THAT POSSESS SOME EXPERTISE IN THE AREA OF SEXUAL OFFENCES (N=71) THAT EITHER BELIEVE THE STATEMENT "RAPE CAN ONLY BE COMMITTED BY A MALE" TO BE EITHER TRUE OR FALSE.

Although legally true as the definition of rape is ‘A person (A) commits an offence if – (a) he intentionally penetrates the vagina, anus, or mouth of another (B) with his penis, meaning you can only be convicted of rape if you possess a penis. Figure 3.5 shows that the majority of participants do not believe that only a male can commit rape and therefore a lot of debate over this topic. As Table 3.6 shows later on in this chapter, participants give their reasons as to why they believe or do not believe this statement. This issue was rectified with the inclusion of Section 2 of the Sexual Offences Act 2003

with the offence; Assault by penetration which removes the use of a penis and replaces it with the intentional penetration of the vagina, anus, or mouth of another person with any part of their body. This means females can be guilty of this act and it has the same weight of punishment as rape (life imprisonment).

The standout issue that came from this question was when level of expertise was compared with this question. The results of that showed that this confusion of who and legally rape another does not just stop at non-expertise, even those with expertise also chose the answer false as seen below.

Figure 3.5 clearly shows that 52 out of the 71 participants in the question who possessed expertise in the area of sexual offences, regardless of level of expertise believe that rape can be committed by any gender/sex. This is a clear example of the need for data and knowledge surrounding sexual offences to be disseminated to the public more freely, because, if experts are getting a legal definition wrong, there is no surprise the public are too.

As shown in Figure 3.5, the majority of participants believe this to be false. Legally, under current legislation this statement is true as only males can be convicted of the act of rape (McKeever, 2018). This question asked participants to explain their answer to the statement that “rape can only be committed by a male,” the table below shows some of the key reasons for their answer.

TABLE 3.6: SHOWS THE REASONS BEHIND PARTICIPANTS CHOOSING THEIR ANSWER FOR THE STATEMENT THAT “RAPE CAN ONLY BE COMMITTED BY A MALE.”

<b>Do you believe the statement that “Rape can only be committed by a male”</b>	
<b>Theme</b>	<b>Number of participants</b>
<i>Lack of consent</i>	37
Legal definition or mentions penis	70
<i>Unwanted penetration</i>	35
<i>Women can facilitate the act</i>	7
<i>Women can force, coerce or drug</i>	59

Table 3.6 shows that 208 participants out of 290 decided to explain their answer as to whether 'rape can only be committed by a male'. Of those 208 participants 70 of them refer to the legal definition or mention that a penis is required. Section 1 of the Sexual Offences Act defines rape as "A person (A) commits an offence if— (a) he intentionally penetrates the vagina, anus or mouth of another person (B) with his penis", therefore, legally only a male can rape another person. However, the majority of participants believe this to not be the case as seen in Figure 3.5 and the other themes shown in the table above.

As Table 3.6 shows other themes that were generated by participants when explaining whether they believe the statement to be true or false, highlighted that in cases of rape, a lack of consent is difference between it being classed as rape or consensual intercourse regardless of the perpetrators gender. One response from a participant gave examples of cases where some of the themes were highlighted.

*'To my understanding some believe the term "rape" is when one penetrates the other in a sexual manner without consent. Whereas I do agree with this statement, here are two examples that I'd say would classify as rape however they contradict my previous statement.*

*-If a female in her 20s has sex with a 15-year-old boy*

*- (This one is more hypothetical however if such a thing did happen, I'd still classify it as rape) if a male was "forced against his will" to take Viagra and a female took advantage of that, that WOULD NOT classify as consensual'.*

Under law these two examples suggested by the participant would come under two separate sections of the Sexual Offences Act 2003. The first example of a female (over the age of consent) engaging in intercourse with a male (under the age of 16, but over the age of 13) would come under the act Sexual activity with a child, "A person aged 18 or over (A) commits an offence if— (a) he intentionally touches another person (B), (b) the touching is sexual, and (c) B is under 16 and A does not reasonably believe that B is

16 or over". This act comes with a lesser punishment than rape, for example if an individual is charged with Sexual activity with a child, they may be imprisoned for up to 14 years, whereas being convicted of rape would be life in prison. As for the second example of a male being "forced against his will" to take Viagra and a female taking advantage of that is a highly researched area with the term 'forced to penetrate' (FTP) being penned for such cases. An article by Weare (2017) states that these types of acts are becoming increasingly more common and as women are not legally recognised as being capable to rape, this act would fall under Section 4 of the Sexual Offences Act 2003 (Causing a person to engage in sexual activity without consent). The SOA 2003 defines Section 4 as "A person (A) commits an offence if— (a) they intentionally cause another person (B) to engage in an activity, (b) the activity is sexual, (c) B does not consent to engaging in the activity, and (d) A does not reasonably believe that B consents". Likewise, to the previous example, being charged under this act the punishment is lesser than rape with imprisonment of up to 10 years.

**b) Rapes are committed by strangers.**

Participants were posed the questions of which situation (stranger attack, domestic attack e.g., partner and acquaintance setting) were most likely to occur, and which were most likely to be prosecuted. 1.4% of participants believed that stranger attacks are most likely sexual assault to occur, with 71.2% suggesting a domestic attack e.g., partner. The remaining 27.4% put acquaintance setting attacks for example on a date as the most likely. Table 3.6 and Figure 3.4 show that close to 100 participants (33%) of respondents supported their answer given to the question regarding which sexual assault was more likely to occur by suggesting that 'rapes are committed by strangers' being a quite common rape myth.

Contrastingly, when asked which are most likely to be prosecuted the opposite answers were provided with 76.4% suggesting a stranger attack and only 10.3% for domestic setting attacks. This brings the issue of consent back to the start. Determining whether consent was given in a domestic setting is much more difficult to prove, compared to being attacked by a stranger (McGregor, 2005). The assumption in stranger attacks is that consent was not given, therefore easier to prove in court and more likely to be prosecuted (Dripps, 1992). However, as many participants believe that domestic setting sexual assaults are more likely to occur, there is an onus on trying to determine a way of figuring out whether intercourse was consensual or not between partners/ex-partners (a concept explored in Chapter Five).

### 3.8. Colloquialism questions

Research such as Payne, Lonsway and Fitzgerald (1999) highlighted a concern surrounding colloquial phrases (generic term rather than using the definition of the act) entering their measure and ultimately may end up having a different meaning for different people. They provide examples such as “putting out” or “hoping to score” as terms to be careful of. In the Misconceptions of consent and sexual offences survey, there are a couple of examples of colloquial phrases such as, the terms ‘stealthing’ and ‘upskirting.’ These phrases are used more commonly than their definitions which are the ‘non-consensual removal of a condom’ and the ‘taking of a photograph under the skirt of another without their consent’ and therefore the survey made sure to include them. A number of questions were asked surrounding both ‘stealthing’ and ‘upskirting.’ Table 3.7 below shows the responses.

**TABLE 3.7 RESPONSES BY PARTICIPANTS FOR THE QUESTIONS THAT HAVE A COLLOQUIALISM TERM ASSOCIATED WITH IT.**

Question	Options			
	Yes	No	Maybe	Not sure
Do you know what 'Stealthing' is?	132	157		
After being told the definition of 'Stealthing' is it rape?	190	30	43	24
Do you think 'Upskirting' is a sexual offence?	266	5	7	9

The table highlights that more participants did not know what 'stealthing' is prior to be given the definition with 157 participants not knowing compared to 132 participants that did know. Once defined in the questionnaire as the non-consensual removal of a condom, the next question asked whether the participants think that this act is rape. Almost two thirds of the participants once given the definition believe that the act is rape. Comparing this question to a similar one surrounding 'upskirting' as seen in the table above, almost every participant agrees that the act of taking a photo under the clothes of another is a sexual offence. Similar to other cases in this chapter, this indecision on determining whether 'stealthing' is rape or not may be due to the severity of the act of rape and participants are unwilling to compare it to rape.

As 'stealthing' is an unusual term and that 157 participants did not know what it meant, on the survey a follow up question was given to these participants to ask them to define as to what they believe 'stealthing' to be Table 3.8 below shows some of the themes highlighted.

Can you explain what you think 'stealthing' might be?	
Theme	Number of participants
Intercourse with someone incapacitated	13
Pressure	6
Grooming	2
Intercourse taken too far	1
Correct definition	21
Stalking	27
Voyeurism	1

Tricking someone into sex	24
Claiming sexual assault	1

TABLE 3.8: SHOWS THE PARTICIPANTS WHO DID NOT KNOW WHAT 'STEALTHING' IS AND SUBSEQUENTLY THE ACT THAT THEY ASSOCIATE WITH THIS TERM.

Table 3.8 shows that of those 157 participants that chose of option of not knowing what 'stealthing' is, 21 accurately defined the term. A number of participants linked stalking to 'stealthing' which may be due to the similarity of the words i.e., stealth according to the Oxford English dictionary is "a movement that is quiet and careful in order to not be seen or heard, or a secret action," which is essentially the concept of stalking. The last element of that definition 'a secret action' can also be linked back as to why 24 participants suggested 'stealthing' as tricking someone into sex.

After being given the definition of 'stealthing' and stating whether they believe that it is now rape it was then asked for participants to explain their answer. The options below show the key themes that came from this and the number of participants that put each theme.

- Consent to protection, not without – 86
- Consent to penetration or sex – 17
- Not rape but put it under a different offence – 48.
- Increased risk – pregnancy or diseases – 48
- Not what was agreed e.g., changed circumstances – 81
- Unsure – 17

The majority of participants gave themes that are synonymous with 'stealthing' is rape as there is two different acts occurring, intercourse with a condom and intercourse without. One respondent clearly did not know what 'stealthing' is but once being told the definition, concluded that it is "definitely rape."

*'Waaaa, horrified!!!!'*

*I had no idea that stealthing was a thing, consenting to sex with a condom is completely different to consenting to sex without a condom. If you have made the choice to have sex with a condom that does not mean that you have made the choice to have sex without a condom. Definitely rape'*

Following on from this response that having sex with a condom is different to consenting

to sex without a condom, there are countless other responses that completely agree with this. A respondent describes the need for another form of consent to be obtained because the removal of a condom changed the conditions that the original consent was based upon.

*'Consent was given based on certain critical conditions and those conditions changed. New consent must be obtained, especially considering it could put the woman's life at risk, not only from disease, but from pregnancy. Her choice to minimize risk of her getting pregnant is removed.'*

However, as with any question being asked there is always the opposing view, and this question is no different. After being told the definition of 'stealthing' the number of participants that still believe that it is not rape dropped to 17 responses from 30. These 17 participants all believe that it is not classed as rape because there was an original consent granted to act of penetration and whether that was with a condom or without is immaterial.

*'I wouldn't class it as rape as both parties would be consenting to the physical act of sex. It would be a betrayal of trust, but I could not understand how it could be rape as – what if it had broke? someone could say it is rape then, so whether a condom is involved or not shouldn't be an issue'.*

Similarly, 17 participants to those that are adamant that it is not rape, 17 other participants are still unsure. These participants mainly put the doubt down to whether the act merits being classed as rape or whether it should be classed as a separate offence. Which again links back to the idea that participants seem reluctant to associate an act to rape that gives the same punishment as murder. Likewise, as stated in Chapter One, Section 1.1, some acts are deemed 'less serious' even though they are similar in that it is a non-consensual penetration of an orifice. Thomas and Balmer (2007) elaborate on this point by linking it to juries and the roles of the jurors, by suggesting that the severity of the offence will affect the conviction rates.



One of the key issues to come from these questions and research in general is that using these colloquialisms in media and articles in fact de-humanise the offence as people do not know what the act is. If the definition of 'stealthing' was used rather than this term, then people would be more likely a) know what the act of 'stealthing' is and b) likely to associate this with an act of rape. It does not solely apply to the terms 'stealthing' and 'upskirting,' there are terms like 'gaslighting;' a form of manipulation and abuse that makes someone doubt reality, that also have this issue (Sarkis, 2018). From this, whenever these terms are used in the media or news, there should be the caveat that the definition is given too.

### 3.9. Reasons to or to not report to the police.

According to RAINN, the Rape, Abuse, and Incest National Network in the USA a survey which was taken on sexual assault crimes gave an insight to why victims did and did not report to the police (possible reasons for low reporting numbers compared to the 700,000 estimated sexual experiences by the CSEW 2018 report). These questions were asked in the questionnaire to get a global view on reasons to or not to report to the police not just the US view. The RAINN survey showed that victims who choose to report to the police; 28% of victims reported to protect themselves from further crimes by the offender, 25% of report were to stop the incident or prevent recurrence or escalation, 21% to improve police surveillance or they believe they have a duty to do so and 17% of responses were to catch, punish and prevent the offender from reoffending (RAINN, 2018). In comparison to the data collected by the questionnaire, the percentage of participants that reported to the police to prevent the victim from further crimes by the offender was lower than the RAINN study at 24%. The participants put the options to stop the incident or prevent recurrence or escalation and to improve police surveillance

or they believe they have a duty to do so at higher percentages than the RAINN study at 32% and 28% respectively. The final option of to catch, punish and prevent the offender from reoffending remained roughly same percentage between the US study and a study involving global participants.

Taking the reasons to NOT report to the police, the RAINN study also provided percentages for a series of those options, likewise the CSEW also generated percentages for comparison purposes. However, not all of the options were found in the RAINN study. These options can be compared to the questionnaire data as seen in the table below.

TABLE 3.9: A TABLE TO SHOW THE PERCENTAGE OF PARTICIPANTS IN THE THREE STUDIES; RAINN – USA, CSEW – UK AND THIS CHAPTERS STUDY - GLOBAL, REASONS TO NOT REPORT TO THE POLICE.

RAINN (Rape, Abuse, and Incest National Network)		CSEW (Crime survey for England and Wales)		Questionnaire data	
Fear of retaliation	20%	Fear of retaliation	34%	Fear of retaliation	25%
Police WOULD NOT do anything to help	13%	Police WOULD NOT do anything to help	17%	Police WOULD NOT do anything to help	22%
Believe it was a personal matter	13%	Believe it was a personal matter	10%	Believe it was a personal matter	22%
Didn't want the perpetrator to be in trouble	7%	Didn't want the perpetrator to be in trouble	8%	Didn't want the perpetrator to be in trouble	4%
Police COULD NOT do anything to help	2%	Police COULD NOT do anything to help	34%	Police COULD NOT do anything to help	3%
Reported the crime to someone different than the police	8%	X		Reported the crime to someone different than the police	14%
Believe it was not important enough to report	8%	X		Believe it was not important enough to report	10%

All the studies put fear of retaliation as the most common reason to not report, this may be due to the fact that as a study at Glasgow University shows, approximately 90% of victims know their attacker (BBC news, 2018). As they are known to the victim there is the feeling that if they do not report to the police, then the perpetrator will not get into

trouble. On the other hand, if they do report to the police, there is a possibility that further offences against them will occur as the perpetrator has got in trouble by someone that they are close to. The data by RAINN and this questionnaire clearly put fear of retaliation as the most common reason to not report, however the CSEW put the option police COULD NOT do anything to help as joint most common.

With the CSEW putting police COULD NOT do anything to help as a common reason to not report it implies people of England and Wales agree with the 'Violence against Women and Girls Report 2017-2018' by the Crown Prosecution Service that "the sensitive nature and complexity of sexual offences affects the outcome of an investigation". Although this is implied by the CSEW data, this view is not shared by the RAINN study or the questionnaire data, 2% and 3% respectively, if anything it is quite the opposite. Both pieces of data conclude that by associating a low percentage COULD NOT but a high percentage to WOULD NOT, that the police could do something to help their situation but would not do anything. This ultimately highlights the question of police perception. The data implies participants actively believe that the police would refuse to do anything regarding their case, which may be brought back to the idea of the "complexity of the cases" (Maier, 2012).

### 3.10. Limitations

This study is not without its limitations. Firstly, the sample of participants that conducted the survey. In total 502 participants began the survey, and those participants varied in age, gender, and country of residence. Taking each category, the age of participants became a limitation. This survey aimed to reduce some of the popularity that rape myths have on individuals' views on rape and sexual offences and according to the 'End Violence against Women' research on Attitudes to Sexual Consent 2018, they found that

over 65s have the most troubling attitudes to rape. Whereas younger people have opinions that are more closely aligned to the law and truthful ongoing events. Therefore, disseminating information and knowledge via an anonymous link online highlights the problem of reaching challenging populations such as the elderly that are more in need of this than the younger population who will have more readily available internet access than the over 65's.

A number of questions asked in this survey surround UK sexual offence statistics and as stated the survey was disseminated via an anonymous link on social media platforms. This, therefore, meant that a number of participants come from countries across the world, and may have a lot less knowledge about the laws and statistics associated with the UK and ultimately may have led to some skewed data.

The second limitation of this survey was the number of partial completed answers. The survey has a number of open-ended questions and if all were answered in depth the survey would take around 15/20 minutes. This information was given to the participants in the information sheet, and therefore may have led to the high number of partially completed answers/questionnaires or discourages participants from taking the survey in general. Following on from the length of the survey, the software Qualtrics did not enable participants to stop the questionnaire and come back to it at another time. Once closed on a device it was recorded as a partially completed response, therefore it is possible that duplicate responses may occur if someone had restarted. Finally, on the limitation of partially completed answers was the sensitivity of the questionnaire in general. With the topic of the survey being sexual offences and rape may put participants off from firstly starting the questionnaire or indeed completing the questionnaire. Also, with self-report questionnaires, especially those focused on

contentious topics such as consent, sexual offences, and rape myths, are liable to socially desirable responding rather than true responses.

### 3.11. Conclusion

The overall question for this thesis is are there issues with consent in sexual offences and are there ways to address these. It is clear to see in this chapter that there are a number of issues that surround consent. Within this chapter there are a number of research questions that needed asking and answers. The first question regarded the prevalence of sexual offences and rape in the United Kingdom and if the public understood the level of prevalence. This chapter highlighted that the participants involved in this study were unsure of the number of sexual offences that occur. This may be due to the number of sources that publish data, such as the Home Office and the Ministry of Justice, each publishing different values for the same offence.

Another research question that centred solely on consent was do the public understand consent and why there may be issues surrounding it. A number of key themes that arose focused on consent in previously consenting partners and rape myths. 180 participants could not indicate whether being in a relationship did or did not influence whether consent could be given. A similar question was posed to the participants about which rape myth was most prevalent and like the previous question there was no clear myth that was or was not the most common. Both of these findings are incredibly interesting and therefore provided the starting point for further studies chapters Five and Seven, respectively.

Sexual offences are prevalent in the UK with a number of misconceptions surrounding the why, who and when. Information about these is very sporadic, with the public having to specifically look for it to understand and obtain knowledge. Studies such as this

chapter provide another way to disseminate data and information to the public about sexual offences and consent. This survey informed participants and helped the understanding of sexual offences and consent as they were answering questions for example, providing statistics and definitions of some colloquialism terms such as stealthing and gaslighting. This is something that is not the case with the Crime Surveys for England and Wales. The CSEW may provide the statistics of the prevalence of sexual offences and rape, however, does not help the public understand the why. This survey bridges that gap of knowledge, understanding but also accessibility.

Although not discussed in depth in this chapter as it is slightly outside the scope of the thesis, this survey could impact the legislation. Participants highlighted that some acts are missing from the Sexual Offences Act 2003. A number of participants emphasised that Female Genital Mutilation (FGM) is currently illegal and a criminal offence in the UK under the FGM act 2003, whereas Male Genital Mutilation (MGM) is in principle legal. Finally, the Misconceptions of Sexual Offences and Consent survey provides the public views on contentious issues and has shown that there are key aspects surrounding consent and sexual offences that require further research e.g., rape myth acceptance and marital and acquaintance rape (which the following chapters explore).

## Chapter Four: Pre-Jury screening tool.

### 4.1. Introduction

Forensic analysis can challenge cases where there is a dispute as to when consent was granted and for which act of intercourse and therefore, is limited in certain respects. However, the issues surrounding consent are not solely fixed to the time it was granted or not granted. One of the public themes that arose from the survey seen in Chapter Three was that some victims are not thought to be believed in cases of rape and sexual assault because of myths and stereotypes that are prevalent in society. The overall purpose of this chapter is to develop and validate a tool that can be used to assess these misconceptions in potential jurors and based on the score it determines whether these beliefs are possessed by the jurors and can ultimately be used to educate.

Gerger et al (2007) define rape myths as “beliefs about rape (i.e., causes, context, consequences, victims and perpetrators and their interactions) that serve to deny, downplay or justify sexual violence”. Rape myth acceptance is an area that has been extensively researched, with several scales developed over the years to measure this from Burt (1970) to the Illinois Rape Myth Acceptance Scale (Payne, Lonsway and Fitzgerald, 1999). However, there is a concern that these prejudicial belief and attitudes are evident in court and that jurors in the deliberation room allow these to impact their evaluation and determination of a verdict (Conaghan and Russell, 2014). According to Edwards et al (2011), rape myths are implicit rather than explicit and anyone “may unintentionally be influenced by rape myths to explain their beliefs, assumptions and actions”. A number of articles outline those sections of society that have been found to have endorsed rape myths to some extent; students (Bannon, Brosi & Foubert, 2013), criminal justice personnel (Smith, Wilkes & Bouffard, 2016) and jurors (Dinos, Burrowes,

Hammond & Cunliffe, 2015). It is not just rape myths that influence decisions, having prior knowledge surrounding sexual offences and consent also play a part as seen by the evaluation of the questionnaire data in the previous chapter (Chapter Three).

According to Temkin and Krahé (2008), there is a concept called the 'real rape' or 'classic rape' stereotype as suggested by Williams (1984). They acknowledge the scenario as when an individual is asked to describe a typical rape situation. Ryan (1988) and Krahé (1992) depict this scenario as an attack by a stranger on an unsuspecting victim, in an outdoor location where threats of violence are used by the perpetrator which subsequently leads to physical resistance by the victim. However, there is literature that research rape and sexual assault that suggests that a 'real rape' scenario is highly uncommon. According to the Crime Survey in England and Wales 2017, approximately 90% of victims knew their perpetrator prior to the offence taking place. Therefore, this 'real rape' stereotype involving a stranger would not be consistent with the majority of cases. Myhill and Allen (2002) showed a similar pattern in terms of the relationship between perpetrator and victim; they found 45% were current partners, 16% were acquaintances, 11% were ex partners, 11% were dates, 10% were other intimates and only 8% were stranger attacks. This indicates that it has been known for more than a decade that the number of stranger rapes that occur is incredibly low, compared to those known to the victim and, yet the myth of rapes being conducted by strangers is still prevalent.

Although, it seems that the 'real rape' stereotype is true for a number of rape cases, Du Mont, Miller and Myhr (2003) suggest that victims who were sexually assaulted in a manner similar to that of the 'real rape' scenario i.e. by a stranger who used force are much more likely to report their assault to the police than those who stray further from



the stereotype i.e. by someone they know but did not resist due to intoxication. As studies have shown, the more a rape incident differs from the 'real rape' scenario, the smaller the number of people prepared to consider it as rape (Burt and Albin, 1981). The Berliner (1991) study observes this in a court setting by suggesting that when a victim is raped by a stranger, that jurors tend to assume a lack of consent, whereas in acquaintance rape cases, the consent dilemma, is more difficult to prove. As rape is the second most serious crime on the statute book after murder and the sentence for rape is up to life imprisonment, it is very possible that a jury could think that the seriousness of the crime does not warrant a sentence comparable to murder (Archard, 1998). Ultimately, rape myths and generalised stereotypes can appear in court proceedings where they may bias verdicts.

Rape myth acceptance in a number of articles has been identified as a main barrier to law reform and progress in conviction rates (Dinos et al, 2015). A study by Dinos et al (2015) which conducted a systematic review of the literature surrounding rape myth acceptance found that in 8 out of 9 studies they reviewed supported the hypothesis that rape myths affect juror decision making. Other studies have found evidence on how rape myths influence decision making. These range from a delay in reporting an assault, to being intoxicated, to not fighting back or having the presence of physical injuries and even acting calm while in court could influence jury members (Raitt and Zeedyk, 1997; Temkin and Krahe, 2008 and Finch and Munro, 2005).

## 4.2. Jury selection

To qualify to be selected for jury service a person must be aged between 18 and 70, have lived in the UK for a period of 5 years after the age of 13 and be eligible to vote. Although the Scottish jury system is slightly different, the main difference is that 15 members sit

on a jury compared to the 12 in England and Wales (Chalmers, Leverick and Munro (2021). The process of jury selection is a randomised process using the electoral register and achieving the above may mean you are selected for jury duty (Thomas and Balmer, 2007). However, this random selection is a key issue in the jury policy and that selection impacts the composition of the jury. It is suggested that any defendant in court is entitled to be tried by a “jury of one’s peers.” According to Thomas and Balmer (2007), this is general comprised of.

- One’s equals or neighbours.
- A body of fair-minded persons
- An impartial body
- A randomly chosen body.
- A representative body

The issue that arises using this method is that a randomly chosen body will not automatically generate a representative body of jurors, some will be unrepresentative due to the random nature. It is currently the view in the United Kingdom that a randomly chosen body will mean a representative body that will remain independent and impartial (Thomas and Balmer, 2007). Although this method of randomly choosing may have a representative body of jurors that may span a range of ages, occupations, ethnicities and comprise of the different genders, it cannot be representative of one’s beliefs especially when it comes to misconceptions around consent and sexual offences. Therefore, the selection process could benefit from a tool that depicts a juries positive or negative attitude towards belief in rape myths.

#### 4.2.1. Juror stereotypes and bias

The issue regarding consent does not stop at whether consent was given or not given, it remains an issue during court proceedings with the problem of juror stereotypes. Juror stereotypes seem to disregard whether consent was given but involve other aspects.

These aspects include the behaviour of the victim in the lead up to the incident, the physical attractiveness of the victim, the level and fact of intoxication, what the victim was wearing, the victims and defendant's personal life and the relationships to one another (Lees, 1996; Finch and Munro, 2007; Schuller and Stewart, 2000; Abbey *et al*, 1987; Whatley, 2005; Rumney and Fenton, 2008; Yescavage, 1999).

Other articles such as Ellison and Munro, (2013), Rose, Nadler, and Clark (2006) and Taylor and Joudo, (2005) comment on other stereotypes. Lack of visible injury was interpreted by the jury as the victim did not try hard enough to resist, therefore the victim must have consented (Ellison and Munro, 2013). Delay in reporting the incident to the police or inconsistencies between their statement and cross-examination in court meant the report was false (Rose, Nadler, and Clark, 2006). Lack of distressed behaviour or those who were not "too" upset meant that they were less credible in the eyes of the jury (Taylor and Joudo, 2005).

When it is one person's word against another, the jury must decide but they have to do that within the context of the law. If a jury finds that the defendant reasonably believed in the victim's consent, they must then find the defendant not guilty. It is only if they are sure beyond all reasonable doubt that the defendant knew that the victim did not consent, that the jury have a duty to find the defendant guilty. To do this the jury must decide the case fairly within the confines of the law, and in light of the evidence and nothing else. However, the nothing else element is an issue. Boeschen et al, (1998) state that "it is clear to see that in rape cases, the victim's accuracy of the allegations is often on trial at the same time as the defendant's culpability".

Amnesty International UK (2005) conducted a study which emphasises the types of stereotypes that may arise during a cross examination of the victim that should not bias

the jury. A poll was conducted of 1,095 participants about the blame culture in the United Kingdom. The poll indicated that 26% of participants thought the woman was partially or fully responsible for being raped if she was wearing revealing clothing. 22% of participants thought she was responsible for being raped if she had many sexual partners. Whereas 30% and 37% thought the woman was partially or fully responsible for being raped if she was drunk or failed to clearly say no respectively. These findings may have dire consequences and a study by Huddersfield University highlights this. Huddersfield University found 43% of jurors chose a guilty verdict before deliberation and that percentage rises to 83% if the juror has firsthand experiences with sexual victimization (Rape crisis, 2017). This study shows that jurors either come to a verdict based on the evidence present or prejudice due to other factors which bias the verdict. One such court case where stereotyping was highlighted was the case *Barbour v HMA* (1982). In this case, the victim was being cross-examined about whether consent was granted or not and responded with "it depends on what you mean by consent." The Lord Justice Steward then summed up with the following statement "it is easy to see how the ambivalence in the concept in consent is exploited by the defence counsels in rape cases. It is also easy to see how the juries are very easily distracted away from the central question of whether she engaged in sexual intercourse freely by focusing on whether her words and actions indicated agreement." The statement shows that there are a number of stereotypes and 'rape myths' which are pre-existing in a juror's mind when they come to a verdict and on occasion ultimately decide their verdict regardless of evidence present.

#### 5.1.1.1. 'Halo Effect'

One of the most common forms of stereotyping and bias is that of forming an opinion based on immediate impression. The 'Halo effect' was first termed this in Edward L Thorndike's 1920 paper on "*A constant error in psychological ratings*". In Thorndike's study, commanding officers were asked to rate their soldiers on a number of physical and personality traits. The study showed that the evaluation of one trait affected the rating of another trait. 'Halo effect' is best defined as "an error in reasoning in which an impression is formed from a single trait or characteristic is allowed to influence multiple judgements or ratings of unrelated factors" (Encyclopaedia Britannica, 2016). Asch (1949) said that people naturally form first impressions of others from the initial information they obtain, and like rape myths and stereotypes these 'halo effect' impressions can be observed in a court setting. Asch's research now known as Implicit Personality Theory was one of the first on the concept of forming first impressions on initial information. One of these first impressions can be seen by the Amnesty international UK (2005) poll that 26% of participants asked were of the thought that a woman was partially or fully responsible for being raped if she was wearing sexy or revealing clothing.

As mentioned by Taylor, Lui and Workman (2018), there are studies where mock juries have been used and where both evidential and non-evidential information have been used. The information used ranges from the evidential of how the alleged perpetrator might be linked to a crime to the non-evidential such as physical attractiveness, gender, ethnicity and what is being worn. This is to see if bias is prevalent. There are a number of studies since Asch's that take these non-evidential pieces of information to see how they affect an overall evaluation of an individual. Taking physical attractiveness there are studies such as Miller (1970); Castellow, Wuensche and Moore, (1990) that research

this. Both studies concluded that more attractive people are generally assigned more positive traits.

Taylor, Lui and Workman also acknowledge two separate studies regarding the gender aspect of the 'Halo effect,' McCoy and Gray (2007) and Ahola, Christianson and Hellstrom (2009). In the study by McCoy and Gray they found that juries tend to show more leniency towards females in cases involving child abuse, which was also found in the study by Ahola, Christianson and Hellstrom. Ahola et al study also found that male defendants received more convictions for murder than females but also were deemed less trustworthy. Another non-evidential factor that has been seen to be an influence in mock jury trials is that of the individual's ethnicity. The study by Forster-Lee et al, 2006 found that jurors in cases were most lenient in sentencing with white defendants who murdered white victims. Their article found also found that female jurors were more punitive toward black defendants than male jurors. This was also seen for female jurors who were more likely to engage in emotive responses when the victim was black, compared to male jurors.

#### 4.3. Rape myths and misconceptions

According to Burt (1970) rape myths are "prejudicial, stereotyped, or false beliefs about rape, rape victims and rapists". There are several pieces of literature which give examples of rape myths, only strangers' rape (Koss, Dinero, Seibel and Cox, 1988), rapists use weapons and cause physical injury (Schafraan, 1993), victims behave in certain ways, i.e., if they were being raped why didn't they fight back (Waterhouse, Reynolds, and Egan, 2014), women routinely lie about rape and only 'certain women' are raped (Brownmiller, 1975; Rumney, 2006) and women ask for it and women 'cry rape' if they have got something to cover up (Burt, 1980). However, according to Bohner et al (2009)

these rape myths can encompass a range of beliefs, which can fall into four categories such as 1) victim blaming, 2) beliefs that excuse the offender, 3) beliefs that doubt the allegations being made and 4) that the act of rape is only exclusive to certain groups of society.

Firstly, the myths surrounding 'victim blaming.' Victim blaming occurs when a victim is held entirely or partially at fault for the act that occurs upon them (Taylor, 2020). This belief puts the emphasis on the victim's behaviour or character, rather than the perpetrators as the reason they may have been raped. One such prevalent victim blaming rape myth is that of a person who is wearing revealing clothing is therefore inviting rape (McGee et al, 2011). A study by Whatley (2005) found those victims who were wearing revealing clothing were attributed the greater responsibility for being raped compared to those that were not wearing revealing clothing.

Secondly, the myths that excuse the offender. These myths are those that give the perpetrator a defence as to why they conducted a sexual assault or rape. The majority of these surround sexual desire for example, that it was a 'crime of passion' and being intoxicated (Farmer and McMahon, 2011). There is an article by Hipp et al, (2015) titled 'Justifying Sexual Assault: Anonymous Perpetrators Speak Out Online' which gave perpetrators of sexual assault and rape a platform to explain why they conducted such acts. The justification for such acts were split into 6 different themes, sexual scripts (what is appropriate, anticipated, and desired during sex), victim blaming, hostile sexism, biological essentialism (physiology such as hormones drives the actions, thoughts, and feelings), objectification and sociosexuality (sex for personal gratification).

Farmer and McMahon (2011) in their rape myth acceptance scale have a subscale dedicated to these types of myths that the offender “didn’t mean to”. Some of the rape myths they state are that men have a powerful desire for sex and sometimes they get too sexually carried away or that if he was drunk then he might rape someone unintentionally and not realise what he was doing.

Thirdly, the beliefs that doubt the allegations being made. One of the major myths is that false allegations of rape are prevalent in society, that an individual has made up a sexual assault for whatever reason (McGee et al, 2011). McGee et al (2011) highlight that holding this belief will clearly cast doubt on the accuser before any evidence is heard and therefore will create scepticism around any accusation made. Those cases which are indeed false, and those that are true allegations are difficult to determine. There are some suggestions that between 2% and 9% of reported rapes are deemed to be false allegations (Kelly and Lovett, 2009).

Finally, that rapes are exclusive to certain groups of society. One of the prominent rape myths is that “only certain types of women get raped and sexually assaulted,” where in fact anyone can be raped, whether that be men (including transgender men), women (including transgender women) and non-binary people. In Bohner et al, (2009) they state that this myth of “only certain women” is those women who are pretty and wear revealing clothing. This ultimately ties in with the victim blaming myths.

#### 4.4. Existing scales

Measuring the attitudes and behaviours that are associated with sexual consent is crucial to addressing sexual offences and violence as a lack of consent in these cases is defining (Glance, Zatzkin and Kaufman (2020). To measure the attitudes and behaviours a number of scales exist, however they leave room for further development as they



majority focus solely on attitudes towards consent or rape myths separately. The current existing consent scales include the Sexual Consent Scale – Revised (SCS-R; Humphreys and Brousseau, 2010), the Consent to Sex Scale (CSS; Jozkowski and Peterson, 2014), the Internal Consent Scale (ICS) and the External Consent Scale (ECS) (Jozkowski et al, 2014) and the latest Process-Based Consent Scale (PBCS) by Glace, Zarkin and Kaufman, (2020). On the other hand, the current existing rape myth scales are the original Burt 1980's Rape Myth Acceptance Scale (RMA), the Illinois Rape Myth Acceptance Scale (Payne, Lonsway, & Fitzgerald, 1999) and the Updated Illinois Rape Myth Acceptance Scale (McMahon & Farmer, 2011).

#### 4.4.1. Consent scales

The Sexual Consent Scale – Revised (SCS-R) measures an individual's attitudes, beliefs, and behaviours on how consent should be dealt with between sexual partners. The scale is loosely based on framework used for the Theory of Planned Behaviour (Ajzen, 1991, 2001 and 2005). From the scale five factors emerged: perceived behavioural control, positive attitude toward establishing consent, sexual consent norms, indirect consent behaviours and awareness of consent (Humphreys and Brousseau, 2010). The Cronbach's alpha was calculated for each of the subscales to indicate adequate to good reliability of the subscale (perceived behavioural control  $\alpha = .93$ ; positive attitude toward establishing consent  $\alpha = .93$ ; sexual consent norms  $\alpha = .81$ ; indirect consent behaviours  $\alpha = .79$  and awareness of consent  $\alpha = .76$ ). Glace, Zarkin and Kaufman, (2020) explain that the SCS-R scale relies on consent being a discrete transaction rather than an ongoing negotiation process and highlight some of the scale items that exemplify this. For example, the item "I feel that sexual consent should always be obtained before the start of any sexual activity," whereas there are other items that suggest a negotiation

process. Glace, Zatzkin and Kaufman suggest further measurement development is needed for those process-based sexual consent scenarios i.e., the development of their scale.

The ICS, ESC and CSS developed by Jozkowski et al (2014) are scales used to measure various methods of communication of sexual consent. Jozkowski et al (2014) penned the term 'External consent' based on "behavioural or verbal indicators that externally express one's willingness to engage in sexual activity". Within the ICS scale there were five factors that emerged; Physical (Cronbach's  $\alpha = .91$ ), Safety/Comfort ( $\alpha = .94$ ), Arousal ( $\alpha = .93$ ), Consent/Want ( $\alpha = .93$ ) and Readiness ( $\alpha = .90$ ). The term 'Internal consent' was theorised based on the concept of mental consent or the "internal feelings of willingness which inform the decision to engage in sexual activity" by Muehlenhard (1995). Similar to the ICS the External Consent Scale also had five factors emerge: Nonverbal Behaviours (Cronbach's  $\alpha = .78$ ), passive behaviour ( $\alpha = .81$ ), communication/initiator behaviour ( $\alpha = .79$ ), borderline pressure ( $\alpha = .748$ ) and no response signals ( $\alpha = .672$ ). The subscale of No Response Signals generating a Cronbach's Alpha of less than 0.7 indicates that this specific subscale may not be measuring the same as the rest of the scale.

The Consent to Sex Scale (CSS) developed by Jozkowski and Peterson (2014) aimed to better understand how students indicate consent to sex using a Likert style scale survey. The CSS consisted of 68 items assessing verbal or behavioural tactics to consenting to sex. Like many other consent scales, the CSS is split into a number of subscales with a couple of them coming from Jozkowski and colleagues' previous scales: Nonverbal signals of interest (Cronbach's  $\alpha = .949$ ), Passive behaviours ( $\alpha = .931$ ), Initiator behaviour ( $\alpha = .900$ ), Verbal cues ( $\alpha = .843$ ) and Removal behaviours ( $\alpha = .801$ ). The scale

showed that the methods of communicating consent may vary among individuals with certain individuals consistently using one or two approaches for expressing consent or different contexts and partners will influence the strategy for communicating consent (Jozkowski and Peterson, 2014).

Although these scales are used, they solely focus on the participant willingness to engage in sex and ultimately how they would communicate that, rather than the attitudes towards consent.

Glance, Zarkin and Kaufman, (2020) developed the latest consent scale, the Process-Based Consent Scale with the aim to provide an alternative means of conceptualising sexual consent based on the limitations of the above scales. The Process-Based Consent Scale adheres to the concept that consent is an “ongoing process characterised by the concern for the other’s continuing willingness to engage.” Similar to those above, the PBCS consisted of 18 items using a Likert scale and was split into a number of subscales: Ongoing consent (Cronbach’s  $\alpha = .86$ ), sexual coercion ( $\alpha = .89$ ) and communicative sexuality ( $\alpha = .84$ ). According to Glance, Zarkin and Kaufman, (2020) these subscales were included to ensure a wide range of topics surrounding consent would be covered, that were previously missed in preceding scales.

These scales only focus on measuring attitudes and beliefs surrounding consent to address sexual offences, however, there is literature and scales developed that measure rape myth acceptance that is also crucial to addressing sexual offences.

#### 4.4.2. Rape myth acceptance scales

In 1980 Martha Burt developed the first rape myth acceptance scale (RMA) in her article “Cultural Myths and Supports for Rape” to measure individual levels of endorsement of these myths. The scale predominately focused on the myths surrounding women, such

as “A woman who goes to the home or apartment of a man on their first date implies that she is willing to have sex” or “many women have an unconscious wish to be raped, and then unconsciously set up a situation in which they are likely to be attacked” (Burt, 1980). Burt’s scale consisted of 19 items (Cronbach’s  $\alpha = .875$ ) and ultimately found that the higher the attitude towards sex role stereotyping and acceptance of interpersonal violence, the greater a respondent’s acceptance of rape myths. But also, that the younger and educated participants reveal less stereotypic and proviolence attitudes and therefore show less rape myth acceptance.

The Illinois Rape Myth Acceptances Scale (IRMA) was developed by Payne, Lonsway and Fitzgerald (1998) to measure their level of agreement to 45 rape myth statements and was arguably the most reliable rape myth scale (McMahon and Farmer, 2011). The scale provided a series of female rape myths and male rape myths. The system was created to determine a way of measuring rape myth acceptance in society; 1 being that the participant strongly disagrees with the rape myth and 5 being that the participants strongly agrees. The higher the score a rape myth accumulates may indicate the greater rejection of that myth. The overall Cronbach’s alpha for the IRMA scale was .93, with the subscales varying. The IRMA is split into 7 subscales: she asked for it ( $\alpha = .84$ ), it was not really rape ( $\alpha = .77$ ), he did not mean to ( $\alpha = .74$ ), she wanted it ( $\alpha = .84$ ), she lied ( $\alpha = .84$ ), rape is a trivial event ( $\alpha = .74$ ), and rape is a deviant event ( $\alpha = .76$ ). Similar to the majority of the scale, the IRMA showed that the higher the score a participant generates the more likely they were to (1) hold traditional sex role stereotypes, (2) express hostile attitudes towards women and (3) be accepting of both interpersonal violence and violence in general (Payne, Lonsway and Fitzgerald (1998).

The scale generated by McMahon and Farmer (2011) is an updated version of the Illinois Rape Myth Acceptance Scale by Payne, Lonsway and Fitzgerald in 1998, however, the main aims of this scale were to update the language and to include some more subtle rape myths, with a focus on victim blaming. Over time according to Swim and Cohen (1997), expressions of victim blaming have shifted from overt sexism to covert sexism with unequal treatment of women being hidden due to the normalisation of the behaviour. The 22-item scale ranged in possible scores on the five-point Likert scale from 22 to 110, in which a score of 110 indicated a strong belief in rape myths, with a score of 22 indicating the opposite. As with all previous scales, both rape myth scales and consent scales, the 22-item scale was divided up into subscales: she asked for it ( $\alpha = .73$ ), he did not mean to ( $\alpha = .70$ ), it was not really rape ( $\alpha = .73$ ) and she lied ( $\alpha = .80$ ). The overall Cronbach alpha for the scale as a whole is  $\alpha = .87$  meaning a good internal consistency of the scale (Fontaine, 2018). This scale showed that there were significant differences between male and female participants in that females were more rejecting of rape myths. There was also no significant relationship between the participants who knew someone who had been sexually assaulted and the scores on the rape myth measure, but also those with any experience with sexual assault prevention programmes had no correlation with rape myth scores.

#### 4.5. Pre jury screening tool (PJST) study

Although, previous scales on sexual consent and rape myths provide useful information on attitudes and beliefs, the goal of this present study is to address the shortcomings of these individual scales by addressing consent and typical rape myths that are still prevalent in society into a single scale. From Chapter Three the views of sexual offences highlighted an issue surrounding marital and acquaintance consent with participants

unsure of it equating to rape. Current scales and Payne, Lonsway and Fitzgerald (1998) highlight it in their limitations to their scale, that they fail to distinguish between stranger and acquaintance rape. Respondents, therefore, would produce diverse types of perceptions or patterns of endorsement when they have several types of rape in mind. This scale, based on the data collected from the Misconceptions of Sexual Offences and Consent survey in Chapter Three, rectifies this limitation with statements focusing on stranger rape scenarios and those from a marital and acquaintance standpoint. Other than the Burt (1980) Rape Myth Acceptance Scale study, all other scales utilised university students with an average age of participants being between 18-24 years old. According to the End Violence Against Women Coalition ‘Attitudes to Sexual Consent’ (2018) study they found that younger people have attitudes and beliefs that are more closely aligned to the law, with anyone over the age of 65 having “troubling attitudes to rape”. Unlike previous scales, and as the Pre-jury Screening Tool is aimed to be used for potential jury members, any and all participants were able to undertake the survey to align with the randomness of jury selection as highlighted by Thomas and Balmer (2007).

#### 4.5.1. Method

The measures included in this study consisted of demographic questions and a series of proposed items for the Pre-Jury Screening Tool (PJST). The proposed items consisted of 42 statements about which the participants were asked to what level they agree or disagree with each statement. The appendix F contains a full list of all the statements. The statements were rated using a 5-point Likert scale. The PJST uses a 5-point Likert scale where 1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree* and 5 = *strongly agree*. 23 statements in this study were intended to be reverse coded

in the data analysis. Participants can be scored between 42 points indicating a strong belief of the rape myths and misconceptions surrounding consent and 210 which indicates a strong rejection of rape myths and misconceptions surrounding consent.

#### 4.5.2. Participants

In total there were 342 recorded responses by the Qualtrics Software from multiple countries: United Kingdom (150, 44%), United States of America (71, 21%), Australia (18, 5.3%), Germany (13, 3.8%) and Canada (11, 3.2%). There were a number of other countries that also provided participants. All participants were recruited online from all parts of the globe, therefore not limited to the UK. This was to coincide with the understanding that there are differing legislative procedures in different countries. All participants completed the survey voluntarily.

#### 4.5.3. Procedure

The Pre-jury Screening Tool (PJST) is a 42-item scale to measure attitudes and beliefs of potential jurors on sexual consent and rape myths to determine those that would adversely affect a verdict. The scale consisted of the generalised demographic questions to obtain some information about the participants conducting the questionnaire in order to determine if these questions have an influence on the answers given. Following the demographic questions, the scale was split into 4 subscale sections; (a) individual perceptions surrounding consent, (b) beliefs about influences on consent, (c) the validity and need for biological evidence and finally (d) general and specific beliefs about rape myths. The questionnaire uses a 5-point Likert scale ranging from 1 (strongly disagree with the statement) to 5 (strongly agree with the statement). Items in the individual subscales were developed from questions included in the Chapter Three survey and a

review of existing literature on sexual consent and rape myth acceptance to ensure a wide range of topics to be analysed.

#### 4.5.4. Analysis

All the statements found in the beliefs in rape myth subscale were negatively worded, and therefore recoded in analysis so that the Likert scale was reversed; subsequently 1 = *strongly agree*, 2 = *agree*, 3 = *neither agree nor disagree*, 4 = *disagree* and 5 = *strongly disagree*. This would then coincide with a low score indicating a strong belief of the rape myths and misconceptions surrounding consent and high score indicating a strong rejection of rape myths. Item analysis was then conducted using IBM SPSS Statistics 25 software.

### 4.6. Results and discussion

#### 4.6.1. Demographic statistics

Of the participants 66.7% were female (n = 228), 28.4% (n = 97) were male, 2.6% of all participants see themselves as non-binary (n = 9). 0.6% and 0.3% were trans male (n = 2) and trans female (n = 1) respectively with 1.5% preferring to not say (n = 5). 69.3% of participants were aged between 18 and 30 (n = 237), 19.9% were aged between 31 and 45 (n = 68). 7% of responses were aged between 46 and 60 (n = 24) and 1.2% or participants were over the age of 60. 82.6% of all responses stated they did not have any expertise in the area of sexual offences (n = 275). 7.5% of participants stated they had less than 5 years of expertise (n = 25), 2.7% and 1.2% stated they had between 5 to 10 (n = 9) and 11 to 20 (n = 4) years, respectively. No participants had between 21 to 30 years expertise; however, 3 participants said they had over 30 years of expertise in the area of sexual offences.



TABLE 4.1: DEMOGRAPHIC CHARACTERISTICS FOR THE TOTAL SAMPLE.

Pre-jury screening tool study – Characteristics		
Demographic information	Number	Percentage (%)
<b>Gender</b>		
Male	97	28.36
Female	228	66.67
Prefer not to say	5	1.46
Trans male	2	0.58
Trans female	1	0.29
Non-binary	9	2.63
Other	0	0.00
<b>Age</b>		
Under 18	9	2.6
18-30	237	69.3
31-45	68	19.9
46-60	24	7.0
60+	4	1.2
<b>Expertise</b>		
None	275	82.6
Less than 5 years	25	7.5
5 to 10 years	9	2.7
11 to 20 years	4	1.2
21 to 30 years	0	0.0
More than 30 years	3	0.9
Did not answer	17	5.1

#### 4.6.2. Descriptive statistics

The descriptive statistics for the P-JST scale can be found in the following tables. The 5-point Likert scale where 1 = *strongly disagree*, 2 = *disagree*, 3 = *neither agree nor disagree*, 4 = *agree* and 5 = *strongly agree* was used with means and standard deviations calculated. Each individual subscale had a mean and standard deviation generated: Perceptions surrounding consent ( $M = 4.05$ ,  $SD = 0.75$ ), influences on consent ( $M = 4.21$ ,  $SD = 0.16$ ), validity and need for biological evidence ( $M = 3.09$ ,  $SD = 0.54$ ) and beliefs about rape myths ( $M = 4.03$ ,  $SD = 0.48$ ).

TABLE 4.2: MEANS, STANDARD DEVIATIONS AND SCALE RESPONSES FOR THE PRE-JURY SCREENING TOOL SURVEY FOR SUBSCALE 1: PERCEPTIONS SURROUNDING CONSENT.

Items Full scale $\alpha = .929$	Scale responses (n, %)						
	Mean	Standard deviation	Strongly disagree. (1)	Disagree (2)	Agree nor disagree. (3)	Agree (4)	Strongly agree. (5)
Subscale 1: Perceptions surrounding consent. $\alpha = .766$	4.05	0.75					
Consent should be obtained before any sexual activity.	4.68	0.73	3 0.91%	4 1.21%	12 3.63%	52 15.71%	260 78.55%
A lack of acknowledged consent before intercourse is fundamentally what makes this an act of rape.	3.98	1.06	8 2.42%	32 9.67%	38 11.48%	130 39.27%	123 37.16%

Any person can be raped.	4.76	0.68	3 0.91%	3 0.91%	11 3.32%	31 9.37%	283 85.50%
Only males can rape another person.	4.60	0.91	250 75.08%	55 16.52%	13 3.90%	6 1.80%	9 2.70%
Consent can be withdrawn during intercourse.	4.57	0.85	4 1.20%	9 2.70%	14 4.20%	75 22.52%	231 69.37%
It is rape if consent is given to vaginal intercourse, but anal intercourse occurs.	4.14	1.07	10 3.02%	19 5.74%	44 13.29%	96 29.00%	162 48.94%
'Stealthing' (the non-consensual removal of a condom part way through intercourse) is rape.	4.11	1.07	7 2.11%	30 9.06%	40 12.08%	95 28.70%	159 48.04%
'Upskirting' (the taking of a photograph under the clothes of another) is a sexual offence.	4.66	0.72	1 0.30%	7 2.11%	13 3.92%	61 18.37%	250 75.30%
A verbal 'yes' is needed every time intercourse happens and needs to be clearly acknowledged by both	3.28	1.23	18 5.41%	91 27.33%	75 22.52%	80 24.02%	69 20.72%
Physical cues alone are not enough to give consent to sexual.	3.40	1.15	14 4.20%	71 21.32%	90 27.03%	91 27.33%	67 20.12%
A verbal 'no' is needed for intercourse to stop.	2.40	1.36	103 31.02%	113 34.04%	32 9.64%	44 13.25%	40 12.05%

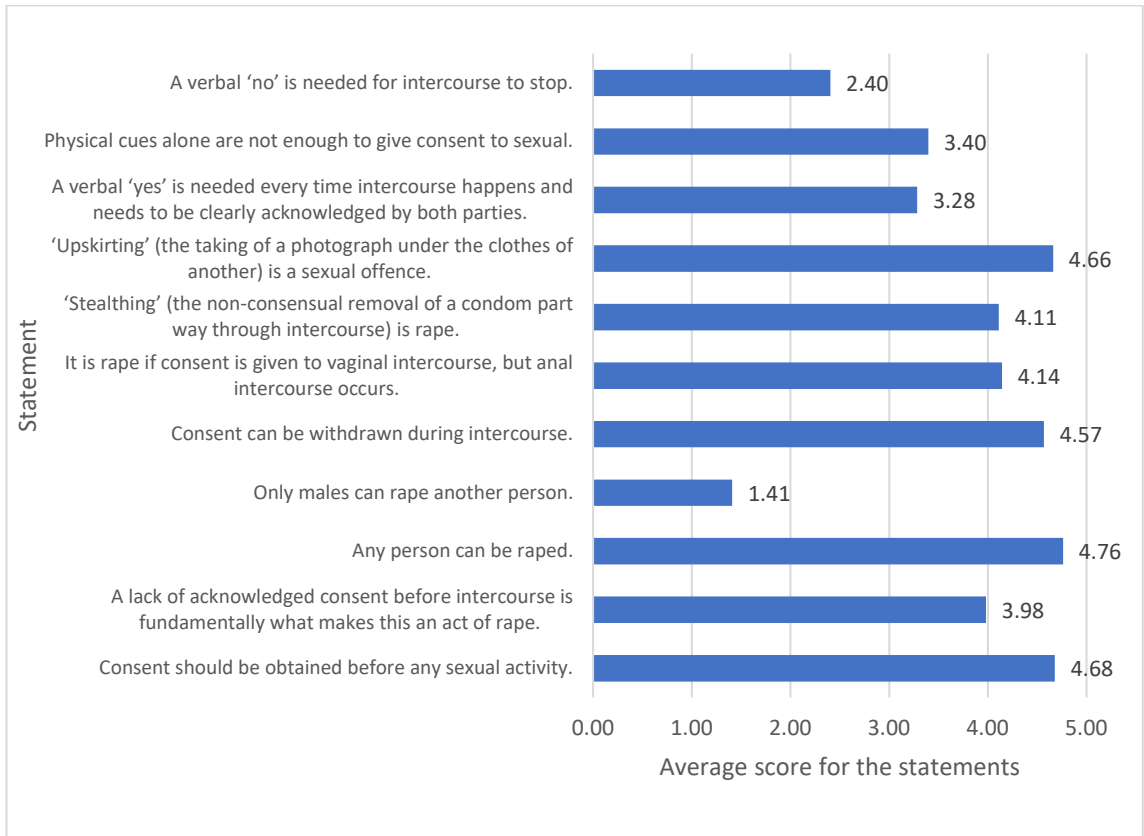
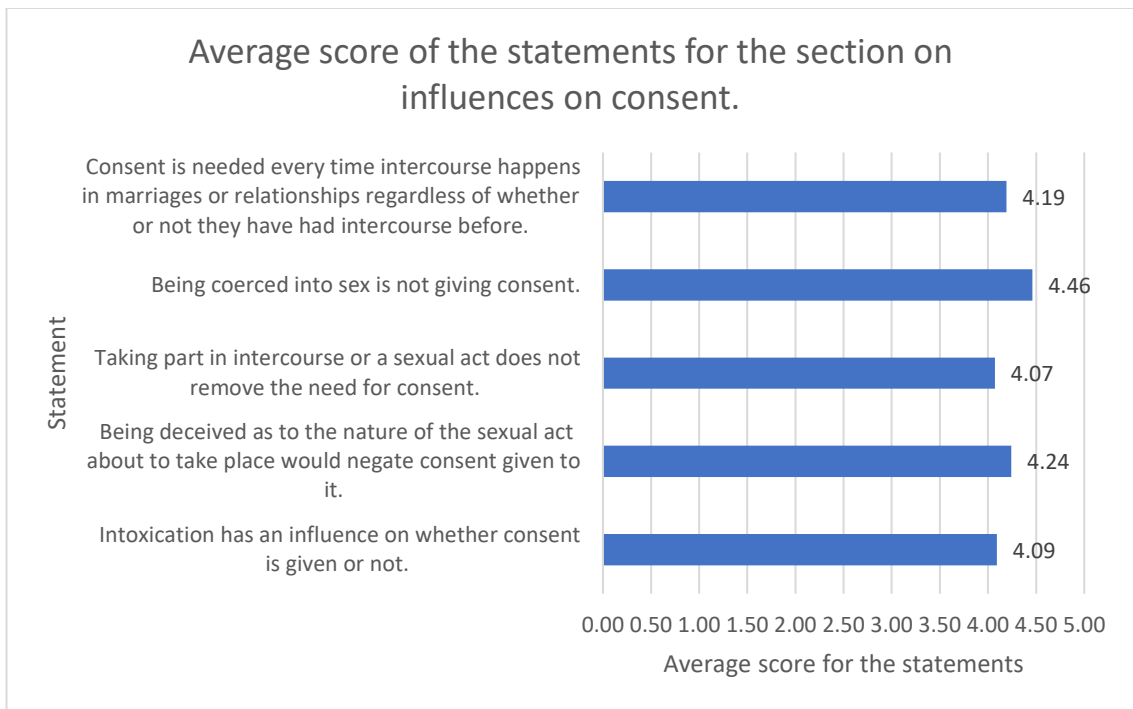


FIGURE 4.1: AVERAGE SCORE OF THE STATEMENTS FOR THE SUBSCALE 1: PERCEPTIONS SURROUNDING CONSENT.

TABLE 4.3: MEANS, STANDARD DEVIATIONS AND SCALE RESPONSES FOR THE PRE-JURY SCREENING TOOL SURVEY FOR SUBSCALE 2: INFLUENCES ON CONSENT.

Subscale 2: Influences on consent $\alpha = .729$	4.21	0.16					
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Intoxication has an influence on whether consent is given or not.	4.09	0.96	6 1.83%	18 5.50%	30 9.17%	138 42.20%	135 41.28%
Being deceived as to the nature of the sexual act about to take place would negate consent given to it.	4.24	0.88	2 0.61%	10 3.07%	39 11.96%	105 32.21%	170 52.15%
Taking part in intercourse or a sexual act does not remove the need for consent.	4.07	0.93	4 1.23%	14 4.31%	43 13.23%	127 39.08%	137 42.15%
Being coerced into sex is not giving consent.	4.46	0.78	2 0.61%	7 2.14%	18 5.50%	89 27.22%	211 64.53%
Consent is needed every time intercourse happens in marriages or relationships regardless of whether or not they have had intercourse before.	4.19	0.98	7 2.13%	14 4.27%	38 11.59%	103 31.40%	166 50.61%



**FIGURE 4.2: AVERAGE SCORE OF THE STATEMENTS FOR THE SUBSCALE 2: INFLUENCES ON CONSENT.**

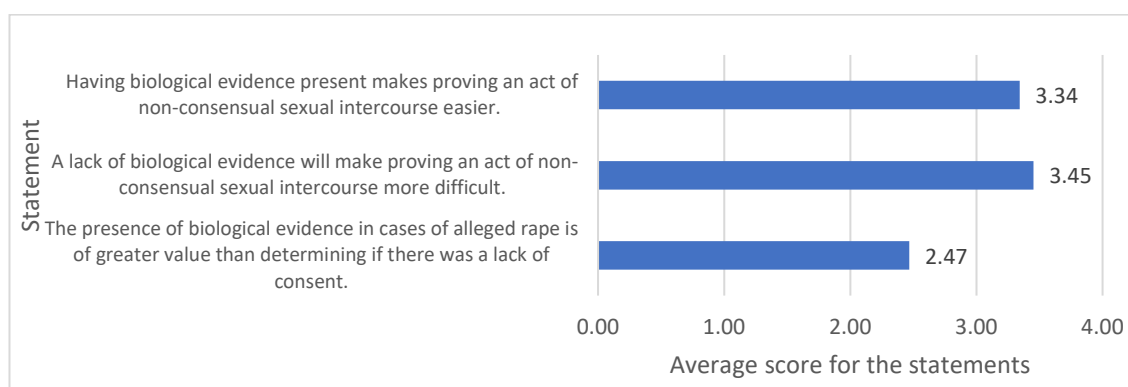
### 4.6.3. Scale evaluation analysis

There are two types of analysis that are applied to scales: assessment of scale reliability and scale validity. To determine scale reliability, item analysis is applied. An item analysis examines the extent to which items within the scale correlates to each other and to the overall scale. Those statements which measure the same should show a strong correlation with participants responses, whereas those which show a poor correlation indicate that some items are measuring something different to the rest of the scale. The P-JST had four items that had to be removed at this stage of the item analysis. The

statement “A verbal ‘no’ is needed for intercourse to stop” was removed from ‘Subscale 1 – Perceptions surrounding consent’ due to it having a negative correlation to the other items. This may have been due to the wording of the statement which unintentionally meant that participants answered that question in separate ways. However, although the statement regarding verblivity of consent is deemed to not correlate with the rest of the measure, the statement is an important one within a measure on attitudes and beliefs towards consent and therefore would not be beneficial to the scale should it be removed.

**TABLE 4.4: MEANS, STANDARD DEVIATIONS AND SCALE RESPONSES FOR THE PRE-JURY SCREENING TOOL SURVEY FOR SUBSCALE 3: VALIDITY AND NEED FOR BIOLOGICAL EVIDENCE.**

<b>Subscale 3: Validity and need for biological evidence. α =.589</b>	<b>3.09</b>	<b>0.54</b>					
The presence of biological evidence in cases of alleged rape is of greater value than determining if there was a lack of consent.	2.47	1.07	50 16.08%	93 29.90%	96 30.87%	62 19.94 %	10 3.22%
A lack of biological evidence will make proving an act of non-consensual sexual intercourse more difficult.	3.45	0.93	10 3.22%	25 8.04%	54 17.36%	185 59.49 %	37 11.90%
Having biological evidence present makes proving an act of non-consensual sexual intercourse easier.	3.34	1.03	9 2.89%	43 13.83%	59 18.97%	157 50.48 %	43 13.83%



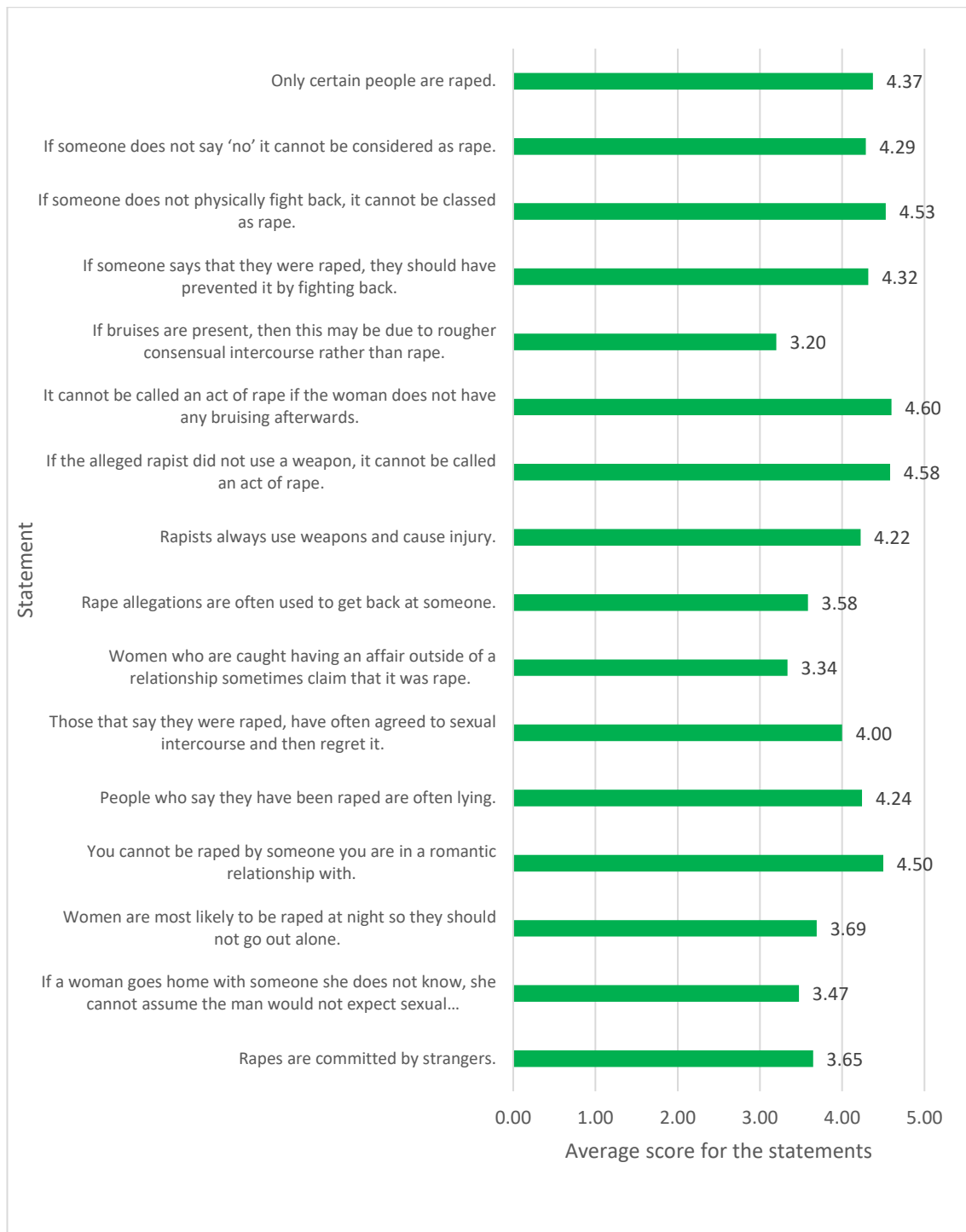
**FIGURE 4.3: AVERAGE SCORE OF THE STATEMENTS FOR THE SUBSCALE 3: VALIDITY AND NEED FOR BIOLOGICAL EVIDENCE.**

Finally, the complete subscale (validity and need for biological evidence) as seen in Table 4.4 and Figure 4.3 was removed from the scale after reliability analysis as the statements showed a non-significant correlation in relation to the other statements in the measurement. This is solely because these statements were not measuring the attitudes

and beliefs towards consent and rape myths but focused on physical evidence. Although dropped, the data obtained from the statements removed from the scale, were still discussed and was beneficial to measuring attitudes and beliefs. Full data for item analysis can be found in appendix G.

**TABLE 4.5: MEANS, STANDARD DEVIATIONS AND SCALE RESPONSES FOR THE PRE-JURY SCREENING TOOL SURVEY FOR SUBSCALE 4: BELIEFS ABOUT RAPE MYTHS – PART 1. (LIKERT SCALE REVERSED. 1 = STRONGLY AGREE, 2 = AGREE, 3 = NEITHER AGREE NOR DISAGREE, 4 = DISAGREE AND 5 = STRONGLY DISAGREE)**

<b>Subscale 4: Beliefs about rape myths – Part 1 α = .913</b>	<b>4.03</b>	<b>0.48</b>					
Rapes are committed by strangers.	3.65	1.10	101 31.66%	97 30.41%	88 27.59%	21 6.58%	12 3.76%
If a woman goes home with someone she does not know, she cannot assume the man would not expect sexual intercourse to take place.	3.47	1.21	101 31.96%	80 25.32%	71 22.47%	49 15.51%	15 4.75%
Women are most likely to be raped at night so they should not go out alone.	3.69	1.15	117 36.56%	90 28.13%	60 18.75%	47 14.69%	6 1.88%
You cannot be raped by someone you are in a romantic relationship with.	4.50	0.86	256 80.00%	42 13.13%	9 2.81%	6 1.88%	7 2.19%
People who say they have been raped are often lying.	4.24	0.82	181 56.56%	96 30.00%	36 11.25%	6 1.88%	1 0.31%
Those that say they were raped, have often agreed to sexual intercourse, and then regret it.	4.00	0.94	138 43.26%	112 35.11%	56 17.55%	9 2.82%	4 1.25%
Women who are caught having an affair outside of a relationship sometimes claim that it was rape.	3.34	1.11	76 23.90%	70 22.01%	111 34.91%	52 16.35%	9 2.83%
Rape allegations are often used to get back at someone.	3.58	1.11	93 29.15%	105 32.92%	69 21.63%	43 13.48%	9 2.82%
Rapists always use weapons and cause injury.	4.22	0.86	191 60.44%	88 27.85%	25 7.91%	11 3.48%	1 0.32%
If the alleged rapist did not use a weapon, it cannot be called an act of rape.	4.58	0.67	273 85.85%	32 10.06%	10 3.14%	2 0.63%	1 0.31%
It cannot be called an act of rape if the woman does not have any bruising afterwards.	4.60	0.67	279 87.74%	22 6.92%	13 4.09%	3 0.94%	1 0.31%

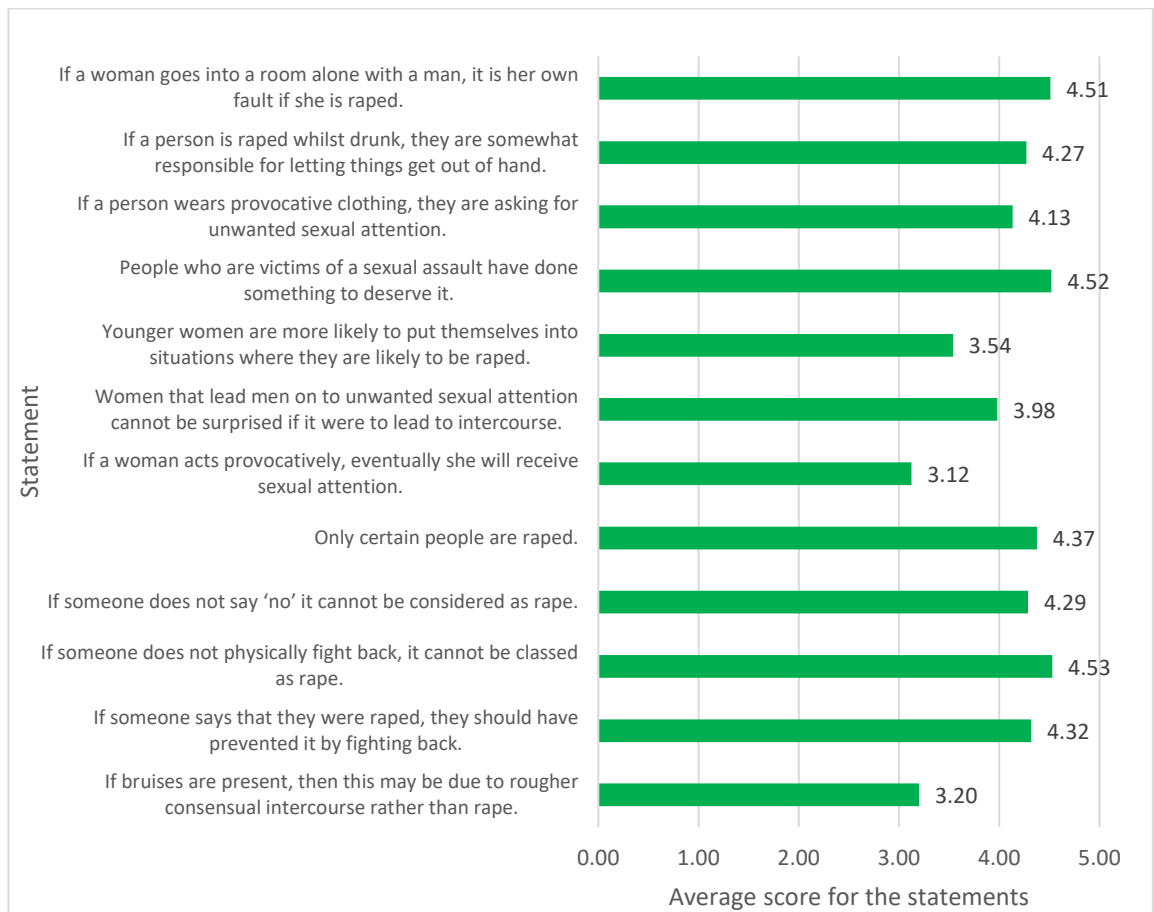


**FIGURE 4.4: AVERAGE SCORE OF THE STATEMENTS FOR THE SUBSCALE 4: RAPE MYTHS (PART 1). STATEMENTS RECORDED, A SCORE OF 1 WHICH WAS STRONGLY DISAGREE IS NOW A SCORE OF 5 AND VICE VERSA.**

**TABLE 4.6: MEANS, STANDARD DEVIATIONS AND SCALE RESPONSES FOR THE PRE-JURY SCREENING TOOL SURVEY FOR SUBSCALE 4: BELIEFS ABOUT RAPE MYTHS – PART 2. (LIKERT SCALE REVERSED. 1 = STRONGLY AGREE, 2 = AGREE, 3 = NEITHER AGREE NOR DISAGREE, 4 = DISAGREE AND 5 = STRONGLY DISAGREE)**

<b>Subscale 4: Beliefs about rape myths – Part 2</b>	<b>4.03</b>	<b>0.48</b>					
If bruises are present, then this may be due to rougher consensual intercourse rather than rape.	3.20	1.29	90 28.39%	47 14.83%	79 24.92%	85 26.81%	16 5.05%
If someone says that they were raped, they should have prevented it by fighting back.	4.32	0.90	218 68.55%	62 19.50%	25 7.86%	9 2.83%	4 1.26%
If someone does not physically fight back, it cannot be classed as rape.	4.53	0.70	263 82.97%	36 11.36%	14 4.42%	3 0.95%	1 0.32%
If someone does not say 'no' it cannot be considered as rape.	4.29	0.86	206 64.78%	70 22.01%	34 10.69%	5 1.57%	3 0.94%
Only certain people are raped.	4.37	0.80	242 77.32%	42 13.42%	21 6.71%	7 2.24%	1 0.32%
If a woman acts provocatively, eventually she will receive sexual attention.	3.12	1.31	87 27.80%	51 16.29%	65 20.77%	91 29.07%	19 6.07%
Women that lead men on to unwanted sexual attention cannot be surprised if it were to lead to intercourse.	3.98	1.01	167 53.53%	76 24.36%	47 15.06%	17 5.45%	5 1.60%
Younger women are more likely to put themselves into situations where they are likely to be raped.	3.54	1.20	117 37.50%	74 23.72%	59 18.91%	56 17.95%	6 1.92%
People who are victims of a sexual assault have done something to deserve it.	4.52	0.67	274 87.54%	22 7.03%	13 4.15%	2 0.64%	2 0.64%
If a person wears provocative clothing, they are asking for unwanted sexual attention.	4.13	1.03	203 64.86%	58 18.53%	26 8.31%	19 6.07%	7 2.24%
If a person is raped whilst drunk, they are somewhat responsible for letting things get out of hand.	4.27	0.93	225 71.88%	50 15.97%	19 6.07%	14 4.47%	5 1.60%
If a woman goes into a room alone with a man, it is her own fault if she is raped.	4.51	0.68	276 88.75%	19 6.11%	10 3.22%	4 1.29%	2 0.64%





**FIGURE 4.5: AVERAGE SCORE OF THE STATEMENTS FOR THE SUBSCALE 4: RAPE MYTHS (PART 2). STATEMENTS RECODED, A SCORE OF 1 WHICH WAS STRONGLY DISAGREE IS NOW A SCORE OF 5 AND VICE VERSA.**

Following item analysis, discriminative analysis of scale items was conducted. Discriminative analysis uses Levene's test for significance to determine the difference between participants with a positive view of a statement, and those with an extremely negative view. If there is no significant difference in the scores of the two groups, then this shows that the item does not discriminate between participants with different opinions of the scale statements. Ultimately, the item is therefore not useful and should not be included in the scale. In this case of discriminative analysis only one statement (rapes are committed by strangers) did not significantly discriminate between positive and negative views. This statement is not specific enough, which is the reason as to why it does not significantly discriminate. Those with opposing views would simply answer agree based on those rapes do occur by strangers or disagree based on rapes occurring

with the perpetrator being someone known to the victim and ultimately the item does not discriminate between the two views. However, this statement is one of the most common rape myths held in society and subsequently a good indicator by itself as to whether an individual holds negative beliefs and attitudes. Therefore, will remain within the scale. Full data for discriminative analysis can be found in appendix H.

The final analysis conducted within the scale reliability is internal consistency reliability analysis. Split half reliability scores alongside overall Cronbach alphas scores were generated for the Pre-Jury Screening Tool (P-JST). The P-JST Cronbach alpha for the scale as a whole was ( $\alpha = .929$ ), and for each subscale: Perceptions surrounding consent ( $\alpha = .766$ ), influences on consent ( $\alpha = .729$ ), validity and need for biological evidence ( $\alpha = .589$ ) and beliefs about rape myths ( $\alpha = .913$ ). According to Salkind (2015) any Cronbach alpha above .70 shows a good split half reliability, with those nearing 1 showing excellent reliability and that the items in the scale are highly correlated. Salkind also states that the Cronbach alpha is sensitive to the number of items in the split half test. For example, they suggest that a larger number of items may result in a larger alpha and subsequently a smaller number of items will result in a small alpha. Although, subscale 3 was removed from the finalised scale due to non-significant reliability, the low Cronbach alpha showing poor reliability may be due to only 3 items being measured.

The validity analysis conducted on the Pre-Jury Screening Tool aims to compare the validity of this scale to an already established and valid scale such as the Illinois Rape Myth Acceptance Scale (McMahon and Farmer, 2011). A positive correlation found between the two scales shows that the scales are measuring the same i.e., attitudes and beliefs and therefore the P-JST scale has good construct validity. In this case, the scale does have a good construct validity with a correlation value of .071. If the value was

negative, then the scales are measuring something different and could even be opposing scales. The validity analysis also looks for significance and if the number of participants involved are enough to give the scale significance. This scale is not significant with a value of .098 but still shows that there is evidence for good construct validity but may not enough participants to be sure.

Of the 42 items on the proposed scale, only 5 items were found to either not significantly correlated with the other items or did not significantly discriminate between those who strongly believe in myths and those who do not strongly believe in myths. However, two statements regarding verbal consent and rapes only occurring by strangers were kept as they are important statements to gain public views on. Therefore, for future use this scale after analysis will be a 39-item scale with the whole of subscale 3 removed due to it not measuring the same attitudes as the rest of the scale.

#### 4.6.4. Demographics

While the item analysis is good for determining scale reliability and validity, there are some key data points that were found during the data analysis. This study and other studies that have generated literature surrounding 'rape myth acceptance scales' have demonstrated that a number of demographics hold false and prejudicial beliefs about rape, consent, and blame. In a comprehensive review of the literature Suarez and Gadalla (2010) and Dinos et al (2015) found that men are more likely to endorse such rape myths compared to women. The scores from the Pre-Jury Screening Tool for men and women, corroborates the statements of these two studies. In this study, the average score for women was 170 (out of 210), compared to the 156 scored by men, suggesting men believe certain myths and misconceptions more than women. A study by Hockett et al (2016) investigated the education levels of the participants and whether that has

an impact on the belief in rape myths. They found the less educated participants are also more likely to believe in myths and misconceptions. This study looked at levels of expertise in the area of sexual offences rather than education, and it determined that the more expertise an individual possesses the less likely they are to believe in these myths. The average score of someone who has no expertise was calculated to be 166 compared to the score of 180 for someone who possesses over 21 years of expertise. Other demographic characteristics suggest that those who agree or are more accepting of myths tend to be older, other studies have also found this (e.g., McGee et al, 2011; Anderson et al, 1997).

#### 4.6.5. Consent

In 1999 Hickman and Muehlenhard defined consent as “free given verbal or nonverbal communication of a feeling of willingness to engage in sexual activity”. The statements surrounding verbal and nonverbal cues for consent fall below the average percentage of agreement for the majority of other statements made in Table 4.2 surrounding consent. This shows the disparity in the views regarding how consent is given or retracted. Firstly, taking verbal, it has long been agreed that “no means no” and “yes means yes” when it comes to consent (Dougherty, 2015). However, this has begun to change as seen by less than 50% of the individuals in this study agreeing or strongly agreeing that a verbal “yes” is needed every time intercourse occurs.

A number of studies have demonstrated that out of the two methods to signal consent, verbal and nonverbal the preferred approach is nonverbal cues: i.e., kissing, getting physically closer intimately touching. Additionally, the responding answer to those nonverbal cues by the other party is to not respond or resist their partners advances (Hall, 1998; Humphries, 2007; Humphries and Brousseau 2010). However, this leads

onto the concept of ‘token resistance.’ ‘Token resistance’ is the concept of resisting or refusing sexual activity while intending to engage in that activity and is a form of sexual miscommunication that may lead to a man’s misunderstanding of consent (Muehlenhard and Rodgers, 1998; Shafer, 2018). Muehlenhard and Rodgers suggest that there is a traditional sexual script that implies that women “are not supposed to directly indicate their sexual interest” and therefore, men are supposed to “take the initiative even when a woman indicates verbally that she is unwilling to have sex, as the presumption that the initial resistance is only a token.” Garcia (1998) conducted research into the perceptions surrounding ‘token resistance’ and similarly found that men are socialised that women who show resistance towards sexual activity are “playing hard to get”.

**TABLE 4.7: PERCENTAGE LEVEL OF AGREEMENT TO STATEMENTS SURROUNDING CONSENT.**

<b>Subscale 1: Perceptions surrounding consent</b>	<b>Ratio</b>	<b>Percentage</b>
Consent should be obtained before any sexual activity.	More than 9 in 10 people either agreed or strongly agreed.	94%
A lack of acknowledged consent before intercourse is fundamentally what makes this an act of rape.	3 in 4 people either agreed or strongly agreed	76%
Any person can be raped.	More than 9 in 10 people either agreed or strongly agreed.	95%
Only males can rape another person.	1 in 20 people either agreed or strongly agreed.	5%
Consent can be withdrawn during intercourse.	More than 9 in 10 people either agreed or strongly agreed.	92%
It is rape if consent is given to vaginal intercourse, but anal intercourse occurs.	3 in 4 people either agreed or strongly agreed	78%
‘Stealthing’ (the non-consensual removal of a condom part way through intercourse) is rape.	3 in 4 people either agreed or strongly agreed	77%
‘Upskirting’ (the taking of a photograph under the clothes of another) is a sexual offence.	More than 9 in 10 people either agreed or strongly agreed.	94%
A verbal ‘yes’ is needed every time intercourse happens and needs to be clearly acknowledged by both	More than 4 in 10 people either agreed or strongly agreed.	45%
Physical cues alone are not enough to give consent to sexual.	Just under half of people either agreed or strongly agreed.	47%
A verbal ‘no’ is needed for intercourse to stop.	1 in 4 people either agreed or strongly agreed.	25%
<b>Subscale 2: Influences on consent</b>		
Intoxication has an influence on whether consent is given or not.	4 in 5 people either agreed or strongly agreed.	83%

Being deceived as to the nature of the sexual act about to take place would negate consent given to it.	4 in 5 people either agreed or strongly agreed.	84%
Taking part in intercourse or a sexual act does not remove the need for consent.	4 in 5 people either agreed or strongly agreed.	81%
Being coerced into sex is not giving consent.	More than 9 in 10 people either agreed or strongly agreed.	92%
Consent is needed every time intercourse happens in marriages or relationships regardless of whether or not they have had intercourse before.	4 in 5 people either agreed or strongly agreed.	82%

As seen above in Table 4.7, 4 out of 5 people either agreed or strongly agreed that ‘Consent is needed every time intercourse happens in marriages or relationships regardless of whether or not they have had intercourse before’. According to the End Violence Against Women survey they found that almost three quarters of participants they asked thought that in most cases it is rape if non-consensual sex occurs within a long-term relationship, therefore supporting the 82% who believe a similar view. In 1997 Johnson, Kuck and Schander conducted research and found that a man could assume that a woman wanted to have sex if she had previously engaged in consensual intercourse. They also highlighted in their research that 8% of men believed that a woman who had consensual sex could not claim that she was raped if the same man later had non-consensual sex with her. This research from over two decades ago is still prevalent in society today as seen in the following sections, however, the act of having consensual intercourse and having non-consensual intercourse poses issues that have been discussed in the stain age prediction chapter (Chapter Five)

#### 4.6.6. Physical evidence

The other key points that were found during the data analysis is that of subscale 3 – Validity and need for biological evidence. As stated previously, this subscale was removed from the finalised P-JST scale due to the split half analysis. As seen in Table 4.4, subscale 3 has a mean score of 3.09, this is almost a whole point lower than the previous three subscales. Based on the scale of 1 to 5 and the corresponding headings, this value

falls on the agree nor disagree response. Although the subscale was not intended to be compared to the rest of the scale, this response indicates confusion among participants. The low mean values of the subscale items individually indicates that participants are unsure whether the presence of biological evidence would impact their verdict on a non-consensual intercourse case. For example, the presence of biological evidence might overpower the debate of whether consent was given or not. The presence of biological evidence may cause jurors to acknowledge intercourse took place and base their opinion on that rather than whether that intercourse was consensual or not. Dinos et al, (2015) highlights that the absence of physical or objective evidence forces the jurors to assess which story they believe, the defendants or the victims and subsequently are open to influences from stereotypes and attitudes.

The majority of participants for the statements “a lack of biological evidence will make proving an act of non-consensual sexual intercourse more difficult” and “having biological evidence present makes proving an act of non-consensual sexual intercourse easier” indicated that they agreed with these statements. According to the majority a lack of biological evidence would make their decision harder as they would be unsure if intercourse occurred, and therefore would base their verdict on other evidence and a ‘he said, she said’ basis. Whereas, if biological evidence were present, the majority indicated that they would know that intercourse has taken place and therefore determining consent would come down to the testimonies.

**TABLE 4.8: THE NUMBER OF PEOPLE WHO AGREED WITH THE STATEMENTS PERTAINING TO THE VALIDITY AND NEED FOR BIOLOGICAL EVIDENCE.**

<b>Subscale 3: Validity and need for biological evidence</b>	<b>Ratio</b>	<b>Percentage</b>
The presence of biological evidence in cases of alleged rape is of greater value than determining if there was a lack of consent.	Just under 1 in 4 people either agreed or strongly agreed	23%
A lack of biological evidence will make proving an act of non-consensual sexual intercourse more difficult.	More than 7 in 10 people either agreed or strongly agreed	71%
Having biological evidence present makes proving an act of non-consensual sexual intercourse easier.	Just under 2 in 3 people either agreed or strongly agreed	64%

According to Peterson et al, (2010) physical biological evidence is collected in 53% of rape cases. Of those, only 42.2% are submitted and then the majority (65.4%) of submitted evidence are examined, with the early evidence sexual assault kits making up the majority of biological evidence submitted. This study showed that 54.5% of cases result in a conviction when there has been physical biological evidence examined compared to only 5.5% when there is no examined evidence. This implies that forensic evidence present seems to be a predictor for conviction. Briody (2002) and Gabriel et al, (2010) also found this to be the case in rape cases.

#### 4.6.7. Rape myth acceptance

Subscale 4 in the Pre-Jury Screening Tool focused on rape myths and levels of acceptance of these myths and misconceptions. As Table 4.9 below shows, there were two participants that fell into the category of extremely likely to believe in rape myths and misconceptions. The participants in the extremely likely category of believing rape myths and stereotypes found that the individuals reside in The Netherlands and Italy. Research has found that there have been variations of the prevalence of rape myths between countries due to societal or cultural backgrounds (Ward, 1995). For example, in Europe there are only 8 countries out of 31 that follow a consent-based rape law, with all other countries following a law, that it is rape only if there have been physical violence, threats or coercion. The Netherlands and Italy do not follow the consent-based law, and this can be seen by their answers to those statements in the Pre-Jury Screening Tool that revolve around consent or where violence has taken place. One of the first statements on the scale states, “A lack of acknowledged consent before intercourse is fundamentally what makes this an act of rape” and both individuals from stated that they strongly disagree with this statement. However, a few statements into the scale is



the statement “Being coerced into sex is not giving consent” where both individuals strongly agree with this statement. This shows that factors such as political, historical, religious, or economic shape an individual’s views and attitudes towards rape and accepting of rape myths (Pederson and Stromwall, 2013).

**TABLE 4.9: BELIEF CATEGORIES FOR PARTICIPANTS BASED ON THEIR OVERALL SCORES FROM THE PRE-JURY SCREENING TOOL.**

210 points = 5 (strongly agree) every question		Number of participants	Average score
42 = 1 (strongly disagree) every question	0%-25% = Extremely likely to believe in myths and misconceptions - 42 points up to 84.	2	77
	25%-50% = Somewhat likely to believe in myths and misconceptions - 84 points up to 126	10	108
Highest points total = 204	50%-75% = Somewhat unlikely to believe in myths and misconceptions - 126 points up to 168	84	156
Lowest points total = 73	75%-100% = Extremely unlikely to believe in myths and misconceptions - 168 points up to 210	217	182

According to Bohner et al, (2009) individuals who have a high rape myth acceptance may inadvertently create a story that fits their cognitive schema i.e., because of their attitudes and beliefs will focus on a particular piece of information and base their views on it. For example, Bohner et al, 2009 highlight the potential that the victim was raped by someone that they knew. Their study suggests that an individual of high rape myth acceptance may create a story that “consent was involved because the victim knew the defendant,” ultimately disregarding all other evidence.

**TABLE 4.10: THE NUMBER OF PEOPLE WHO AGREED WITH THE STATEMENTS PERTAINING TO RAPE MYTHS.**

<b>Subscale 4: Rape myths</b>	<b>Ratio</b>	<b>Percentage</b>
Rapes are committed by strangers.	1 in 10 people either agreed or strongly agreed	10%
If a woman goes home with someone she does not know, she cannot assume the man would not expect sexual intercourse to take place.	1 in 5 people either agreed or strongly agreed	20%
Women are most likely to be raped at night so they should not go out alone.	Under 1 in 5 people either agreed or strongly agreed	17%
You cannot be raped by someone you are in a romantic relationship with.	1 in 25 people either agreed or strongly agreed	4%
People who say they have been raped are often lying.	1 in 50 people either agreed or strongly agreed	2%
Those that say they were raped, have often agreed to sexual intercourse, and then regret it.	Just under 1 in 20 people either agreed or strongly agreed	4%
Women who are caught having an affair outside of a relationship sometimes claim that it was rape.	Just under 1 in 5 people either agreed or strongly agreed	19%
Rape allegations are often used to get back at someone.	Under 1 in 5 people either agreed or strongly agreed	16%
Rapists always use weapons and cause injury.	1 in 25 people either agreed or strongly agreed	4%
If the alleged rapist did not use a weapon, it cannot be called an act of rape.	1 in 100 people either agreed or strongly agreed	1%
It cannot be called an act of rape if the woman does not have any bruising afterwards.	1 in 100 people either agreed or strongly agreed	1%
If bruises are present, then this may be due to rougher consensual intercourse rather than rape.	Almost 1 in 3 people agreed or strongly agreed	32%
If someone says that they were raped, they should have prevented it by fighting back.	1 in 25 people either agreed or strongly agreed	4%
If someone does not physically fight back, it cannot be classed as rape.	1 in 100 people either agreed or strongly agreed	1%
If someone does not say 'no' it cannot be considered as rape.	1 in 33 people either agreed or strongly agreed	3%
Only certain people are raped.	1 in 33 people either agreed or strongly agreed	3%
If a woman acts provocatively, eventually she will receive sexual attention.	Just over 1 in 3 people agreed or strongly agreed	34%
Women that lead men on to unwanted sexual attention cannot be surprised if it were to lead to intercourse.	Under 1 in 10 people either agreed or strongly agreed	7%
Younger women are more likely to put themselves into situations where they are likely to be raped.	1 in 5 people either agreed or strongly agreed.	20%
People who are victims of a sexual assault have done something to deserve it.	1 in 100 people either agreed or strongly agreed	1%
If a person wears provocative clothing, they are asking for unwanted sexual attention.	Under 1 in 10 people either agreed or strongly agreed	8%
If a person is raped whilst drunk, they are somewhat responsible for letting things get out of hand.	Just over 1 in 20 people either agreed or strongly agreed.	6%
If a woman goes into a room alone with a man, it is her own fault if she is raped.	1 in 50 people either agreed or strongly agreed	2%

The following sections correspond to several types of rape myths, and those being myths can be broadly divided into four categories relating to the victims, the perpetrators, myths surrounding victim blaming and myths that cast doubt over the allegations being made (Leverick, 2020). Each section has a figure associated which depicts the level of endorsement each myth has from the 342 participants who conducted this measure.

## A) Myths relating to the victims.

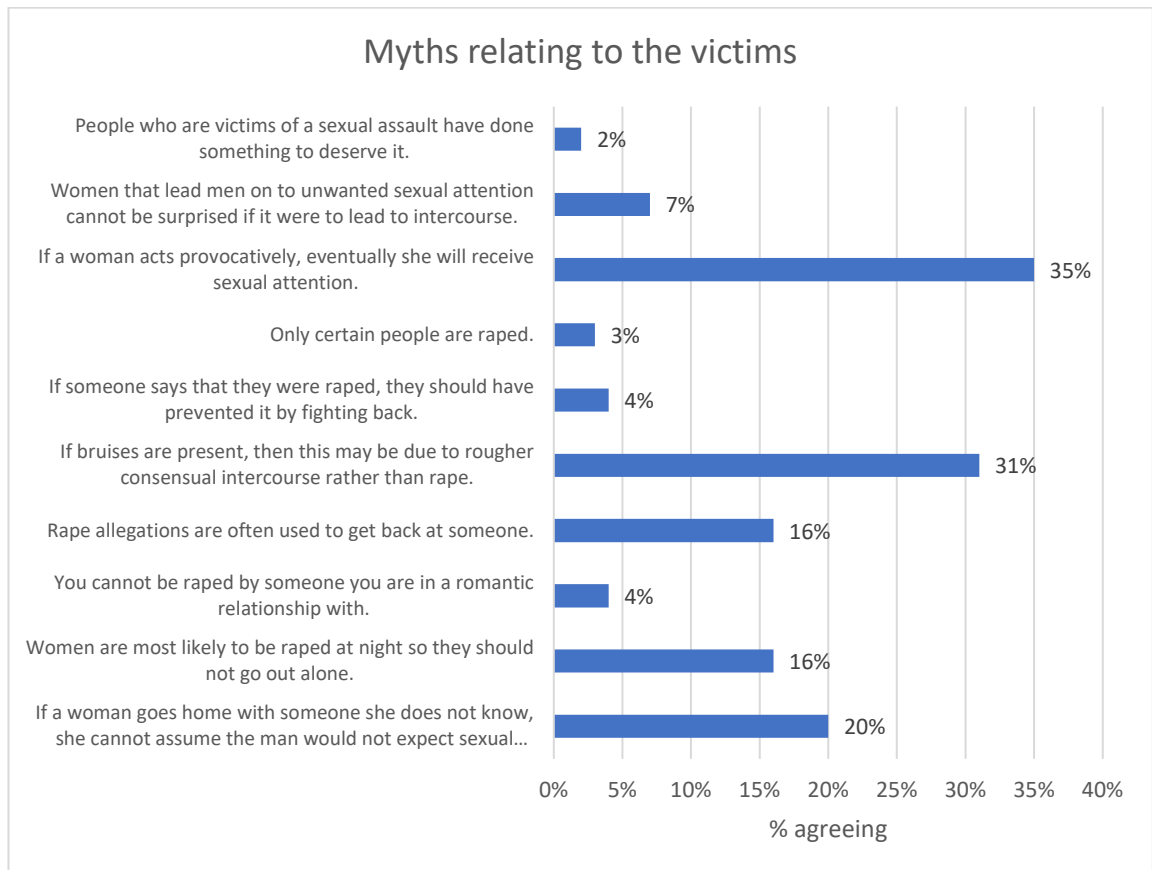


FIGURE 4.6: PERCENTAGE AGREEING WITH RAPE MYTHS THAT ARE RELATING TO THE VICTIM.

Figure 4.6 above shows that 31% of participants in this study highly endorse the statement that the presence of bruises or injury may be by rougher intercourse than rape. It is a commonly held belief in the scientific and legal communities that the presence of physical injury indicates a lack of consent and therefore a sexual assault has occurred (Song and Fernandes, 2017). The interpretation of injuries that are sustained during intercourse have great forensic significance as to the outcome of sexual assault cases. Physical injury in sexual offence cases refer to either extragenital (injuries sustained in any region of the body excluding the genital region) or genito-anal injury (Alempijevic et al, 2007). According to Mclean et al, (2011) extragenital injuries are the most common injuries found on victims, with 72% of victims in their study sustaining an extragenital injury compared to just 23% sustaining a genito-anal injury. It is important

to note that in this study, bruises are the term used to show the presence of injuries. There are studies such as Alempijevic et al, (2007) that used a more detailed system to categorise injuries and the greater the injury on the system the less likely the defence of rougher intercourse can be used. In the Alempijevic et al, study of sexual assault court cases 44% of their victims had sustained mild injuries (redness) and 18% had moderate injuries (bruising, lacerations, and abrasions). They also found 1% of cases the victim had sustained a severe injury (fractures or internal organ injuries), while 37% had no injuries present. However, a number of studies showed that bruises found on the extremities such as arms and legs, but also around the neck were the most common injuries that were reported (Sugar et al, 2004; Palmer et al, 2004 and McGregor, Du Mont and Myhr, 2002).

It is not just extragenital injuries that can be found in cases of sexual assault, it is highly likely that examination for genito-anal injuries was also conducted (Song and Fernandes, 2017). A study by Slaughter et al, (1997) showed that of 178 individuals who showed extragenital injuries, 74% of them also showed genito-anal injuries. A later study by Palmer et al, (2004) stated that “genito-anal injury being present and extragenital injuries being absent was a rare occurrence” (4 out of 153 women). Ultimately, intercourse that results in harm towards another cannot be deemed as to have the consent of both parties (R v Jobidon, 1991).

On the other end of the spectrum, a statement pertaining to a rape myth relating to the victim that is not as highly endorsed is that ‘you cannot be raped by a person you are in a romantic relationship with,’ with only 4% of participants agreeing. The rape myth stems from the idea put forward that those that are married especially, consent to everything when they enter the contract of a marriage (Hale, 1736). However, as stated

in Chapter One it was not until 1991 where the law was changed that those who are married, should they be subjected to non-consensual intercourse, it would be deemed as rape. The study by Myhill and Allen (2002) showed that it was much more likely that sexual assault or rape would occur with those they are in a romantic relationship with. They found that 45% of sexual assaults/rapes are perpetrated by current partners, 16% by acquaintances, 10% by other intimates and only 8% of rapes are by strangers. These findings just support the reason as to why this rape myth is not as endorsed as others found in Figure 4.6.

### B) Myths relating to the perpetrators.

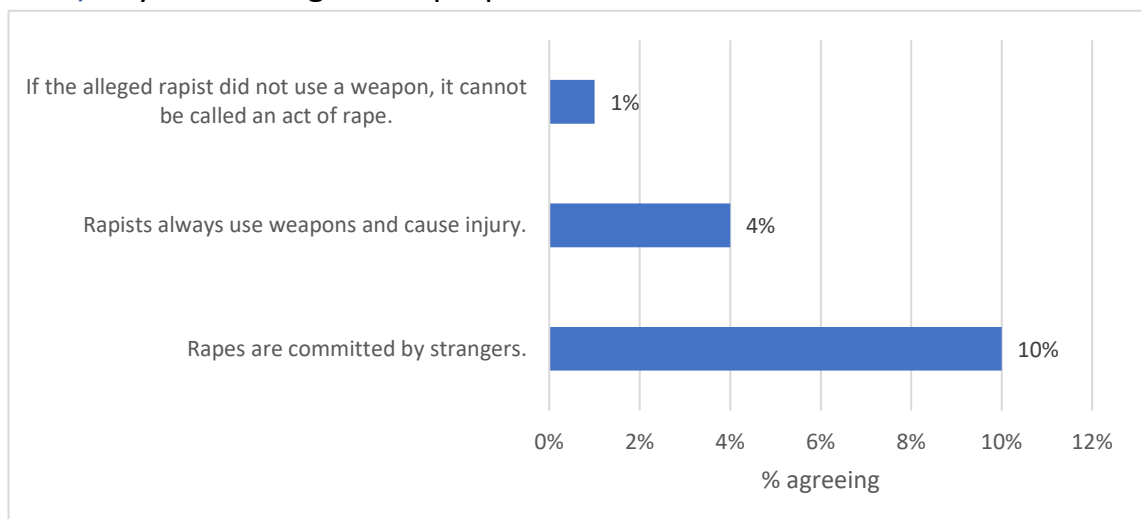


FIGURE 4.7: PERCENTAGE AGREEING WITH RAPE MYTHS THAT ARE RELATING TO THE PERPETRATOR.

Figure 4.7 shows that only three rape myth statements from the Pre-Jury Screening Tool pertain to the perpetrators, two relating to weapons and the final one stating that strangers commit rapes. The figure clearly highlights that the myth that strangers commit rapes was much more highly endorsed than those regarding weapons. According to Friis-Rodel, Leth and Astrup (2021) in only 2.4% of rapes, specifically stranger rapes a weapon is used. This is an incredibly low percentage and therefore the reason as to why these myths are hardly endorsed compared to other rape myths. The

statement that ‘rapes are committed by strangers’ is one of the most common rape myths with vast amounts of literature stating this is not the case (Dripps,1992; Myhill and Allen, 2002; McGregor, 2005). The fact that only 10% of participants agree with this is encouraging as 90% do not believe in this rape myth.

### C) Victim blaming myths.

There have been numerous reviews of the literature surrounding juror decision making and a key aspect that they all find is victim blaming. Victim blaming is using other factors to influence their decision, whether that be what the victim was wearing or the character of the victim themselves (Lees, 1996; Finch and Munro, 2007; Schuller and Stewart, 2000; Abbey *et al*, 1987; Whatley, 2005; Rumney and Fenton, 2008; Yescavage, 1999). A study by Whatley (1996) found that victims who wore more revealing clothes were deemed less respectable and were significantly more likely to be held responsible for being attacked.

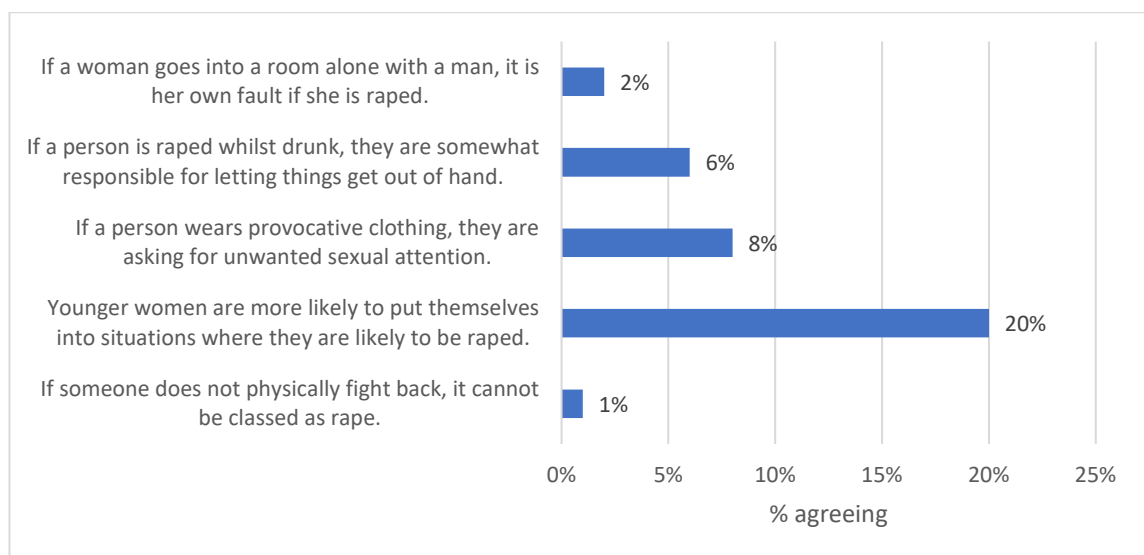


FIGURE 4.8: PERCENTAGE AGREEING WITH RAPE MYTHS THAT BLAME THE VICTIM.

Beliefs that blame the victim pertain to such beliefs that those who get voluntarily intoxicated are at least partly responsible for their rape (Leverick, 2020). Figure 4.8 showed that there are some myths that are highly endorsed, and others that are not.

20% of the participants in this study agree with the rape myth that ‘younger women are more likely to put themselves into situations where they are likely to be raped’. According to the Crime Survey for England and Wales (2020), sexual assaults commonly occur among younger women, with about 1 in 10 people aged between 16-24 having been a victim in the past year. However, the rape myth clearly focuses on the idea that these younger women are putting themselves in situations where they are more likely to be raped. A study conducted by the Office for National Statistics (2020) highlighted that the highest portion of rapes occurring against women, happened in their own home at 38%. This contradicts the endorsement of those 20% in this study as you would assume that the victims would feel safe in their own home and therefore, not putting themselves in a situation to be sexually assaulted. The ONS study also shows the 26% of women were raped in the offender’s home, agreeing with the highly endorsed statement that they would be putting themselves into a dangerous situation. The study also lists other locations where sexual assaults and rapes occurred and similar to being in their own home, would not be seen as putting themselves in a dangerous situation; 5% in a park, 4% in a pub/bar, 3% at school/university and 3% on the street.

Contrastingly, a rape myth that is clearly not as highly endorsed, is that of ‘if someone does not fight back, it cannot be classed as rape.’ There are articles that believe that this is one of the biggest rape myths currently in society and that not fighting back is an indication of consent (Selby, 2020; RAINN, 2021; Rape Crisis, 2021). This myth is one that is highly contested due to the behavioural concept of a “fight or flight” response. According to the Rape Crisis organisation there are five automatic reactions to fear: freeze, flop, friend, fight, and flight. Only two of these reactions are seen as fighting back, fight as the name suggests is physically pushing, struggling, and verbally saying ‘no’

to the perpetrator and friend where the victim shouts for a bystander to help. Whereas there are three reactions that are not deemed as fighting back, and as the figure suggests 1% of participants would see the following responses and would not class it as rape. Firstly, the flight response involves trying to run away is possible. The next two responses are freeze (going tense, still, and silent) and flop (becoming loose and floppy), these are common reactions of rape and sexual violence to either reduce physical pain or hope that doing so they would avoid further harm. However, both is not giving of consent. Selby (2020) in her article suggest that people are incredibly bad at predicting the reactions of those who face certain situations, with some choosing to fight and others flight. Therefore, this has made attitudes to rape and sexual assault so complex, and a particularly good reason as to the need for a Pre-Jury Screening Tool.

#### D) Doubt of allegations being made.

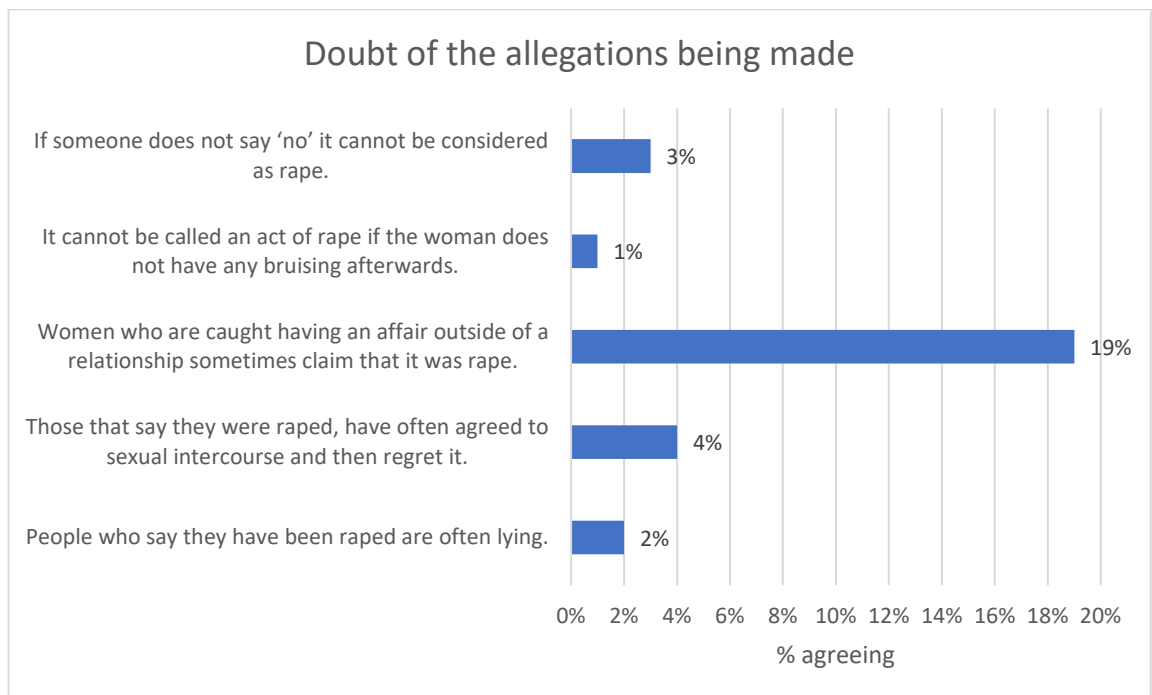


FIGURE 4.9: PERCENTAGE AGREEING WITH RAPE MYTHS THAT CAST DOUBT OVER THE ALLEGATIONS BEING MADE.

Beliefs that cast doubt over the allegations that are being made pertain to such beliefs like a 'real' sexual assault victim would always report their attack immediately (BBC, 2018). Feist et al, (2007) conducted some research for the Home Office and found that



46% of recorded rapes were reported on the day that they took place, and 14% of victims took over six months after the attack. Contrastingly, in the United States studies have estimated that two out of three sexual assaults and rapes are never reported (RAINN, 2018).

Figure 4.9 shows several statements that vary in the level of endorsement by participants of this study. The figure shows that one statement was more highly endorsed compared to the other statements, with that statement being ‘Women who are caught having an affair outside of a relationship sometimes claim that it was rape.’ It showed that 19% of participants believe that women who get caught having an affair would rather lie and potentially destroy an individual’s life and reputation than come forward and tell the truth to their partner. Although type of scenario is a rare occurrence, it does still happen with a few cases in the last two decades. This level of endorsement poses some serious problems regarding the most likely rapes and sexual assaults to occur. As been stated a number of times during this chapter and the thesis as a whole, victims of rape are more often attacked by people known to them than strangers. So therefore, having a highly endorsed rape myth of people lying about consensual sex with people they know poses issues around myths and stereotypes entering court rooms.

In contrast to a highly endorsed rape myth as seen in Figure 4.9 one of the less endorsed myths pertains to people who have been raped are often lying. According to Amnesty International (2005), there is no evidence to suggest that false reports of rape are common, with around 4% of all reported rape cases being deemed as false. The Amnesty International Organisation suggests that the likelihood of a rape accusation being false is firstly due to the severity of the act but also the courage needed to explain that

something so personal has happened to you. This second point is further compounded by the fact that a large number of people have a fear that they would not be believed both by the police at the time of reporting but also by the jury in court.

#### 4.7. Limitations

Within the discussion section there are a couple of limitations that were highlighted, for example the removal of a complete subscale, subscale 3: Validity and need for biological evidence. Although this subscale was removed due to the analysis showing that the statements were indeed not measuring the same as the rest of the scale, the Cronbach Alpha was below the threshold as well at .589. According to Salkind (2015) the Cronbach alpha is sensitive to the number of items in the split half test. For example, they suggest that a larger number of items may result in a larger alpha and subsequently a smaller number of items would result in a small alpha. Although, subscale 3 was removed from the finalised scale due to non-significant reliability, the low Cronbach alpha showing poor reliability may be due to only 3 items being measured. As this is deemed as a limitation, the work that could be conducted in the future is to increase the number of statements that surround the biological evidence aspect. Also, as the reliability analysis highlighted the statements showed a non-significant correlation in relation to the other statements in the measurement, so therefore, it may be beneficial to have a separate measure on the need and validity of biological evidence, in relation to sexual offence cases.

The scale validity analysis conducted gave a score of .098, meaning the measure is not significant. However, there is evidence to suggest that the number of participants who participated influences the value. The Pre-Jury Screening Tool only had 342 participants, whereas previous scales such as the Payne, Lonsway and Fitzgerald (1998) and the McMahon and Farmer (2011) scales had a lot more responses, therefore making their measure significant compared to this. If possible, it would be highly beneficial to have many more participants undertake the measure. Additional limitation is that the scale

in this study is essentially a pen and paper exercise for a single individual to conduct, and therefore would have their own individual views. Some research suggests that the jury deliberation process to come to a verdict may “function as a counterbalance to negative assessments towards specific aspects of the trial such as witness credibility” (Dahl et al, 2007), which this study does not possess. However, there is the counter argument put forward by others that rape myth has an influence and presence throughout the entire process from cross-examination to deliberation (Finch and Munro 2005).

#### 4.8. Impact

There has been research that shows that individuals when posed with a judgement of credibility of an accusation of rape, would more likely base their decision on personal beliefs and attitudes than what a witness says. A study by Taylor and Joudo (2005) found that 210 members of the public who participated in mock trials when shown the exact same testimony, juror opinions varied. The jurors were mostly influenced by demographics, beliefs, and attitudes of how a ‘real rape’ victim would behave. This Pre-Jury Screening Tool includes statements that are deemed as part of a ‘real rape’ scenario, which being “an attack by a complete stranger on an unsuspecting victim, in an outdoor location where threats of violence are used by the perpetrator which subsequently leads to physical resistance by the victim” (Ryan, 1988; Krahe, 1992). In actuality, the concept of the ‘real rape’ scenario rarely occurs with only 8% of rapes conducted by strangers. This measure is therefore valuable as a way of determining whether an individual firstly possesses these negative beliefs and attitudes but also whether have a misconception of what form of sexual assaults can occur.

In some countries according to Dinos et al, (2015) there are initiatives that have been put in place to essentially educate individuals in court as to the impact of rape, how victims may deal with the attack and general victim behaviour, to prevent prejudices entering the courtroom. A study conducted by Ellison and Munro (2009) gave educational guidance to jurors on victim's demeanour, time taken to report and the lack of evidence regarding physical violence and found that those that receive education were more likely to accept differences in victim responses. The Pre-Jury Screening Tool could provide a way of determining specific individuals that require education based on their score from the measure. Although predominantly this tool was developed as a jury tool, data highlighted in the survey found in Chapter Three showed that participants believe that rape myths are present in police forces, therefore may be used as a tool in the criminal justice system from beginning to end. Ultimately, the PJST would be an important method of aiming to challenge beliefs and attitudes an individual holds surrounding consent and sexual offences.

#### 4.9. Conclusion

The purpose of this research was to develop and validate a tool to be used for measuring attitudes and beliefs towards rape myths and misconceptions surrounding consent for those that are about to sit on a jury. As there are several scales that either focus of attitudes towards rape myths or attitudes towards consent, a combination of them both in a single scale would be highly beneficial. The P-JST was originally a 42-statement, Likert scale measuring (a) perceptions surrounding consent, (b) influences on consent, (c) the validity and need for biological evidence and (d) beliefs about rape myths. However, after reliability and discriminative analysis removing statements that did not measure the same, the scale was changed to a 39-item measure. The results of this study

highlight that the P-JST is a valid and reliable scale used to measure attitudes and beliefs. Table 4.3 showed that there are individuals that are highly or extremely likely to believe in rape myths and misconceptions surrounding consent. Therefore, determining these attitudes would be highly beneficial in reducing the inclusion of stereotypes in the decision making of a jury.

Ultimately, the rationale for this thesis is to address issues with consent, as seen in Chapter Three one such issue was that victims fear that they would not be believed both as to the nature of the act itself but also that they did not consent. This data is a proof of concept that there are individuals who may be called up for jury service that are likely or extremely likely to endorse rape myths, but also this tool could be used to challenge views such as rape myths, victim blaming and misconceptions surrounding consent both at a court level but also a policing level.

## Chapter Five: Semen Stain Age Prediction using RNA degradation.

### 5.1. Introduction

In forensic cases where intercourse has taken place, body fluids are usually left behind. Body fluid identification (BFID) of the type and origin can provide valuable information regarding what occurred and who, however BFID struggles to determine time since deposition (TSD) of biological stains. Determining the age of a stain, would be able to provide police with valuable information regarding criminal cases and for this chapter, sexual offence cases specifically. Although the research of stain age prediction cannot determine whether consent was given or not, it can corroborate accounts. For example, the ability to predict the age of a seminal fluid stain would aid in the corroboration of an individual's account. An example of this would be if a couple stated that they had consensual intercourse 4 days ago, split 3 days ago, and then there was a report of non-consensual intercourse 2 days ago. The aim of the chapter would be to use the RNA degradation profile of the semen specific markers to see whether it fits the timescale and corroborates events. An article in Nature by Ferreria et al, 2018 found that some RNA genes remain active after death due to their being a reaction by the cells to the death of the individual and the cessation of the blood flow, and therefore a unique pattern of gene expression after death could be used in criminal investigations. The unique pattern of gene expression in the deposition of biological samples is different as the sample is not dead, therefore the gene expression may remain normal until either the change in environment (hypoxia) impacts expression or function of RNA cannot continue because its individual components have degraded.

Using this information, this research looks into whether fluids which exit the body exhibit similar patterns and as stated previously if the degradation profile can be used to determine the time since deposition.

Marital rape is the term used to describe the sexual acts that are committed without the individuals consent and/or against their will by the husband. Acquaintance rape is identical to marital rape except it is non-consensual acts to a partner not in marriage (RAINN, 2019). In the United Kingdom, the issue of marital consent first became a topic in law in 1736 due to a quote by barrister Sir Matthew Hale regarding marital rape. Hale stated, “the husband cannot be guilty of rape committed by himself upon his lawful wife, for by their mutual matrimonial consent and contract the wife hath given herself up in this kind unto her husband which she cannot retract” (Hale, 1736). Hale’s justification for such a comment was that upon marriage, the wife gives up her body and therefore gives her irrevocable consent to intercourse.

It was not until 1991, and the decision in the case of R v R which expressed, “the law should declare that a rapist remains a rapist subject to the criminal law regardless of their relationship to the victim” (R v R, 1991), that the quote by Hale was now not deemed as the law and husbands were not exempt from prosecution of marital rape. Even after this stance, there were two cases in the same year that conflicted on marital rape. R v C (1991) reiterated the statement that there is no marital exemption to the law of rape. However, the case of R v J (1991) argued based on the statutory definition of rape in the 1956 and 1975 amended sexual offences acts that included the word ‘unlawful’. The use of ‘unlawful’ was taken in the context of being outside marriage and because of this confusion, Hale’s quote was deemed not good law and the word



'unlawful' was removed from the definition of rape under the Criminal Justice and Public Order Act 1994 (CJPOA).

According to the Crime Survey in England and Wales in 2018, the majority of sexual offences that occur are committed by people already known to the victims, roughly around 90%, with 46% of these being committed by partners or ex partners. However, the Home Office has this value at just 33% of sexual offences (Office for National Statistics, 2019). Currently, there is no reliable method and relatively little research on how to predict the age of a stain but like body fluid identification the impact could be huge, especially in those cases where consent is an issue. In these cases of partner or ex-partner offences, the defence of the perpetrator is that their DNA would be present because they are in a relationship or were in a prior relationship. Knowledge about the age of a stain would be invaluable in these types of cases. Accurate TSD and age of a stain would corroborate testimonies or alibis and would be able to provide a time point of a crime (Salzmann et al, 2021).

Currently, there are a number of techniques that have been used to estimate the age of blood stains such as spectroscopy and chromatography, however they base estimates on colour change (Bremmer et al, 2012). However, samples such as semen, saliva and vaginal secretion cannot be determined using these techniques. At the moment, the technique of semen persistency is used to suggest when intercourse occurred, however this can only be applied to those cases where an intimate vaginal swab can be taken. This technique is based on volume of semen found in the vagina, the more semen found, the more likely intercourse took place recently. However, for semen left in condoms or on clothing this technique cannot be applied. Therefore, recently predicting the age of a stain has moved to looking into the degradation of RNA in biological stains. This

chapter aimed to predict the age of a semen stain by using a number of RNA markers that potentially degrade at different rates and identifying enough degraded markers to estimate how old the stain is. This could then provide the police with key information of when an act occurred and whether that time matches the account given by the victim and perpetrator.

## 5.2. Semen

It is typically stated in literature that a male on average ejaculates between 1.5mL and 5mL of semen (Gunn, 2009; Li, 2008). However, in the same literature Gunn (2009) and Li (2008) differ on the number of spermatozoa found in the ejaculate. Gunn states semen contains anywhere between 40 million and 250 million spermatozoa every ejaculation, whereas Li indicates that number is between 10 million and 100 million spermatozoa present. This number though can vary with the age of the male, genetic background, diet as well as smoking and drug use. As with the majority of biological fluids, semen is extremely complicated and comprises of a number of components. Similarly, to saliva, semen is a product of exocrine glands meaning that they are released outside the body via ducts (Gunn, 2009). There are two parts to semen, seminal fluid, and spermatozoa (Eliasson, 1982). Seminal fluid is a mixture of a number of glandular secretions, seminal vesicle fluid, prostatic fluid secretions, epididymis, and bulbourethral secretions. Each of these secretions account for various amounts of the seminal fluid as a whole; like with the value of spermatozoa present in semen, the values of the various secretions change depending on the literature read. According to Piñon

(2002) seminal vesicle fluid accounts for between 46%-80%, prostate fluid between 13%-33%, the testes approximately 5% and the bulbourethral glands between 2%-5%. Li (2008) varies slightly by suggesting approximately 60% of semen is made up by seminal vesicle fluid, prostatic fluid around 30% and 5% for epididymis and bulbourethral, respectively.

The ejaculate contains a number of elements such as fructose, which serves as the energy store, citric acid, calcium, and a variety of proteins (Gunn, 2009). Fructose is a major constituent of seminal vesicle fluid and absence of this enables the assumption of an abnormality in the tissue that provides that constituent i.e., the seminal vesicles. (Piñon, 2002). The prostatic fluid which accounts for approximately 30% of the ejaculate contains extremely high concentrations of enzymes, acid phosphatase (AP) and prostate-specific antigen (PSA). The bulbourethral gland during sexual arousal produces a secretion prior to the ejaculate called pre-ejaculate. This pre-ejaculate has the role of both lubrication of the urethra for the spermatozoa to pass through and also the removal of foreign matter such as urine (Lumen, 2019). Alongside the seminal fluid, the sperm or spermatozoa are the other main consistent of semen. There are three distinct regions to a human spermatozoon: the head, the middle piece and the flagellum as seen below.

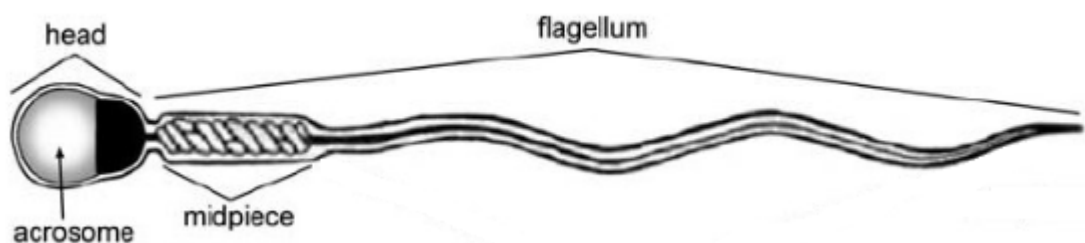


FIGURE 5.1: THE COMPONENTS OF A SPERM CELL (SUAREZ, 2010).

Each region of the spermatozoa has a different role. The head contains the nucleus, which consists of densely packed chromosomes. On the top of the spermatozoa head is an acrosomal cap, this is comprised of digestive enzymes that break down the cell wall of the egg. The midpiece or middle piece houses the mitochondria that provides the energy to the flagellum. The flagellum/tail uses the energy provided by the mitochondria for spermatozoon motility (Li, 2008).

### 5.3. RNA

RNA or ribonucleic acid has many similarities to the other nucleic acid, DNA, with a couple of key differences. RNA has the same structure as a single stranded DNA molecule and is comprised of sugar, phosphate, and nitrogenous bases (Piñon, 2002). RNA has a sugar backbone of ribose instead of the deoxyribose sugar backbone of DNA. Another similarity is that of the complimentary bases; Guanine (G), Cytosine (C) and Adenine (A) and found in both DNA and RNA. However, the fourth base varies, in DNA the last base is Thymine (T) whereas in RNA, Thymine is replaced by the base Uracil (U) (Hancock, 2001). Finally, RNA molecules are predominately found in the cytoplasm compared to DNA being found in the nucleus of cells.

RNA can be grouped into several types: messenger RNA (mRNA), micro-RNA (miRNA), ribosomal RNA (rRNA), transfer RNA (tRNA), anti-sense RNA, small interfering RNA, small nuclear RNA, and small nucleolar RNA (Venkstern, 2012). Each type of RNA has a specific function; mRNA carries the information needed to make a protein from the genes on a DNA molecule to rRNA. rRNA combined with protein components combine to form the ribosome, which in turn binds mRNA and synthesises proteins (Alberts, Johnson, and Lewis, 2002). tRNA aids in the production of bonds between amino acids to make proteins. tRNA transfers specific amino acids to rRNA and subsequently puts them in the

correct order on the mRNA strand (Gunn, 2009). miRNA molecule's function is to downregulate gene expression by with the addition of enzymes block mRNA from being translated and therefore accelerate the degradation. Anti-sense RNA serves as the template to produce mRNA. Small nuclear and small nucleolar RNA's process the precursor mRNA molecules and are responsible for sequence-specific nucleotide modification respectively (Venkstern, 2012; Gunn, 2009).

During the process of gene expression, mRNA is produced via a process called transcription and uses a technique called splicing which removed the introns and joined the exons together, creating the spliced mRNA strand that is used in protein synthesis (Guo, 2014). Introns are sequences that sit between exon sequences and are spliced by an RNA-protein complex named spliceosome as they do not directly code for proteins. Exons on the other hand are the coding sequences for amino acids and therefore are present after the process of transcription. As splicing involves the removal of sections of sequences (introns), it is imperative that other steps aid with the stability of the strand, in this case a step called capping occurs. Capping reduces degradation and increases the stability of the mRNA (Kornberg, 2007). Another step that occurs to the pre-mRNA molecule which is necessary in the production of a mature mRNA molecule is that of the cleavage step. This step is the first step in the addition of a polyadenine tail (Poly-A tail) to the pre-mRNA molecule, which like capping aids in the stability of the molecule. The addition of a poly-A tail allows the mRNA molecule to be exported form the nucleus and begin protein synthesis. (Pallister and Watson, 2011).

### 5.3.1. RNA analysis in Forensic Science

Until recently, RNA was rarely used as a source of forensic information due to RNA being much less stable than DNA, which is a reason "scientists have refrained from investing

time and money into this field” (Bauer, 2007). However, research has now seen that areas of RNA can be extremely long lived, such as the paper from Karlsson et al, (2003) which showed gene expression in RNA samples from 1975. This therefore can aid with historical cases, especially those of a sexual nature as highlighted in this chapter.

There are a number of forensic applications that can use RNA such as the identification of body fluids/tissues. When forensics is needed regarding a crime, most people tend to think of DNA and its ability to link suspects to victims, or to crime scenes. However, RNA is able to provide information that DNA cannot. As RNA provides the backbone of genes that are expressed in cells, and that expression differing between cell types, it can show which tissue and/or fluid is present. For example, if the crime being investigated is a rape case, then assessing whether there is a presence of body fluids such as vaginal fluid on male samples would be highly beneficial. This is done by checking the gene expression of vaginal fluid specific markers mixed with a male sample, a positive expression result would provide information that a potential act has occurred. In addition to this RNA analysis can aid in the determination of the age of stains (Bauer, 2007). The first paper surrounding RNA was only published in 1984 (Oehmichen and Zilles, 1984). This article looked at post-mortem RNA synthesis of human corpses and found that both DNA and RNA were detected in tissue specimens of different intervals between 2.5 hours and 32 hours after death. Since 1984 a number of studies have been conducted and due to the susceptibility of RNA to degrade, the analysis of degradation via gene expression levels can be used to determine the time since deposition of stains. This can be seen in some of the current biological methods shown in Section 5.3.2.

### 5.3.2. Current mRNA biological methods

Age determination of biological stains span multiple disciplines ranging from chemical techniques looking into the UV-visible spectrum of haemoglobin (Hanson and Ballantyne, 2010) and levels of alkaline phosphatase (Halamkova et al, 2016) to biological techniques.

Research by Hanson and Ballantyne focused on the wavelength of haemoglobin in blood with a maximum absorption of 412nm, however as the samples degraded the absorption decreased towards the shorter wavelengths, indicating the possibility of determining the ages of stains. The limitation of this method is the issue of mixed samples of multiple body fluids, as found in many sexual offence cases and the lack of being able to analyse other fluids within a sample. Whereas biological techniques can accommodate for this.

Biological techniques using RNA span the two most common types of miRNA and mRNA. miRNA being a lot smaller fragments than mRNA means that it is more stable. Articles such as Wang, Zhao and Hou (2017) and Mayes et al (2019) look at using miRNA targets in semen and blood respectively as methods of body fluid identification, with Wang et al in a previous paper (2013) providing a number of miRNA targets for blood, semen, menstrual blood, vaginal secretions, and saliva. Glynn (2020) provides a review of research and the potential applications of miRNA profiling. This research into miRNA uses is incredibly important, however not the main scope of the research which focuses on mRNA.

The biological techniques focus on researching the mRNA degradation of body fluid markers with the last decade having a surge in research within the area. Bauer et al, (2003) and Anderson et al, (2005) were some of the early studies and their work is explained further below. A lot of the research focuses on blood and blood stain age

predictions with articles such as Alshehhi, McCallum and Haddrill in 2017 and Anderson et al, (2011). However, more recently research has begun to apply this methods to other body fluids and types for example Alshehhi and Haddrill, (2019) looking at samples from semen and saliva and Manasatienkij and Nimnual, (2021) focusing on menstrual blood. Research by Cortellini, et al, (2020) highlight a case where a young girl complained of vulvar burning and blood loss during urination, and investigation showed she may have been subjected to sexual abuse. Police arrested a man who spent time with her, and RNA analysis of his fingernail swab found vaginal mucosa (MUC4 and CYP2B7P1) genes present. Although this information could suggest that he digitally penetrated someone, the DNA present could determine who via DNA profiling. The case does not provide information on the determination of when these events may have occurred. The section below will highlight some of the prominent literature that researches the biological techniques using RNA to determine the ages of stains.

Bauer et al, (2003) developed a semi-quantitative duplex reverse transcription-polymerase chain reaction assay and investigated 106 bloodstains that were up to 15 years old. The study found that stains with an age difference of more than 5 years show statistically significant variances for the housekeeping genes used. (Beta-Actin and Cyclophilin). The study by Anderson et al, (2005) used real-time reverse transcriptase PCR to determine the ratios of mRNA and rRNA genes over time from human blood that had been dried for 150 days. Their article found that determining ratios of two different RNAs, in this case 18S and Beta-Actin can be used to determine the age of a bloodstain. Although these articles indicate it is possible to determine the age of a stain, the research by Bauer et al, (2003) and Anderson et al, (2005) use reference genes that are “expressed in all cell types at relatively high levels”. Therefore, their findings could not



be applied to mixed stains (multiple body fluids). Similarly, if those fluids were deposited at various times, this could further complicate the interpretations.

The study by Alshehhi et al, (2017), took this issue into consideration and examined the RNA degradation of blood-specific makers to determine the age of bloodstains. Their research used Reverse Transcription-Quantitative Polymerase Chain Reaction (RT-qPCR) to examine the relative expression ratio (RER) of multiple blood-specific markers. The genes used in this study were mRNA markers; HBA, PBGD and HBB, a couple of miRNA markers; miR16 and mrR451, alongside the reference genes 18S, ACTB and U6. This study by Alshehhi was one of the first research articles that used body fluid specific genes to determine the time since deposition rather than universal reference genes like Anderson and Bauer. In the Alshehhi et al, (2017) study blood samples were collected from 10 participants; 6 females and 4 males and 20  $\mu$ L of blood was deposited onto cotton swabs. The samples were stored for a number of days until a desired age was reached. Those days were the following: 0, 3, 6, 15, 30, 90, 180, 270 days. Swabs were then extracted using TRI<sup>®</sup> Reagent method (Sigma-Aldrich), quantified, before undergoing reverse transcription quantitative PCR using TaqMan<sup>®</sup>.

Their results showed that RNA markers degrade at different rates in aged stains with the small sized miRNA markers having the highest stability compared to the larger sized mRNA markers (Alshehhi et al, 2017). The mRNA markers HBA and HBB rapidly degraded in the first 6 days of the study and then degraded differently. HBA continued to degrade in a linear fashion, while HBB stayed the same before a spike in degradation at 270 days. The figure found in the Alshehhi study depicts the remaining mRNA marker PBGD degraded for 15 days and then stopped. This meant that the marker degraded lower than the limit of detection of the system. The  $\Delta$ Cq values for the miRNA markers showed

the high stability, with relatively little degradation occurring apart from a slight degradation of miR16 after 15 days. The study concluded that this method provided information that different markers degrade at different rates and therefore can be used to determine the time since deposition of bloodstains. Ultimately, taking these issues that are faced by Anderson, Bauer, and the study by Alshehhi, this chapter's study was devised.

This chapter looked into the ways of counteracting issues with mixed stains using RNA degradation of biological fluids that are commonly associated with sexual offences such as semen.

#### 5.4. Understanding the degradation profiles of semen specific mRNA makers

The studies found in the section above used several different methods for stain age prediction of bloodstains, with different markers degrading over time at different rates. The next few sections aim to explore the degradation profile of semen specific mRNA markers, with the aim of using the profile for the development of a stain age prediction model. This section therefore highlights potential causes of degradation and subsequent variations in degradation profiles, ultimately using this to determine the age of a biological stain. There is no official definition of a degradation profile for the degradation of mRNA markers, however it is fundamentally the pattern (i.e., the gene expression levels) of which a marker degrades over time. Determining the age of a stain replicates the research that is being conducted for Post-Mortem Interval (PMI) determination. When the time of death is not known, the time since death is estimated so an approximate time can be given. Over the last 20 years, analysis has used chemical,

physical, and entomological approaches to calculate time of death for example various stages of death: Algor mortis (body cooling), Livor mortis (the pooling of blood at the lowest points due to gravity) and Rigor mortis (the stiffening of limbs). Each of these have a very rough estimate attached to them as to how long since death, for example a body will begin to cool by 1.5 degrees every hour, blood begins to pool between 6-12 hours and the body will go stiff after 8 hours and will remain like so for up to 24 hours (Cockle and Bell, 2015) However, with intrinsic factors (sex, age, weight and environment conditions) affecting predictions universal formulas for predicting time since death would be ill-suited (Ali, Ibrahim and Fayed, 2017). However, recently advances in molecular biology has allowed the use of time-dependant markers such as proteins, DNA and RNA to establish PMI (Scrivano et al, 2019) and therefore instead of establishing the time of death, some research has started to look at establish when a stain was deposited for forensic cases. According to Ferreria et al, (2018) it is possible that genes remain active after death and using this information it can be determined when death occurred and ultimately, could be used to determine time since deposition. The degradation of biological fluids found regularly in sexual offence cases such as semen ideally needs to be linear for definitive age predictions. An example of this is the half-life process, where it could be assumed that after 1 day, half of the semen would have degraded, then after 2 days it would have degraded by half again and this process continues. If the data is not linear then it is possible that different days after deposition may generate the same, as the BBC (2018) states that genes remain active after death. If this is the case, then multiple markers will need analysing together and those points compared rather than using a single marker. However, research conducted by Bauer

(2007) and Alshehhi et al, (2017) highlighted that the gene expression levels of blood vary over time and do not follow a linear pattern.

**TABLE 5.0: POTENTIAL AFFECTS AND INFLUENCES ON GENES, PRE, DURING AND POST DEPOSITION**

<b>Pre-deposition</b>	<b>During</b>	<b>Post-deposition</b>
Weight	Force of ejaculation	Substrate
Age		Environmental
Time of day		
Diet		
Function		

In PMI analysis RNA degradation is not solely affected by time, but factors such as the cause of death (such as strangulation causing hypoxia) and environmental conditions especially (Lv et al, 2016; Sampaio-Silva et al, 2013), something these sections below focused on, alongside the functions of the markers.

#### 5.4.1. Functions of the markers.

The following study comprised of one reference gene: Glyceraldehyde 3-phosphate dehydrogenase (GAPDH), two sperm specific markers Protamine 1 (PRM1) and Protamine 2 (PRM2) and two seminal fluid markers Kallikrein 3 (KLK3) and Transglutaminase 4 (TGM4). Section 5.4.1 explored the functions of each of the markers and explained why the degradation profile may potentially vary due to the function (although this cannot be definitively proven).

GAPDH is an enzyme that participates in the breaking down of glucose to obtain energy, more specifically this enzyme catalyses a step in a process called glycolysis, converting glyceraldehyde 3-phosphate to D-glycerate 1,3-bisphosphate (1,3-BPG) using NAD<sup>+</sup> as the electron acceptor (Lodish et al, 2000). GAPDH comprises a polypeptide chain of 335 amino acids. Structural studies identified two regions: the glyceraldehyde-3-phosphate

catalytic site and the NAD<sup>+</sup> binding site (Sirover, 1999). A number of studies have showed GAPDH participating in a number of other cell functions from endocytosis to nuclear membrane assembly (Robbins et al, 1995; Nakagawa et al, 2003).

The function of GAPDH, but more specifically the endocytosis function may impact its degradation profile. Endocytosis is the process by which cells take in substances from outside of the cell (Kumari, MG, and Mayor, 2010). Usually this would happen within the body with a number of substances that are highly concentrated. Taking the cell outside of this highly concentrated environment is bound to have an effect on cell stability, whether that is function or cell structure. However, in a number of articles GAPDH is used as the reference gene due to it being a very stable marker, and therefore this may not be as influential upon the degradation profile as suggested (Anderson et al, 2005; Baber et al, 2005).

Spermatogenesis is a complicated process involving the division of spermatogonial stem cells into mature spermatozoa (Akmal et al, 2013). There are a number of stages to spermatogenesis and Protamine 1 and 2 are involved. The stages consist of the mitosis proliferation of spermatogonial stem cells to produce spermatocytes, the division of spermatocyte meiosis to produce haploid round spermatids, and the final stage involving the conversion of haploid round spermatids to mature elongated spermatids (Ze et al, 2009). During the final stage of spermatogenesis, the individual spermatids, haploid round and elongated undergo a change in the composition and PRM1 and PRM2 play a significant role in the condensing of chromatin required to induce the quality of potent spermatozoa. This change occurs firstly when the bond between DNA/histone in haploid round spermatids is replaced by a DNA/transition protein bond, then

subsequently in elongated spermatids the DNA/transition protein bond is replaced by a DNA/protamine bond (Steger, 1999).

Variation of the degradation profile of protamine markers may be due to the fact that PRM1 and PRM2 play an active role and are used in the production of mature spermatozoa by generating DNA/Protamine bonds. Some fluctuation that occurs over time in the degradation profile of the protamine markers may be accounted for due to the degradation and break down of the mature spermatozoa, ultimately releasing the protamine from the DNA bond. Finally, as the sample would not be able to generate any more spermatocytes because of ejaculation, gene expression will plateau and decrease as protamine is no longer required and therefore will begin to degrade itself.

Kallikrein 3 or the Prostate Specific Antigen (PSA) is secreted by the epithelial cells of the prostate gland. It is a seminal fluid specific protein that is produced for the ejaculate to allow sperm to swim freely (Prins, 1999). It is also instrumental in dissolving the coagulum (gel which houses the sperm comprised of Semenogelin and fibronectin) and cervical mucus, resulting in the semen becoming more liquid and allowing entry of sperm into the uterus (Baccaglioni et al, 2019; Balk, Ko and Bubley, 2003). With KLK3 being a product of the prostate gland, research has found that elevated levels may be an indicator of prostate cancer (Gupta et al, 1999).

Based on the function of Kallikrein 3, the degradation profile should show a decrease in gene expression as the marker is a key component in the dissolving of the coagulum.

Finally, Transglutaminase 4 or Prostate TG is a prostatic secretory molecule present in the prostate gland, prostate fluids and is also found in the seminal fluid (Dubink et al, 1999). There is limited literature available surrounding TGM 4 and the functions in humans, but it is suggested that it has a critical role in male reproduction (Landegren et

al, 2015). Similar to that of KLK3, Transglutaminase 4 can also be used as an indicator of prostate cancer, with TGM4 being elevated in the seminal plasma of prostate cancer patients (An et al, 1999; Drabovich et al, 2019; Landegren et al, 2015)

Due to the lack of knowledge about the specific function on TGM4, it cannot be determined whether the functions in fact influence the degradation profile of the marker, therefore, other factors may have an effect, which is what the next section looks into.

#### 5.4.2. Environmental conditions

As semen is ejaculated there is an obvious environmental condition change from body temperature, enclosed in the testes, to conditions outside the body such as those chosen for the stain age prediction study i.e., room temperature in a dark place. Prior to deposition RNA expression within the body will be different regarding an individual's diet, exercise but also the time during the day. According to Ali, Ibrahim, and Fayed (2017) mRNA stability and decay are strongly affected by factors such as environmental conditions and even tissue type. According to Weber and Lednev (2020) research into the time since deposition of biological stains would need to be validated and require further research into the potential impacts that environmental conditions and even different substrates have on the degradation profiles. Therefore, this section would therefore explore a number of different external factors that may affect the semen sample and evaluate whether it may potentially impact the degradation profile of specific markers similar to that of the functions.

#### 5.4.2.1. Temperature and humidity

The factor of temperature and humidity has been extensively researched for biological stains and whether different a temperature or a humidity have an impact on the degradation and decay of the sample (Ali, Ibrahim, and Fayed, 2017; Snyder, 2016; Al-Kandari, Singh and Sangar, 2016). Research conducted by Al-Kandari, Singh and Sangar (2016) subjected biological samples to four temperature ranges 55°C, 37°C, 24°C and 4°C over a period of 28 days. The study found at a low temperature of 4°C the sample was not significantly degraded for the whole study. At a room temperature 24°C and normal body temperature for a human of 37°C the research showed that these temperatures did not have a significant role in sample degradation at least up to day 20, for blood, saliva, and semen samples, with slight degradation after. Finally, at 55°C the different biological samples had contrasting degradation profiles over the 28 days. Both blood and saliva samples immediately degraded after day one until the sample reached zero at day 14. Whereas the results for semen showed that the sample was resistant to degradation at elevated temperatures over 28 days with only slight degradation occurring. The study above researched the biological sample as a whole, whereas this thesis research is looking at, specifically RNA. Studies such as Opitz et al, 2010 have conducted research on RNA and found that no degradation occurred at room temperature and those that are similar to body temperature. Although, hot temperatures such as 60°C highlighted vastly different degradation levels to the other temperature ranges.

When temperature is used as a variable for studies the majority of the time relative humidity (RH) is also researched to determine the impact on the sample, this is no different for studies regarding stability of DNA or RNA. Research by Lund and Dissing



(2004) focused on the stability of DNA when subjected to elevated temperatures and humidity. In their study, they found that at 100% relative humidity, with varying temperatures up to 65°C, long (1600bp), medium (273bp) and short (147bp) DNA fragments were still able to be amplified up to 3 months after deposition. However, this was only the case with dry stains, wet samples at 100% relative humidity degraded the DNA rapidly. In 2010, Lund, Sondervang and Dissing repeated the study, this time using a range of relative humidity's, 50%, 80% and 93%. The results coincided with results of the previous study that there was no significant difference in the stability of the sample at room temperature and that the DNA fragment could still be amplifiable with relative humidity having little to no effect on degradation. Lund, Sondervang and Dissing concluded their research by stating that "normal climatic conditions are not critical for the long-time survival of DNA in untreated stains."

Ultimately, this chapter is looking to explore the reasons behind the potential varying degradation profiles of semen specific markers and as seen from the studies above, room temperature conditions (like those found in the following chapter) does not seem to impact degradation. This suggests that the function of the RNA makers has much more of an impact on the degradation profile than the environmental condition, whether that be room temperature or relative humidity.

#### 5.4.2.2. pH

Change of pH of biological samples is unlikely to occur to crime scene stains. However, may be impacted if presumptive tests such as Kastle-Mayer (KM) or Leucomalachite Green (LMG) for blood are used first. A study by Sutthapodjanarux, Panvisavas and Chaikum (2009) researched the change of pH to determine whether profiles could be generated when the sample was subjected to an alkali and an acidic condition. The

research found that highly acidic or highly alkaline conditions will destroy DNA strands due to the different conditions affect the hydrogen bonding and ultimately causing hydrolysis. Partial DNA profiles were able to be obtained from an alkaline pH bloodstain if the pH was between 7-8 because it would be more subtle on the DNA structure, therefore producing DNA profiles. Research conducted by Bernhardt and Tate (2012) focused on RNA and the affect pH has upon RNA in different conditions. Similar to that of the Sutthapodjanarux, Panvisavas and Chaikum (2009) study, at high acidity or high alkaline RNA is susceptible to acid hydrolysis and alkaline hydrolysis, respectively. Unlike the previous study, this study by Bernhardt and Tate (2012) suggest that the phosphodiester bond found in RNA is most stable at a more acidic pH of 4-5.

As acidic or alkaline condition were not implemented into this thesis study, it can be stated that pH could not have had an impact on the different degradation profiles found in the following chapter, and therefore may be due to the function of the markers or a separate environmental condition.

#### 5.4.2.3. Hypoxia

One of the major changes that occurs to a biological fluid from within the body to outside is the oxygen concentration. The human body is a very oxygen rich environment, and the change to a low oxygen environment will bring on a condition called hypoxia to the cells and tissues of the biological fluid (Giaccia, Simon and Johnson, 2004). Hypoxia is a state in which oxygen is not available in sufficient amounts at the tissue level to maintain adequate homeostasis (the regulation of conditions in the body, cells, and tissues) (Almac et al, 2014). Understanding the degradation profile of specific genes, aims to understand the gene expression levels of those markers over a period of time and according to Paulding and Czyzyk-Krzeska (2000) hypoxia can affect mRNA stability.

In their article they highlight mRNA molecules such as Vascular Endothelial Growth Factor (VEGF), Tyrosine Hydroxylase (TH), and Erythropoietin (EPO) that have increased stability in hypoxia state conditions. However, Paulding and Czyzyk-Krzeska do suggest that conditions of hypoxia that compromise mRNA stability would ultimately lead to degradation. Therefore, it may be that this difference in oxygen concentrations that could cause a change in the expression of biomarkers especially those that are hypoxia sensitive (Asaghiar and Williams, 2019).

#### 5.4.2.4. Substrate

Alongside the chemical effects on degradation such as those above like temperature, humidity and oxygen concentrations, there has been a lot of research that has been conducted into the effect substrate has on body fluids. Research by Laber and Epstein (2001) focused on bloodstains and the impact of substrate upon blood. They found that different substrates affected how a blood clots, but more importantly with regards to semen samples, the bloodstains drying time. Laber and Epstein used a number of different volumes and a series of different porous and non-porous surfaces, however Weber and Lednev (2020) still believe that these interactions are yet to be fully explored. Hanson and Ballantyne (2010) specifically focused on whether the substrate impacts the age analysis of stains, when the sample has to be physically extracted from the substrate itself (to replicate real life crime scene scenarios). Their research found that substrate does not have an effect on stain age prediction analysis. The study in the following chapters used liquid samples, therefore the impact of substrate on the degradation profile of semen specific mRNA markers was nullified.

### 5.4.3. Impact

These sections have highlighted the degradation profile of markers will not follow a linear path, with a number of variables impacting the degradation (i.e., function and environmental conditions). Studies by Noble and Pozhitkov (2017) show that there is sufficient energy after degradation begins for some genes to be switched on and remain active for a sustained period of time. Therefore, understanding the degradation profile of mRNA markers would have a massive impact on both forensic analyses, but also other areas. The degradation profiles of body fluid specific makers can be used to determine the age of biological stains. For example, rape cases between previously consenting partners where a suspect argues that physical evidence such as semen had occurred at the earlier consensual intercourse, as the following chapter explored.

The other areas that understanding the degradation profile would have an impact is the area of cancer research. According to Colell et al, (2009) cancer and hypoxia is of particular interest as tumour cells maintain a high proliferation rate and consumption of nutrients and oxygen. As a result, areas with low oxygen develop in most solid tumours, and therefore cells have diverse mechanisms to adjust to hypoxia. As stated earlier in this chapter, both KLK3 and TGM4 used in this study have been identified as markers used to determine the potential of prostate cancer based on the gene expression levels (An et al, 1999; Drabovich et al, 2019; Gupta et al, 1999). This study would aid in determining whether the gene expression levels of certain markers are expected to be found at that level due to degradation or whether the gene expression levels suggest the potential of prostate cancer.

It is clear from research that environmental conditions may influence gene expression levels, therefore for a stain age prediction model to work, clear information on the

conditions present at the crime scene would be needed as all manner of crimes happen in completely different conditions (CSEW, 2021). For example, in the following sections study room temperature and the sample being stored in a dark place were the only variables analysed. This was to give a baseline level of gene expression over different time periods. Therefore, other conditions such as lower/higher temperatures, light, and dark conditions for both, whether the semen sample was taken as a liquid or a stain would impact the level of gene expression and ultimately, the length of time since deposition. Therefore, a time since deposition model would be incredibly difficult to predict with an increase in the number of variables. However, over time as increased variables are analysed having an automated system (i.e., machine learning) as highlighted in Chapter Eight would be highly beneficial.

## 5.5. Stain age prediction research questions

This chapter aimed to address the overall objective determining the age of a biological stain using RNA degradation.

As seen in Section 1.5 of Chapter One there are a number of overarching aims and objectives and this chapter highlights a number of research questions that aim to answers those.

- a) What are the optimal conditions for primer sequences to be amplified in PCR?
  - b) Can stain age prediction be conducted using the RNA degradation of genes GAPDH, PRM1, PRM2, KLK3 and TGM4?
  - c) Does the introduction of vaginal fluid to a sample of semen affect the gene expression levels of a number of semen specific markers?
  - d) Does refining the time period of degradation affect the gene expression levels of a number of semen specific markers?
-

- e) Can a model be created from the gene expression levels of markers to determine the age of a biological stain?

## 5.6. Experimental design

To address the issues posed by the studies above, the following sections depict the experiments used to overcome these issues.

- Primer optimisation study – optimise the conditions of the primers.
- Preliminary degradation study – determine it is possible to age biological stains using RNA degradation.
- Main stain age prediction study – more extensive study looking into stain age prediction using RNA degradation of semen specific primers.
- Mixed stain age prediction study – introducing vaginal fluid into a semen sample to determine whether a mixed sample has an effect on the degradation rate of the markers chosen.
- Concentrated days stain age prediction study – Refining the days from 7 days to 3 days, extracting every 8 hours to understand the impact based on data from the main stain age prediction study.

The step-by-step protocol used for these studies can be found in Chapter Two, with a brief overview found in the section below.

### 5.6.1. Methodology

Forensic samples of semen were deposited into sterile collection pots via self-masturbation and to extract the RNA from the degraded samples the Qiagen miRNeasy® mini kit was used. To convert the RNA to cDNA, the BioRad iScript™ Reverse Transcription Supermix was used for all samples. After these steps, depending on the study the

samples were subjected to differing methods. For the primer optimisation study after the sample underwent conversion to cDNA, the samples were then subjected to gradient PCR of multiple temperatures, followed by gel electrophoresis where the samples were run on a 2% agarose gel for 1 hour to separate the bands. The bands were then compared to a 100base pair ladder also run on the gel. A comprehensive method for this study can be found in Chapter Two.

Once the primer optimisation was conducted, that data was then used to inform the cycling conditions for qPCR. A volume containing 100ng of cDNA is deposited into a 0.1mL 96 well BrightWhite qPCR Plate by PrimerDesign, along with the SYBR® Green master mix comprising of 10µL of SYBR® Green, 1µL of a stock primer solution containing both forward and reverse primers and 7µL of DNA free H<sub>2</sub>O.

As part of a method development stage for the study in Section 5.8, the preliminary study aimed to control the variables such as the storage factors for the semen samples, the volume of original sample to extract and the kits needed for the experiment. In this case, the samples were stored at room temperature in a cupboard and that temperature was be checked regularly to control the variable as best as possible. Due to the viscosity of semen, taking exactly the same about of sample to extract may prove difficult. A few articles suggest a method of dipping a swab into the sample and extracting from the swab (Allard, et al, 2007). However, this creates a few issues; firstly, this method cannot control the volume of semen that is extracted and therefore may affect future results. The introduction of a swab creates another variable to control because there is also the issue that different swabs either retain more RNA than others and subsequently other swabs may release more RNA when extracted (Garvin, et al, 2012). Using a pipette and drawing up an exact volume of sample would counteract the issue with the introduction

of a swab, however due to the viscosity of semen, it is incredibly difficult to pipette. A potential bypass of this issue is to widen the end of the tip by cutting off the tip, however this leads to an increase in inaccuracy. It is therefore better to use a method called reverse pipetting for viscous samples. Reverse pipetting is a technique to dispense a measured quantity of liquid by means of air displacement (Batista, et al, 2007). The technique involves filling the pipette to the maximum extent and then empty the pipette only by pushing to the first stop (de Groot, 2018). This aims to control the variables, so that the semen stain age prediction study below can generate an unaffected baseline level for other results to be compared to should variables be introduced such as those for a stain age prediction model.

For this study, all consumables such as 1.5mL microcentrifuge, 0.2mL PCR tubes and pipet tips were autoclaved. All work surfaces were cleaned with 2% Virkon.

### 5.6.2. Statistical analysis

As stated in section 5.3, RNA is much less stable than DNA and because of this, RNA as a molecule can be used for time since deposition studies (Anderson et al, 2011). Time Since Deposition (TSD) studies aim to use gene expression levels of a fresh sample and compare that to samples that had been left for different periods of time to identify whether different time periods generate different values that then can be used to suggest that based on this value, this long as passed since deposition (Bremmer, et al, 2012). For biological stain analysis, both a reference gene and a target gene are needed. Reference genes are internal controls that have sequences different to the target gene. Its most significant role is to show minimal variability in expression when subjected to experimental factors (Chervoneva et al. 2010). Contrastingly, target genes are those being analysed, in this case for stain age prediction studies and when subjected to



experimental factors are expected to change (degrade) to help aid determining the age of a stain (Kozera, et al. 2013).

Analysis of degraded markers for stain age prediction studies can be conducted using a number of different methods. This section explains a couple of methods. The first method being generic degradation rate, which is a method that can be used for determining which markers may be best for age estimation (Alshehhi, McCallum and addrill, 2018). Degradation rate uses  $\Delta Cq$  values which corresponds to the difference between the  $Cq$  values of the degraded samples and  $Cq$  values of a control sample. Figure 5.4 shows how this method can be used by showing that RNA markers degrade at different rates, depending on the age of the stain.

The second method is the LIVAK method or  $\Delta\Delta CT$  method, which analyses the relative changes in gene expression from real-time quantitative PCR experiments (Livak and Schmittgen, 2001). This method calculates the fold change of the gene of interest (i.e., degraded sample), relative to the control condition that has been normalised against the housekeeping gene. Fold change can be seen as a number or as a percentage. For example, if the analysis generates a fold change value of 1 (or 100%), then there is just as much gene expression in degraded sample compared to the control sample. A value higher than 1 (i.e., 1.2 or 120%) shows an upregulation of the gene in the degraded sample relative to the control and a value lower than 1 (i.e., 0.5 or 50%) shows a downregulation of the gene in comparison to the control. Furthermore, statistical analysis using parametric or non-parametric tests can be used to determine whether there is any significance between the degraded samples based on fold change.

The final method that can be used for stain age prediction that was not used in this research is that of maximum persistency of semen. Maximum persistency of semen is

determined by the positive visual identification of sperm cells using Christmas Tree staining (Casey et al, 2016). There are two components of Christmas Tree staining; Picroindigocarmine stains the midpiece and flagellum of the sperm in green and blue, while Nuclear Fast Red gives the sperm heads a red colour and the acrosomal cap, a pink colour (Allery et al, 2001). This staining gives the sperm a unique colour and therefore makes them highly distinguishable under microscope. The maximum persistency of sperm element comes into this when distinct parts of a sperm begin to degrade and break off the main body of the sperm. The flagellum of a sperm is the most susceptible to damage and therefore will break down first. Research has found that mobile sperm have been found in semen that has been ejaculated between 30 minutes and up to 12 hours prior (Wallace-Haagen's, Duffey and Holtop, 1975; Allard, 1997). For sperm that are not mobile, research has found that the persistence of sperm can range between 16 to 72 hours (Casey, et al 2017; Rodgers, 2014). Whereas only the presence of sperm heads in semen, articles have suggested that the time since ejaculation can be anywhere between 16 hours and up to 9 days (Wallace-Haagen's, Duffey and Holtop, 1975; Allard, 1997; Casey, et al 2017; Rodgers, 2014). Due to the difference between some of the times given for the various stages, this method is not as definitive as it could be for sexual offence cases therefore the reason it was not used in this research.

Data obtained from these methods underwent statistical analysis using SPSS and depending on the data whether it was normally or not normally distributed, this would in turn determine the test conducted. Post-hoc corrections were also conducted. Post-hoc corrections like the Bonferroni corrections are conducted to reduce the chances of obtaining false positive results when multiple tests are performed on the same single

set of data. This correction suggests that the p value for the test is equal to the alpha divided by the number of tests that are performed (Bland and Altman, 1995).

### 5.7. Primer optimisation study

This study aimed to counteract the issue faced by the Anderson et al, (2005) study of having genes expressed in all cell types and subsequent mixed stains issues. To counteract having multiple genes expressed, choosing body fluid specific primers will do this. The process of PCR is not 100% efficient even when there is a pure DNA sample and the primers have been specifically designed. Usually, for primers to bind in the process of amplification, optimal temperatures, concentrations, and samples are needed for improved efficiency (McLennan et al, 2013).

In this study a series of semen specific primers were selected from literature (GAPDH, PRM 1, PRM 2, KLK 3 and TGM 4) and were subjected to the process of determining the correct conditions for optimal amplification. The literature where these primers were found also provided an annealing temperature that was associated with each primer. It was assumed that these would be the optimal annealing temperatures for those primers if they had been published. Therefore, the first run was each primer with that associated temperature. In this case the associated annealing temperatures were not the correct temperatures as for some primers, there were no bands present on the gel and others there were multiple bands. This meant that the annealing temperature was either too high or too low. Rychlik, Spencer, and Rhoads (1990) and McLennan et al, (2013) state that if the annealing temperature is too low, then non-specific fragments will become amplified. This generates multiple bands or 'smearing' on the agarose gel. If the temperature is too high, the yield of the product is poor and therefore may see the loss of the desired band present.

To counteract this and to determine the correct annealing temperature, gradient PCR was conducted. Gradient PCR is the process by which the thermocycler used can run different temperatures for each of the wells, meaning multiple samples of the same product can be run at the same time but have different annealing temperatures selected. Although the annealing temperatures can be estimated based on the theoretical melting temperature ( $T_m$ ) of the primers, the length, concentration, and sequence may affect the annealing temperatures (Su, 2017). This, therefore, explains the need for gradient PCR to be conducted.

The temperatures for the gradient PCR can be found in Table 2.3 in Chapter Two. In this case, based on the clarity of the bands it is assumed that the following temperatures are the optimal annealing temperatures for the primers chosen. GAPDH = 64°C, PRM1 = 60°C, PRM2 60°C, TGM4 = 58% and KLK3 = 57°C.

In some cases, the change of 1°C in temperature can show bands present on the gel, or those same bands to not be present. This indicates that it is not just annealing temperature that has an effect on the quality of the bands present on an agarose gel, Rychlik, Spencer, and Rhoads (1990) suggest the concentrations of the primers will have an effect. Working in conjunction with the annealing temperature, over concentrated primers will cause multiple bands present on a gel or under concentrated will cause no bands to appear. Due to the concentration of primers being too high, the forward and reverse primers can bind to themselves to produce a phenomenon called primer dimers (Brownie *et al*, 1997). Primer dimers typically have a base pair length of between 30 and 50 bp meaning it will fall under the first band of the ladder. The base pair lengths of the primers chosen for this study can be found in Table 2.5. The product lengths found in Table 2.6 are all much higher than that of a primer dimer. This, therefore, removes the

potential of a band being seen and misidentified as the product. Using the assumed optimal annealing temperature different concentrations were used to see how much of an effect concentration has on the quality of bands present in the gel. Different concentrations of primers were run on a gel ranging from 500nM/ $\mu$ L down to 50nM/ $\mu$ L as seen in the appendix K. The gels depicted based on the clarity of the bands that the 250nM/ $\mu$ L concentration of the forward and reverse primers would be the optimal concentration.

Following the determination of the optimal annealing temperature and the concentration, the last step was to determine whether these primers chosen were indeed semen specific. As the primer sequences were taken from literature, the literature states that they were semen specific either sperm or seminal specific. To check this other body fluids such as blood and saliva were used instead of semen. If bands other than primer dimers were present on the gel of blood and saliva, then it could be stated that those primers were not semen specific. If that was the case, then the issue faced by Anderson et al (2005), of having mixed stains would be prominent as the non-semen specific primer would amplify for multiple body fluids. It was seen that the primers chosen for this study were indeed all semen specific.

The outcome of this study and the optimal temperatures and concentrations enables the following studies to be conducted.

### 5.8. Preliminary semen degradation study

Due to the lack of literature and the relatively little exploration of this area; looking into stain age prediction using semen samples, this pilot study briefly looks into the possibility of using RNA degradation for semen samples as a method of stain age prediction. Should this pilot study generate results to suggest that it can be predicted, a

more in depth and comprehensive study would be conducted. For this study, a number of components need to be conducted; a primer optimisation study to determine concentrations and optimal annealing temperatures. Once conditions have been optimised the degradation study can be conducted, the protocol for this Chapter Two, Section 2.4, and associated sections. As this study was a preliminary one, some of the variables were changed for the following studies based on the data obtained within this study.

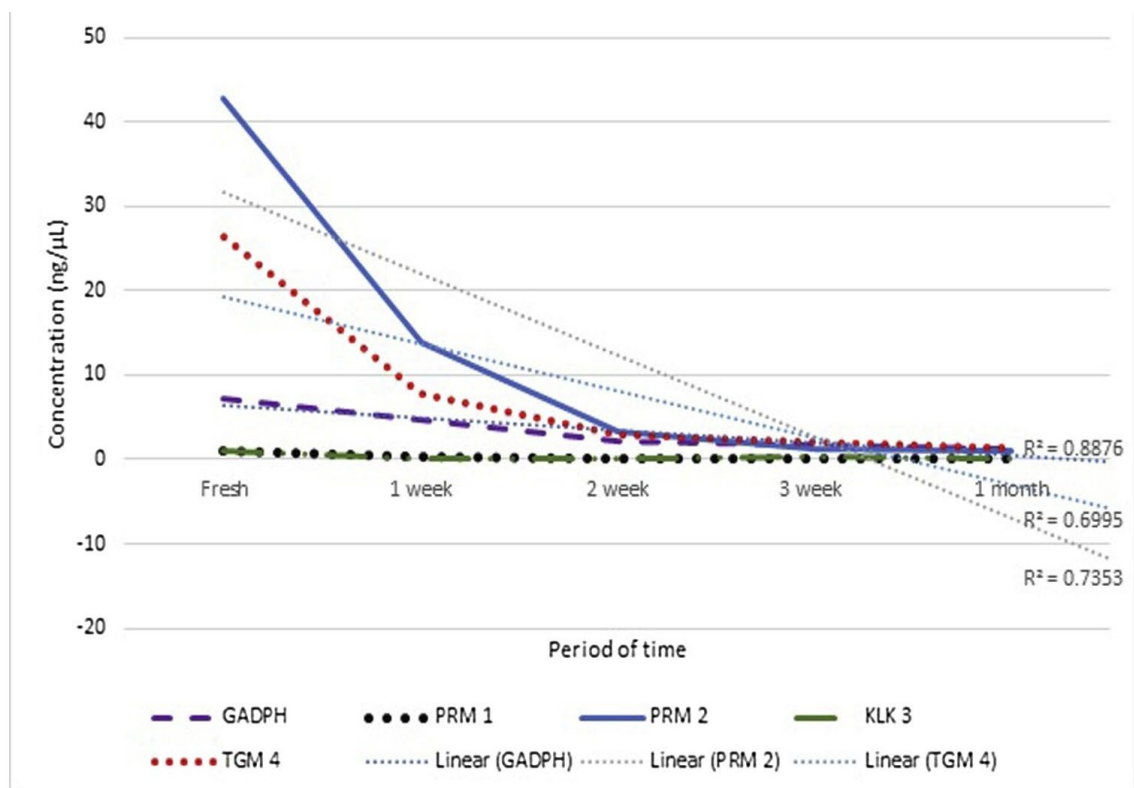


FIGURE 5.2: SHOWS THE DEGRADATION LEVELS OF SEMEN SPECIFIC PRIMERS OVER A PERIOD OF TIME RANGING FROM A FRESH SAMPLE TO A SAMPLE THAT HAS BEEN STORED FOR A MONTH AT ROOM TEMPERATURE. R<sup>2</sup> VALUE OF 0.6995 CORRESPONDS TO PRIMER TGM 4, R<sup>2</sup> VALUE OF 0.7353 CORRESPONDS TO PRIMER PRM 2 AND R<sup>2</sup> VALUE OF 0.8876 CORRESPONDS TO PRIMER GADPH. ERROR BARS WERE OMITTED FOR CLARITY.

The results from the qPCR data give various different information from the cycle threshold levels to concentration levels of the semen specific markers. As seen in the figure above, a graph of concentration levels was produced. PRM 1 and KLK 3 has relatively low expression in the fresh sample and although there does appear to be a decrease over time, the low initial expression makes it difficult to observe a clear

degradation profile. Semen specific markers, PRM 2 and TGM 4 exhibit a significant degradation from the fresh samples and samples that have been stored for a week dropping from a concentration of 42.728ng/ $\mu$ L and 26.465ng/ $\mu$ L in the fresh sample to 13.862ng/ $\mu$ L and 7.689ng/ $\mu$ L respectively a week later. Both markers then continue to degrade at a similar rate for the remaining of the study. The reference gene GADPH follows a relatively linear decrease, in that the concentrations shown in the qPCR reaction start at around 7ng/ $\mu$ L in a fresh sample and then begins to decrease in concentration around a half very week that the sample is stored. These different degradation rates could potentially be used to estimate the time since deposition of body fluids, especially for samples that are earlier than 3 weeks old. It is clear that multiple primers have to be characterised from a sample for stain age prediction. However, this method of determining gene expression does come with the limitation that using quantification data would be affected by the volume of sample used, and the issue of pipetting technique.

### 5.9. Main semen stain age prediction study

This study is a larger and more comprehensive study of the pilot study above, taking into consideration the potential variables present. This study was split into a number of sections. The first section, based on the data generated from the pilot study condensed the timeframe down from one month to one week due to the sudden decrease in concentration levels of the markers. This study had the number of participants increased to five to determine whether what is shown in the preliminary study is replicable. The second section of this study introduced vaginal material to create a mixed stain. This would determine whether a more closely related crime scene stain mixture of semen and vaginal material will affect the gene expression rates of semen specific markers. The

concluding section of this study, from the data of the previous two sections decrease the timeframe further to three days and extract the sample more times throughout those three days for example every 8 hours.

Body fluids like semen have specific markers associated with them as seen in Table 2.2, and those are amplified using qPCR and concentrations levels recorded. Each body fluid is stored to degrade up to 7 days or 3 days and every day or every 8 hours sample is taken and extracted depending on the study. The qPCR reading aims to show the differing cycle threshold (CT) value of each body fluid specific marker for each time period to show degradation. These time periods were chosen for each study as they would clearly show if there was degradation occurring between each extraction and ultimately indicate that it was possible to age a stain based on the degradation rates.

qPCR analysis provides data on the fluorescence emitted from the sample, and the cycle value this fluorescence is greater than the background fluorescence. The lower the cycle threshold (CT) or sometimes termed quantification cycle (Cq) value in qPCR, the greater the gene expression in the sample, with the higher Cq value meaning a low gene expression in the sample, Figure 5.4 below depicts this. As Figure 5.4 shows the cycle thresholds of each of the semen specific markers are relatively stable, however a single increase or decrease in a Cq value for example, 25 to 26 is double the amplification of the sample, however, shows a decrease in gene expression. The figure highlights that KLK3 has an average Cq value over the 7-day period of approximately 33, compared to GAPDH being just under 25. These differences have an impact. Research suggests that generating a Cq value of 29 and below shows high gene expression of the target marker, between 30 and 36 suggests moderate gene expression and above 36 is indicative of weak gene expression of the target makers (Public Health England, 2020).



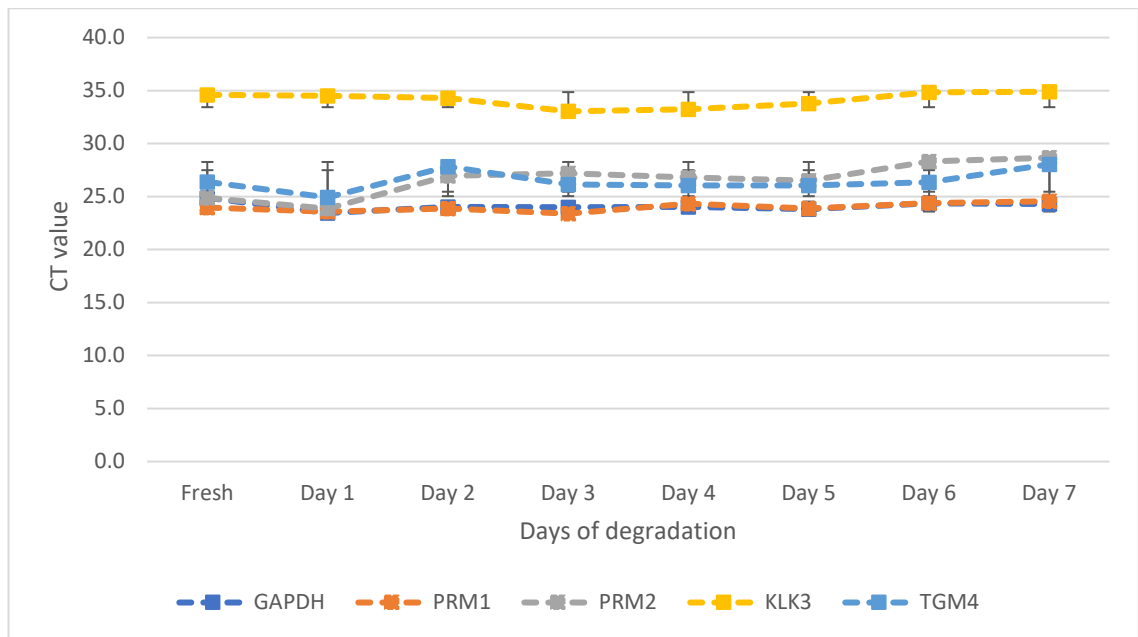


FIGURE 5.3: CQ VALUES OF A NUMBER OF SEMEN SPECIFIC MRNA MARKERS (PRM1, PRM2, KLK3 AND TGM4) AND THE CQ VALUES OF A HOUSEKEEPING GENE GAPDH.

The figure above shows the stability of the markers, using the average of all of the participants. This stability is also the case when comparing the markers of each of the individual participants. Regardless of whether the time period is over one week or over the period of a month, the figures show that KLK3 has very weak gene expression, with PRM1 and the housekeeping gene GAPDH being highly expressed. The table below shows a range of the lowest Cq values to the highest Cq values for each marker over the two different time periods.

TABLE 5.1: THE AVERAGE CQ VALUES OF EACH OF THE SEMEN SPECIFIC MARKERS OVER THE TWO DIFFERENT TIME PERIODS, WITH STANDARD DEVIATIONS.

	GAPDH	$\Sigma$	PRM1	$\Sigma$	PRM2	$\sigma$	KLK3	$\sigma$	TGM4	$\sigma$
Fresh –	23.6 –	0.34	23.3 –	1.25	24.1 –	1.65	31.7 –	1.04	28.7 –	0.45
28 days	24.6		26.9		28.7		34.9		30.1	
Fresh –	23.4 –	0.40	23.3 –	0.38	23.8 –	1.51	33.0 –	0.66	24.9 –	0.95
7 days	24.8		24.5		28.6		34.9		28.0	

The table above shows the levels of gene expression based on the Cq values of each of the markers follow a similar path apart from TGM4 which is more highly expressed over the shorter time period than over the longer period. This may refer back to the previous

chapter on the functions of the markers. As Landegren et al, 2015 state, Transglutaminase 4 has a critical role in male reproduction, therefore would be understandable if the gene expression of TGM4 is much higher over the brief period of time after ejaculation, than up to 28 days. However, over the longer period of time the variation between the data points for TGM4 were more closely aligned compared to the shorter period of time. The standard deviation data also shows that over a shorter period there was a lot less variation for the PRM1 marker than over 28 days suggesting less stability or greater degradation over a longer period of time.

Alongside physical depictions of gene expression levels by using Cq values and the stability of each of the marker using the delta Cq values as seen in the previous figures, statistical analysis can also provide valuable information. The Shapiro-Wilk test was used to determine the normality of the data and based on those results determined whether a parametric test or non-parametric test would be used. The table below shows the results of the test for normality.

**TABLE 5.2: TEST FOR NORMALITY COMPARING DAYS OF DEGRADATION WITHIN EACH MARKER**

<b>Test for normality</b>	
<b>Marker</b>	<b>p-value</b>
GAPDH	.003
PRM1	.006
PRM2	.493
KLK3	.017
TGM4	.034

**TABLE 5.3: TEST FOR NORMALITY COMPARING THE MARKERS WITHIN EACH DAY OF DEGRADATION**

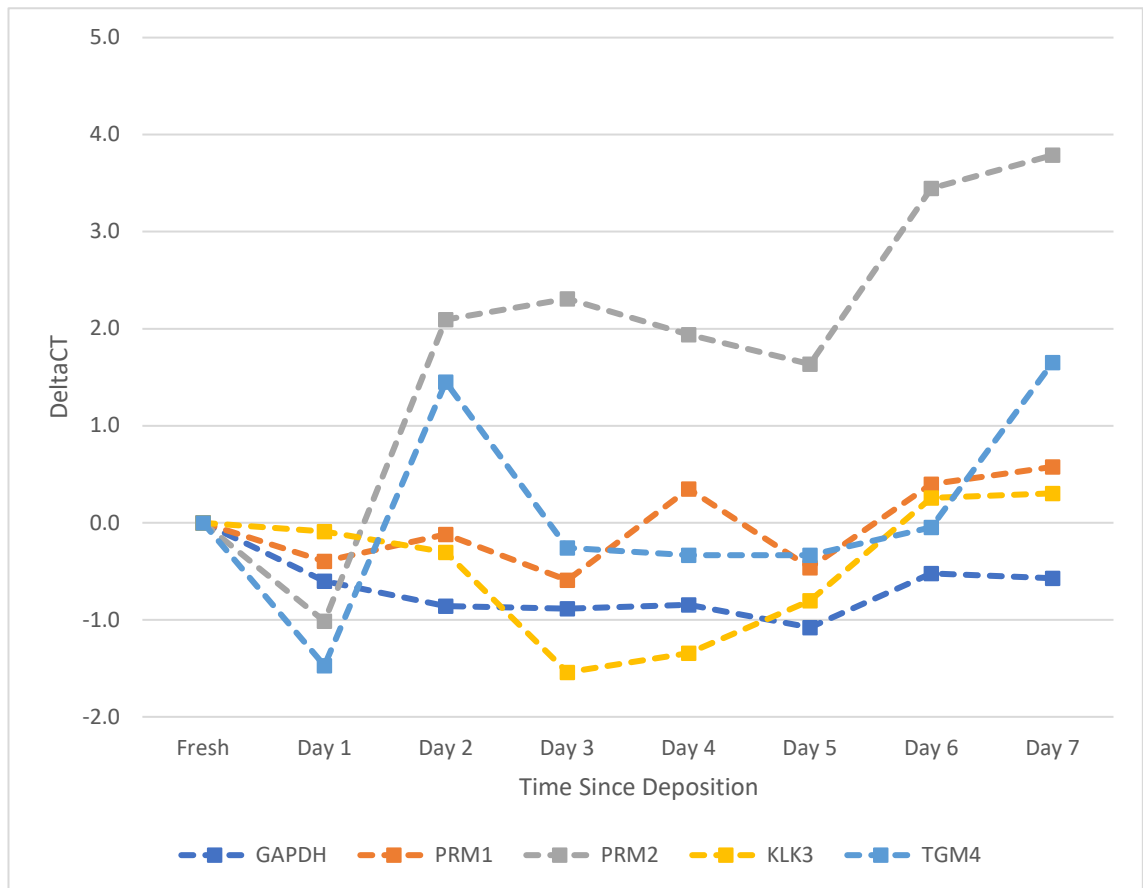
<b>Test for normality</b>	
<b>Day</b>	<b>p-value</b>
Fresh	.000
Day 1	.000
Day 2	.015
Day 3	.001
Day 4	.010
Day 5	.000
Day 6	.000
Day 7	.004

Based on the p-value generated from the tests for normality above, the appropriate statistical test was used that being Kruskal Wallis and ANOVA. In appendix I there are a number of tables which either compare each of the markers for each time period (for example comparing GAPDH to PRM1 Cq values at fresh), or each of the time periods for each marker (for example comparing PRM1 Cq values at fresh and day 4) to see whether there is a significant difference between different data points. When comparing individual time points for each marker over the 7-day time period, statistical analysis conducted showed that there was no significant difference for all time points both GAPDH and PRM1. This shows that a slight change in Cq values over the 7-day time period as seen in Table 5.1 are not significant and ultimately shows the stability of the markers as seen in Figure 5.3. However, the statistical analysis conducted also showed that the other markers, PRM2, KLK3 and TGM4 displayed statistically significant differences for some data points in comparison to each other. The table below shows this for PRM2, with KLK3 and TGM4 found in the appendix I.

TABLE 5.4: THE STATISTICAL ANALYSIS CONDUCTED FOR PRM2, SHOWING THE SIGNIFICANCE BETWEEN DIFFERENT DATA POINTS.

		PRM2 – Bonferroni correction						
	Fresh	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Fresh		1.000	.735	.405	1.000	1.000	<u>.009</u>	<u>.002</u>
Day 1	1.000		<u>.031</u>	<u>.014</u>	.054	.144	<u>.000</u>	<u>.000</u>
Day 2	.735	<u>.031</u>		1.000	1.000	1.000	1.000	1.000
Day 3	.405	<u>.014</u>	1.000		1.000	1.000	1.000	1.000
Day 4	1.000	0.54	1.000	1.000		1.000	1.000	1.000
Day 5	1.000	.144	1.000	1.000	1.000		1.000	.628
Day 6	<u>.009</u>	<u>.000</u>	1.000	1.000	1.000	1.000		1.000
Day 7	<u>.002</u>	<u>.000</u>	1.000	1.000	1.000	.628	1.000	

Table 5.4 shows that for example when comparing a fresh sample where PRM2 is the focused marker to samples that have been allowed to degrade for 6 or 7 days that there is a significant difference. Taking the Cq values of those individually, the differences in gene expression levels may be the reason for the significance. For example, the average Cq value for PRM2 at the fresh data point was 24.88, whereas at day 6 and 7 it was 28.33 and 28.67, respectively. As seen Livak (2001) produced the method for analysis for Cq values. Figure 5.4 below shows the delta Cq value for each time point. Delta Cq corresponds to the difference between the Cq value of the marker of interest and the Cq value of the control sample. The delta Cq values of shows the difference of expression between two markers whereas, the Cq value shown above is specific to the expression of a single gene.



**FIGURE 5.4: (Cq TIME X – Cq TIME 0) FOR GAPDH, PRM1, PRM2, KLK3 AND TGM4 FOR SEMEN SAMPLES STORED AT ROOM TEMPERATURE FOR A PERIOD OF 7 DAYS. COMPARISON OF THE SAMPLES AT EACH DIFFERENT DEGRADATION POINT TO A FRESH (CONTROL) SAMPLE TO HIGHLIGHT THE CHANGE IN EXPRESSION OF THAT MARKER OVER TIME. THE MORE LEVEL, THE MORE STABLE THE MARKER IS.**

The above figure shows the stability of each of the markers, however this time over a 7-day period, and due to the time period being concentrated the stability is a lot more erratic. Figure 5.4. compares the samples at each different degradation point to a fresh (control) sample to highlight the change in expression of that marker over time. The more level, the more stable the marker is. This was calculated using the  $\Delta cq$  values of the markers. As seen with all previous figures using Cq values, the GAPDH housekeeping gene is incredibly stable compared to the genes of interest. Similar to Figure 5.3 PRM2 rapidly degrades early into the study before continuing to degrade after a period of plateauing. Unlike the previous delta CT figure which highlighted that PRM1 and KLK3 degraded in a similar linear fashion, this figure shows some differences. Although the

delta Cq values change for these genes over the time period, they remain around zero therefore showing the stability of the markers over 7 days.

The delta Cq generation of values as stated before shows degradation, however it is not useful when it comes to the production of a potential stain age prediction model. For a stain age prediction model to work definitive changes in degradation need to be highlighted, this can be shown using the Livak and Schmittgen (2001) method. The Livak and Schmittgen model normalises the values of each of the genes of interest against the housekeeping gene, this then generates a valued called fold change as seen in the figure below.

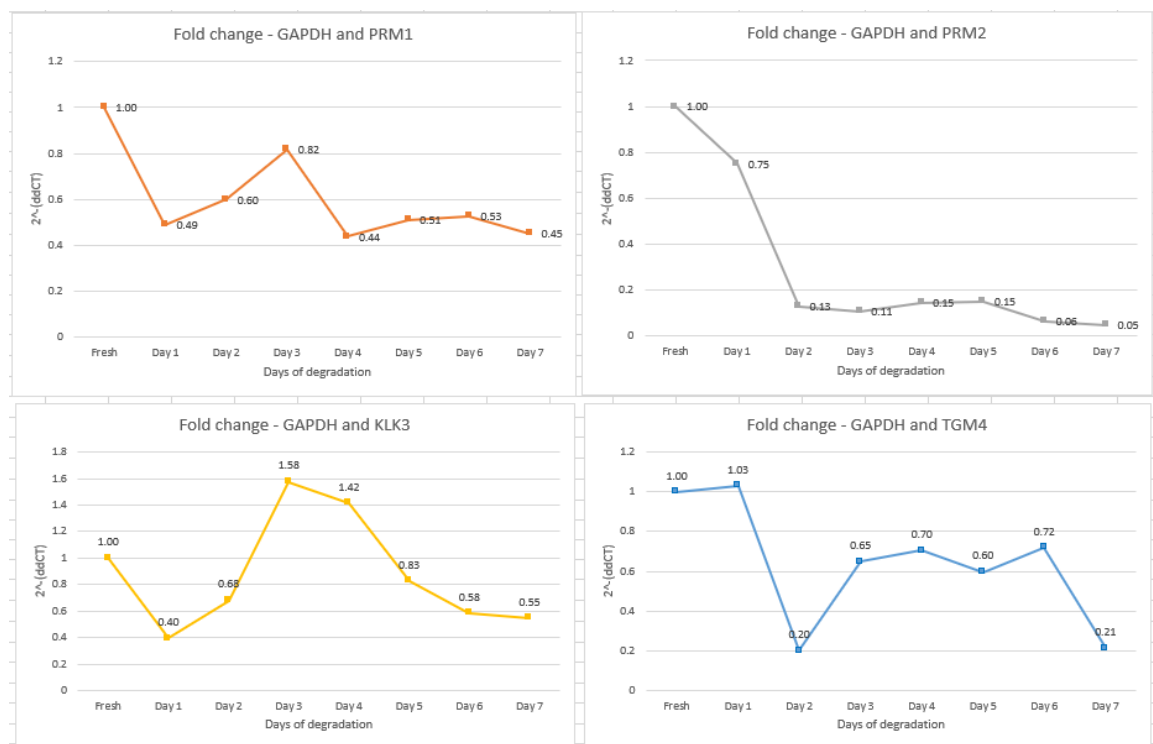


FIGURE 5.5: FOLD CHANGE SHOWING VARYING GENE EXPRESSIONS OF THE SEMEN SPECIFIC MARKERS WHEN NORMALISED AGAINST THE HOUSEKEEPING GENE GAPDH.

Fold change is the change in gene expression of the test condition (i.e., fresh sample) compared to the degraded samples (Livak and Schmittgen, 2001). Generating a fold change of 1 using the Livak method means that there is 100% as much gene expression in the test condition as in the degraded sample. A fold-change value above 1 is showing

upregulation of the gene of interest compared to the control. Values below 1 are indicative of gene downregulation relative to the control. Determining why there is upregulation, downregulation or degradation is what Section 5.4. aimed to understand.

Figure 5.5 shows that each of the genes of interest have a degradation profile regarding fold change. It is this figure that provides the valuable information for the development of a stain age prediction model. As the figure shows each of the markers when normalised against GAPDH housekeeping gene generated a different degradation profile. The previous chapter aimed to understand the reasons for this variability in fold change over a relatively brief period of time. The main factor was highlighted to be the functions of the markers. There are two key data points that stand out from the figure that require further explanation, the day three data point for KLK3 and the immediate decrease in gene expression for PRM2.

According to a number of articles KLK3 is instrumental in dissolving the coagulum and cervical mucus, resulting in the semen becoming more liquid and allowing entry of sperm into the uterus (Baccaglini et al, 2019; Balk, Ko and Bublely, 2003). Therefore, it is expected to see the decrease in gene expression originally for KLK3 as it is being used up. However, the sudden increase in gene expression for day three suggests that another factor is impacting the degradation of KLK3. This may be due to environmental factors and it something that is explored in Section 5.4. Based on the function of PRM2 which play a significant role in the condensing of chromatin before replacing a DNA/transition protein bond with DNA/protamine bond it is expected that the gene expression of PRM2 decreases as it be being used up (Steger, 1999).

Due to the variation of the fold changes seen in Figure 5.6 of the genes of interest, it is logical to determine whether any of the changes are significant. To determine whether

these differences in the stability of the markers are significant and impact the research, statistical analysis can be conducted. In this case, Kruskal Wallis tests were conducted on the individual markers and normalised against the housekeeping gene GAPDH. According to the statistical tests comparisons between each individual days found that neither of PRM1, KLK3 and TGM4 showed any significant difference. PRM2 was the only marker than showed any significant difference. As a marker, PRM2 generated a p value of .003 showing significant difference. The table below shows the comparison of each of the days for PRM2.

**TABLE 5.5: STATISTICAL ANALYSIS OF PRM2 TO SHOW THE SIGNIFICANT DIFFERENCE BETWEEN FRESH, DAY 1 AND DAY 2 SAMPLES COMPARED TO THE REST OF THE DATA POINTS.**

PRM2 Normalised against GAPDH – Bonferroni correction								
	Fresh	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Fresh		.777	<u>.027</u>	<u>.006</u>	<u>.017</u>	<u>.020</u>	<u>.001</u>	<u>.002</u>
Day 1	.777		.053	<u>.014</u>	<u>.036</u>	<u>.041</u>	<u>.003</u>	<u>.004</u>
Day 2	<u>.027</u>	.053		.596	.871	.912	.280	.347
Day 3	<u>.006</u>	<u>.016</u>	.596		.713	.675	.582	.682
Day 4	<u>.017</u>	<u>.036</u>	.871	.713		.958	.358	.437
Day 5	<u>.020</u>	<u>.041</u>	.912	.675	.958		.332	.407
Day 6	<u>.001</u>	<u>.003</u>	.280	.582	.358	.332		.887
Day 7	<u>.002</u>	<u>.004</u>	.347	.682	.437	.407	.887	

The table clearly shows that there is a significant difference between a fresh, day one sample compared to all other remaining days. This corroborates what can be seen in the above figure. This data provides a particularly good indication for a stain age prediction model. As there is an immediate decrease in gene expression and then that gene expression remains at a constant level, it can be said that if PRM2 is detected then the stain was deposited less than three days ago. Due to this a further study was conducted to determine whether there are any key changes in the markers over a shorter more condensed time period of three days, however analysed more frequently. Section 5.11 below discusses that study.



## 5.10. Introduction of vaginal material.

In sexual offence cases, there is an increased likelihood that biological stains may be mixed i.e., semen and vaginal material. This mixture may impact the degradation profile of the semen specific markers; therefore, this section aims to determine whether the introduction of vaginal material affects degradation rate.

Vaginal secretion contains the secretions produced by the glands found in the vagina and cervix and is commonly terms as fluid or discharge (Marques et al, 2011). The secretions' primary function is to remove dead cells and bacteria from the vagina to prevent infections and heightened susceptibility to sexually transmitted infections (Su, 2017). Vaginal secretion protects from infections by containing a range of antimicrobial substances including lysozyme, lactoferrin, fibronectin and polyamines such as spermine and IgA (Marques et al, 2011). The quantity of vaginal secretions produced per day is on average around 6 g, with less than a gram of secretion present in the vagina at any one point. Different points of the menstrual cycle will ultimately affect the viscosity, colour, and odour of vaginal secretions due to changes in hormone levels (Chiriboga et al. 1998). However, there is also the possibility that other external factors would impact the vaginal fluid secreted, those being contraceptive drugs, antibiotics and the individual being pregnant (Su, 2007).

Following the same methods as all previous mini studies within this chapter (as seen in section 5.6). This study aimed to have a 1:1 volume mixture of semen to vaginal material. As expected with the markers chosen being semen specific, the Cq values, delta Cq values and fold changes were all relative the same compared to semen only samples. The only difference that occurred surrounded the GAPDH, housekeeping gene. As GAPDH is found in all biological samples, the Cq values showing quantity of the marker

higher as there was more of it in a mixed sample compared to a one fluid sample, as seen in Appendix I

The study ultimately concluded that analysing semen specific mRNA markers in a mixed sample would not influence the trend of a degradation profile/ a time since deposition model due to the markers being chosen are (semen) body fluid specific, although the fold change levels did vary as seen in the figures in Appendix I, when normalised against GAPDH. With the sample being a 1:1 ratio of 20uL of semen and 20uL vaginal fluid, its potential that the expression would be affected due to GAPDH being found in both samples, semen, and vaginal fluid.

The figure below shows the gene expression of the individual markers without manipulating the data for fold change. These clearly show that the gene expression of the individual markers is not affected by a mixed sample.

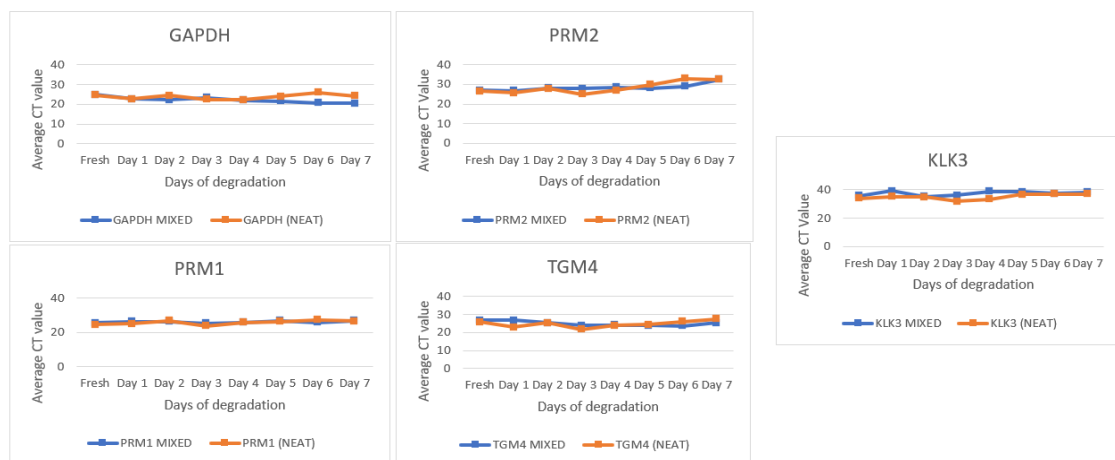


FIGURE 5.6: GENE EXPRESSION OF THE INDIVIDUAL MARKERS COMPARING NEAT AND MIXED.

As seen in the results normalising against GAPDH as the housekeeping gene would show results that is different when comparing a single fluid sample and a mixed fluid sample, because it itself as a gene it found in most bodily fluids. Therefore, this would need to be taken into consideration if using it to normalise the other markers.

### 5.11. Condensed 3-day study.

Due to significant variation between fresh and a day 3 sample, especially seen in PRM2 both Figure 5.5 but also Table 5.5 further lab analysis was conducted over a fresh to day 3 timeframe with extraction of the samples every 8 hours to determine significance of those variations of the first 3 days. The method for this study can be found in Section 5.6.1

The study replicated the gene expression of Figure 5.6 with an immediate decrease within the first day of degrading. It can be assumed that this is due to the change in environmental conditions between the body and the study conditions (room temperature, in a dark cupboard). The data for this study can be found in appendix J.

The research aiming to understand the degradation profiles suggested oxygen concentration as a key factor that leads to rapid degradation. The human body is a very oxygen rich environment, and the change to a low oxygen environment will bring on a condition called hypoxia to the cells and tissues of the biological fluid (Giaccia, Simon and Johnson, 2004). According to Paulding and Czyzyk-Krzeska (2000) hypoxia can affect mRNA stability. Paulding and Czyzyk-Krzeska do suggest that conditions of hypoxia that compromise mRNA stability would ultimately lead to degradation. Therefore, it may be that this difference in oxygen concentrations that could cause a change in the expression of certain markers.

In conjunction with this study, to determine possible reasonings why some markers seem to plateau after a couple of days, semen persistency testing could have been conducted to highlight which days sperm potentially die. This would only impact the markers that a sperm specific, these being Protamine 1 and Protamine 2. Semen persistency testing is the microscopic identification of the spermatozoa using Christmas

tree staining. This stain contains two dyes: Nuclear Fast Red and Picroindigocarmonine each dying a different section of the sperm, head a pink/purple colour and the tail a green colour respectively (Casey et al, 2017). Then using Allard et al, 2007 classification system it would be easy to identify whether there were many spermatozoa or no spermatozoa, which can lead to a rough determination of a time frame. Research by Marchesi et al, (2011) has shown that spermatozoa on average last up to  $3.1 \pm 1.6$  days. This, therefore, corroborates the gene expression change for PRM2 seen in Figure 5.6. However, this is something that could be conducted in the further development section in Chapter Seven

### 5.12. Stain age prediction model.

The research above this section, on verifying the possibility of determining the time since deposition of a stain all leads to the potential development of a stain age prediction model. Although, not created in this work, the model would use the qPCR data and fold change values of the markers to generate the day since deposition of the sample. The numerous studies conducted in this chapter had found that multiple markers would have to be compared for such a model to work, rather than a single marker. This is because the degradation profile varies and is affected by the factors highlighted, function, and environmental conditions.

For a stain age prediction model to be developed it is clear vast amounts of data would be required following on from the data generated in these studies. For the model, each marker would need a value (fold change) associated to them for each period (allowing for variation), that can be added to every time a new piece of data is analysed using machine learning. Once an unknown sample is analysed, the algorithm could compare

the fold change value of the sample to a bank of values associated to each time period of generate a potential day at which the sample was deposited.

For example, using Figure 5.6 below showing fold change if TGM4 was the analysed marker and a fold change of 0.71 was generated for the unknown sample it would be difficult to know whether that sample was deposited four days ago or six days ago. Therefore, a second marker would need analysing for example KLK3. If a fold change of 0.60 was generated for KLK3, on its own it may have been deposited two days ago or six days ago. However, analysing both markers it would be clear that the sample was deposited six days ago.

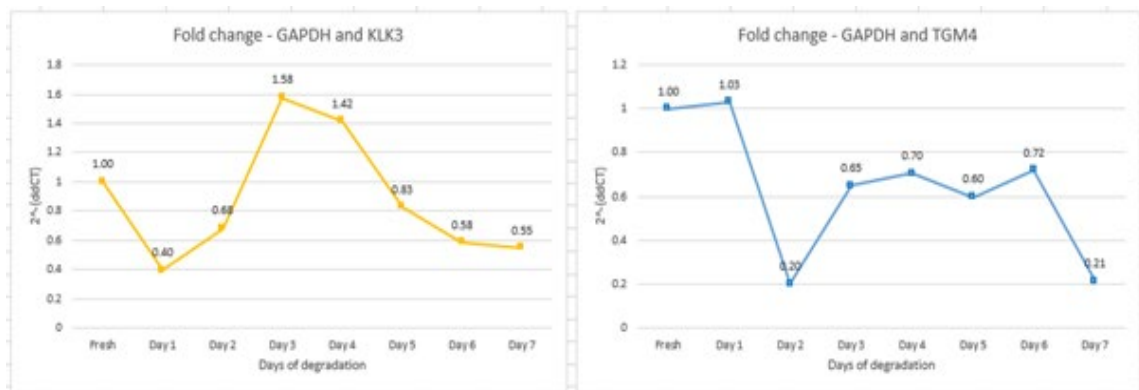


FIGURE 5.6: FOLD CHANGE OF KLK3 AND TGM4 WHEN NORMALISED AGAINST GAPDH TO SHOW THE DEVELOPMENT OF A STAIN AGE PREDICTION MODEL.

The other key point to come from the fold change data is the idea of there being a cut-off point, where the data might become background interference. It is assumed that any data points that fall below 10% or 0.10 is background interference and that the sample has fully degraded by that point. In Chapter Seven, further developments section, how exactly a stain age prediction model would work is explained used the idea of machine learning so that the model can adapt to different markers, conditions, and time periods.

### 5.13. Conclusion

This chapter had a number of research questions associated with it, firstly the optimal primer conditions were deemed to be GAPDH = 64°C, PRM1 = 60°C, PRM2 60°C, TGM4

= 58% and KLK3 = 57°C for each of the markers chosen. The study also aimed to discover whether it was possible to determine the time since deposition of body fluids, semen specifically and the results indicated that it is possible. Therefore, this is a proof of concept. In an ideal scenario, the degradation of the individual markers would be consistent, this is not the case and some markers plateau and vary. However, that variation of fold change and gene expression highlights the need to further research into the impact function and environmental conditions have on degradation. Also, the variation allows for the possibility of stain age predictions to aid in cases of rape, especially those between previously consenting partners. The study also highlighted that the introduction of another body fluid would not impact the stain age prediction of the semen specific markers, therefore aiding cases where there are mixed stains. A key finding that arose from the chapter is that the markers chosen can provide the time since deposition of the stain at 8-hour intervals, potentially having a massive impact on sexual offence and rape cases.

However, the development of a stain age prediction model using the RNA degradation of markers is possible if multiple markers are analysed together and ultimately, could have a monumental impact both on sexual offence cases but also the implementation of a model for other body fluids utilising the same method could aid the investigations of all other cases where time of deposition is debated. Ultimately, the development of a model would come down to making sure that the markers used are specific to the body fluid type and that time between deposition and being analysis is as small a window as possible due to degradation starting almost immediately.

However, one key aspect of this research that poses challenges is that it focuses on there being a number of stains/samples i.e., a consensual sample and a non-consensual

sample to analyse. However, there is a limitation to this work if there was consensual intercourse occurred and soon afterwards non-consensual intercourse occurred with the only evidence being that from a high vaginal swab. In this case, there would be a mixed sample of the same body fluid and therefore using the body fluid specific markers would not be able to determine when each act occurred. In the end, DNA profiling will be able to determine multiple persons, but ultimately, in a case like this, it would come down to one person's version of events against another, as a result showing the difficulty forensics has at tackling questions over consent.

## Chapter Six: General discussion

The aim of this thesis was to explore the issues of consent in sexual offence cases and identify common types of absences of consent. A multi-disciplinary approach was developed to potentially address some issues with and surrounding consent. This chapter ties together all of the individual studies and highlight the key findings of each chapter in relation to the main aim.

### 6.1. Key findings from Chapter One: Review of the literature.

Following on from the introduction sections in Chapter One which explained the issue surrounding consent and the wider area of sexual offences, Chapter One also specifically focused on issues that either influenced consent or changed the circumstances of consent. The main aim of the literature review chapter was to encompass all information on issues with consent with the aim of highlighting any issues that could be overcome forensically. Figure 1.4 depicted a series of issues with consent and the number of articles that are associated with that issue, this figure highlighted the vast amounts of research into issues with consent. However, upon further reading of the literature the majority of articles focused on the individual issue as an influence on consent and did not compare to other issues to explore the implications of a combination of issues. Having an article that compares issues and suggests an issue to prioritise could have informed the focus of one of the following studies. This chapter aimed to create that piece of literature that combined all issues that surround consent to ultimately provide a clearer picture of the questions surrounding consent.

Research into the literature found that one of the key issues when consent is called into question for cases of sexual assault and rape is when either party; the victim or the



perpetrator are intoxicated. Monks, Tomaka, Palacios, and Thompson (2010) state that alcohol consumption affect 'perception, reaction time and decision making' all key factors when deciding to consent to intercourse or to not consent. However, it is not just alcohol that falls under the category of intoxication, drugs can also intoxicate an individual. The review of the literature underlined a huge gap in the legislation regarding alcohol, drugs, and consent, with that being sections 76(2)(d) and (f) of the Sexual Offences Act 2003. Section 76(2)(d) refers to the complainant being asleep or unconscious at the time of the relevant act, whereas s.76(2)(f) refers to a substance being involuntarily given to the complainant, which enables them to be stupefied or overpowered at the time of the relevant act (Sexual Offences Act, 2003). This gap in the legislation refers to an individual voluntarily consuming alcohol and involuntarily consuming alcohol. For example, if an individual has their drink spiked it is assumed, they did not consent and therefore protected by s.76(2)(f). However, for an individual who is voluntarily intoxicated i.e., drinks their own drinks willingly but does not reach the level of unconsciousness would only be protected under the general definition of consent. Therefore, one person's accounts when voluntarily intoxicated to another's versions of events makes it 'not surprising that courts have difficulty in accusations that involved intoxicated individuals' (Clough, 2019). Intoxication is a huge issue regarding consent, however, is also an incredibly complicated issue for forensic analysis to tackle because as stated before it is usually ends by deciphering the facts between two individuals and the addition of alcohol or drugs compounds the problem.

Following an issue that is clearly a complicated issue to overcome, Figure 1.4 showed that one area seemed to be researched a vast amount more than any other issue, is that of marital and acquaintance consent/rape. Marital and acquaintance rape is the term to

describe the sexual acts that are committed without either the wife's or partner/acquaintance consent or against their will (RAINN, 2019). Research into this area found that marital and acquaintance rape was a popular topic as it was not until 1991 that it became law that a husband could be charged with sexual assault or rape and consent was not all encompassing just because the couple was married. This law change posed the question of cases of rape between two previously consenting partners. For example, if a married couple had consenting intercourse on one day and then the following week separated but the husband then proceeded to have non-consensual intercourse, how would this be determined. While determining whether consent was granted proves difficult, forensically the element of rape can be researched. Studies has now started to focus on stain age predictions for these types of cases. Taking the example above, while there is an allegation of rape, the husband could suggest that physical evidence i.e., semen came from the previously consenting intercourse. Determining when a sample was deposited would have significant impact on debated cases of consent between two previously consenting partners and therefore became a focus of chapter Five.

## 6.2. Key findings from Chapter Three: Misconceptions of Sexual Offences and Consent survey.

As stated previously, Chapter One; the review of the literature aimed to research the issues around consent in order to determine which issues could be prioritised. The review found one issue that could be overcome forensically (marital and acquaintance rape), however understanding what the public believed to be a key issue could be beneficial. Therefore, Chapter Three comprised of a survey disseminated to the public on the misconceptions of sexual offences and consent.

The aim of this survey was twofold; firstly, to obtain the public's views and opinions on sexual offences and consent, but also to educate the public on certain aspects they may not be familiar with. There are many key findings that have emerged from this chapter for both elements of the aim. To begin with the public views and opinions on sexual offences and consent. A number of early questions in the survey centred on sexual assault and rape statistics, for example they gave participants options to choose for the number of sexual assaults or rapes that occur in the UK each year. At the time of the survey being disseminated in 2018 the ONS published the statistics that there were 150,732 recorded sexual offences in the year ending March 2018, with 53,977 of those being rape offences (Office for National Statistics, 2018). One of the key findings from these questions was that the public overestimated the number of sexual offences that occur each year, but underestimated the number of rapes that occur. Some of the participants in the study allude to different acts having different 'weights' as a potential reason for this. For example, one participant states "rape is the most heinous of sex crimes, and ultimately has a large punishment associated with it, whereas sexual offences cover all different acts, from touching to harassment, therefore more acts would surely mean more of them occurring."

Following onto the element of educating the public on certain aspects of sexual offences and consent, all questions such as those involving statistics had the published statistics included at the end of the survey. This was to help the public understand the prevalence of sexual offences in society. Colloquialism terms was an area that needed further explaining to a number of participants for example terms such as 'Stealthing' and 'Upskirting.' Of the 302 participants who answered the question "Do you know what 'Stealthing' is?" 157 did not know. Brodsky (2017) states 'Stealthing' is the non-

consensual removal of a condom during intercourse and one respondent clearly did not know what 'stealthing' is but once being told the definition, concluded that it is "definitely rape" and were "horrified to find out that stealthing is a thing".

The final couple of key findings that emerged from the survey on misconceptions surrounding sexual offences and consent provided the reasons for the subsequent chapters. Firstly, a key finding that links back to Chapter One and the literature review, was that of marital and acquaintance rape. A question asked participants to rank between 1 and 7 the most common influence on consent, the options being intoxication, submission, deception, fear, fraud, coercion, and marital and acquaintance consent (i.e., being in a marriage/relationship). 180 participants or 65.5% of all answers for the marital and acquaintance consent placed it at position four, neither the most common nor the least common influence on consent. This implies that the general public are confused about this issue or do not understand this issue, however it is clear based on literature that it is a critical issue (Willmott, 2016, RAINN, 2018). As the literature and the answers by the public highlight marital and acquaintance consent as an issue, it is therefore appropriate that further research into the subject was conducted (chapter Five).

The data generated in this chapter clearly shows the need for education of certain aspects of sexual offences and consent. One identifiable piece of training or education that can be imposed is making individuals aware that although you are in a relationship/married to someone that consent needs to be granted every time intercourse occurs, it cannot be assumed. It is understandable that saying "do you consent to this?" to your partner is unusual given the contexts of a relationship. However, those in relationships can have that conversation where another cue can be

used instead, as long as it cannot be mistaken as the opposite response (Treat, Church and Viken, 2016).

The second key finding that generated a study from the data collected in the misconceptions surrounding sexual offences and consent survey associates to rape myth acceptance. A number of sections of the survey related to rape myths, whether that be ranking different myths to determine which are the most common in society or reasons why a victim would not report their attack to the police. The question that asked participants to rank rape myths most common to least common did not show an overall myth that was deemed the most common by the public. This was one of the reasons why further research was conducted. While although there was no definitive prominent rape myth, further questions could be asked as to how accepting are individuals of these specific myths.

One of the open-ended questions in the survey asked participants their views on potential reasons why victims would choose not to report to the police. Comparing three data sets; RAINN, CSEW and this studies data, 13%, 17% and 22% of participants between that the police WOULD NOT do anything to help (RAINN, 2018; CSEW, 2018). This ultimately highlights the question of police perception. The data implies participants actively believe that the police would refuse to do anything regarding their case, for a fear that they would not be believed if their case contained any typical rape myths. From these sections on rape myths a study was conducted in Five the Pre-Jury Screening Tool to research rape myth acceptance further.

### 6.3. Key findings from Chapter Four: Pre-jury screening tool (P-JST)

This chapter was generated by public views on rape myth acceptance found in Chapter Three. The chapter intended to create a tool/scale that would highlight whether an

individual possessed negative rape myths that would stereotype victims and influence their decision should they sit on a jury. The study aimed to develop and validate the possibility of such a tool. The scale comprised 39 items split into 4 subscale sections; (a) individual perceptions surrounding consent, (b) beliefs about influences on consent, (c) the validity and need for biological evidence and finally (d) general and specific beliefs about rape myths.

The study found that based on split half reliability scores alongside overall Cronbach alphas scores, the P-JST Cronbach alpha for the scale as a whole was ( $\alpha = .929$ ). Each subscale also had a Cronbach alpha generated; perceptions surrounding consent ( $\alpha = .766$ ), influences on consent ( $\alpha = .729$ ), validity and need for biological evidence ( $\alpha = .589$ ) and beliefs about rape myths ( $\alpha = .913$ ). According to Salkind (2015) any Cronbach alpha above .70 shows a good split half reliability, with those nearing 1 showing excellent reliability and that the items in the scale are highly correlated. Subscale 3: validity and need for biological evidence and the corresponding statements were removed from the tool because of the low Cronbach alpha score, but also as analysis suggested the statements may not be measuring the same as the rape myth statements. Taking each of the subscales into account, they all have different key findings. Subscales 1 and 2 focused on the area of consent and showed there was a disparity between how consent is given for an act to occur or how it is retracted. Dougherty (2015) suggests it has always been that “no means no” and “yes means yes”, however the responses to the statement that ‘a verbal “yes” is needed every time intercourse occurs’ differs. The research highlights that only 50% of participants either agree or strongly agree with this statement indicating that body language or other forms are becoming enough to grant consent or indeed retract it.

The third subscale in the Pre-Jury Screening tool focused on the validity and need for biological evidence. Although as stated previously the subscale was removed from the final measure, the data still provided some interesting findings. The low mean values of the statements from the Likert scale indicated that the participants involved were unsure whether the presence of biological evidence would impact their verdict on a non-consensual intercourse case. Dinos et al, (2015) highlights that the absence of physical or objective evidence forces the jurors to assess which story they believe and ultimately are open to influences from stereotypes and attitudes, which this scale aims to reduce. According to Peterson et al, (2010) physical biological evidence is collected in 53% of rape cases. Of those, only 42.2% are submitted and then the majority (65.4%) of submitted evidence are examined. The study shows that 54.5% of cases result in a conviction when there has been physical biological evidence examined compared to only 5.5% when there is no examined evidence. This implies that forensic evidence present seems to be a predictor for conviction (Briody, 2002; Gabriel et al, 2010).

The final subscale surrounded rape myths and the acceptance of those myths. The accumulation of scores between 1 and 5 for each of the statements determined whether the participant was extremely unlikely, unlikely, likely, or extremely likely to believe rape myths and stereotypes. The measure found two participants were extremely likely to believe these rape myths and according to Bohner et al, (2009) individuals who have a high rape myth acceptance may inadvertently create a story that fits their cognitive schema. 20% of the participants in this study agree with the rape myth that 'younger women are more likely to put themselves into situations where they are likely to be raped'. The rape myth clearly focuses on the idea that these younger women are putting themselves in situations where they are more likely to be raped. A study conducted by

the Office for National Statistics (2020) highlighted that the highest portion of rapes occurring against women, happened in their own home at 38%. This contradicts the endorsement of those 20% in this study as you would assume that the victims would feel safe in their own home and therefore, not putting themselves in a situation to be sexually assaulted.

Contrastingly, a rape myth that is clearly not as highly endorsed, is that of 'if someone does not fight back, it cannot be classed as rape.' There are articles that believe that this is one of the biggest rape myths currently in society and that not fighting back is an indication of consent (Selby, 2020; RAINN, 2021; Rape Crisis, 2021). This myth is one that is highly contested due to the behavioural concept of a "fight or flight" response. It is these contested myths that this tool aims to overcome whether that be at court level or even at police level when reporting the offence to identify acceptance of myths and unconscious bias.

The final key finding from this chapter is that of the dissemination method. In this case the survey was circulated via an anonymous link on social media platforms and on one occasion heightened by a prominent psychologist focusing on victim blaming. Although this vastly increased the number of participants, those participants were predominately female with a vested interest in the area, and therefore may not be a true reflection of the general population. Albeit this study was looking at seeing if individuals possessed negative beliefs personally, rather than their data suggesting a population believed a certain way.

#### 6.4. Key findings from Chapter Five: Stain age prediction chapter.

The aim of this chapter was to establish whether using the gene expression levels of degraded semen specific mRNA markers could determine the age of a deposited stain.



When researching and undertaking these studies to achieve this aim a number of key findings arose. The first key finding from the research came from the primer optimisation study looking into the optimal annealing temperatures and concentrations of the primers for improved results. Based on the clarity of the bands the following temperatures were the optimal annealing temperatures for the primers chosen. GAPDH = 64°C, PRM1 = 60°C, PRM2 60°C, TGM4 = 58% and KLK3 = 57°C. Apart from KLK3, all other annealing temperatures for the remaining primers were identical to the temperatures found in the literature.

The research in this chapter highlighted the stability of the markers by way of Cq values generated through qPCR. A number of figures found in Chapter Five showed that GAPDH is very stable housekeeping gene to use in research studying the degradation profiles. The Cq values also showed that GAPDH is highly expressed meaning there is abundant product for further analysis. On the contrary to GAPDH, KLK3 although is shown as being a relatively stable gene, it is lowly expressed with Cq values being between 33 and 37. This is very unusual considering the role KLK3 has within semen because according to Prins (1999) It is the seminal fluid specific protein that is produced for the ejaculate to allow sperm to swim freely. It is also instrumental in dissolving the coagulum and cervical mucus, resulting in the semen becoming more liquid and allowing entry of sperm into the uterus (Baccaglioni et al, 2019; Balk, Ko and Bublely, 2003).

According to the Crime Survey for England and Wales (2020) it is estimated that 618,000 woman and 155,000 men have been victims of sexual assaults. It is therefore likely that in sexual offence cases biological samples recovered may be mixed with both semen and vaginal material present. This study introduced vaginal material to the semen sample to understand whether it would affect the degradation profile of the semen specific mRNA

markers. The research found that the introduction of vaginal material doesn't impact the degradation profiles/fold change of semen specific primers, only the housekeeping gene, GAPDH (as it is also found in vaginal material).

The final key finding that was generated from this study refers to the production of a stain age prediction model. Once determined that stain age prediction is viable the next stage would be to create a system that would input the qPCR data and fold change values of the markers and generate a time since deposition. However, the study found that multiple markers would have to be compared for such a model to work, rather than a single marker. This is because the degradation profile varies and is affected by the factors such as function, and environmental conditions. For example, the fold change of a single marker may suggest gene expression at day two to be 65% but also day six, meaning it would be unknown whether the sample was deposited within the last two days or the last six. Therefore, multiple markers would need to be compared. An example of this would be if a second marker showed on day two 80% gene expression but on day six only 40% and when analysed 65% and 80% gene expression respectively was shown, this implies that the sample was deposited in the last two days rather than the last six.

## 6.5. Recommendations

Throughout this research several recommendations have been devised.

- Data surrounding sexual offences and consent in the UK needs to be more readily available to the public than just the Crime Survey for England and Wales.
- The data should be published by a sole source to outline the problem rather than data being distributed by several government branches i.e. The Home Office and

the Ministry of Justice, this prevents more favourable data being selected to raise awareness of the prevalence of sexual offences and rape.

- In cases of sexual offences, it may be beneficial to provide the Pre-Jury Screening tool to the investigating officers to determine unconscious bias before being passed onto those who may sit of a jury for sexual offence cases.
- If the tool identifies those with negative beliefs, then it would be beneficial to educate those individuals about the misconceptions and myths surround sexual offences and consent, and maybe provide training opportunities for them.
- The development of a stain age prediction model analysing multiple markers at the same time would be incredibly beneficial to not only cases of a sexual nature but all cases where the time since deposition is up for debate.
- Mixed methods approach to sexual offences and consent are extremely valuable by providing hard physical evidence but also information that forensic science cannot deliver.

## Chapter Seven: Conclusion and further work

### 7.1. Conclusions

The overall aims of this thesis were to explore the issues of consent in sexual offence cases and identify strategies to overcome these issues. A multi-disciplinary approach was used to develop strategies that may potentially address some issues with and surrounding consent. From this overarching aiming several studies were generated these included, a survey into misconceptions surrounding consent and sexual offences, a tool to assess the prevalence of stereotypes/bias and rape myths in society and finally an age prediction study to determine when a stain was deposited. The main aim was met by achieving the objectives stated in Section 1.9.2.

In order to achieve these aims, what were the key issues that affect, and influence consent were needed to be understood. To do this a survey was devised to obtain information from the public on all areas of sexual offences and consent ranging from the prevalence of offences to rape myths. This research indicated that the concept of consent is changing. It used to be that for consent a verbal “yes” or a verbal “no” was needed for intercourse to occur or not. Although, the responses from a number of participants suggest that body language is now acceptable to base your decisions on whether consent is granted. However, body language is ambiguous, therefore is easily misinterpreted compared to a “yes” or a “no” and ultimately leads to questions over whether consent was indeed granted.

The main body of this research involved developing studies that look to overcome issues surrounding consent. The survey highlighted that there was a severe lack of understanding when it comes to consent between previously consenting partners

whether that be in a marriage or a relationship. A few responses by participants seemed to imply that consent was all encompassing within the relationship, and it was not needed to be said or indicated each and every time intercourse occurred. Due to this it was clear that research was needed to be conducted to determine when consenting intercourse occurred and when non-consensual intercourse transpired. The stain age prediction study aimed to do this.

Research from that study showed that it was possible to determine when a biological stain was deposited using the degradation profiles of a series of mRNA markers. Although, focusing on semen and sexual offence cases, the study highlighted the ease of which this research could be applied to all other body fluid types, whether that be bloodstains, saliva, or vaginal fluids. The results of the stain age prediction study provided a beginning point for the development of a stain age prediction model, using a number of body fluid specific markers in comparison with each other. Although not completed within this thesis, exactly how this could work can be found in the further developments section below.

The other study that comprised the main body of this research pertained to the acceptance of rape myths that incorporate consensual aspects. The survey found in Chapter Three emphasized that rape myths are widespread in society but did not disclose whether the participants themselves were accepting of these myths. Therefore, it was logical to research the levels of endorsement of rape myth by the general public. The research highlighted that those myths that closely relate to a the 'real rape' or 'classic rape' stereotype (attack by a stranger on an unsuspecting victim, in an outdoor location where threats of violence are used by the perpetrator which subsequently leads to physical resistance by the victim) are highly endorsed by the public (Ryan, 1988;

Krahe, 1992). Previous research has shown that this 'real rape' stereotype very rarely occurs, with up to 90% of rapes the perpetrator is known to the victim (Myhill and Allen, 2002). Therefore, if a very generic stereotype and myth is highly endorsed, it is important to understand whether and which other rape myths are too.

## 7.2. Future developments

As the area of sexual offences and consent is so broad there are numerous avenues that could be explored for further work. This section focused on areas that have arose from the studies conducted in this thesis.

Firstly, further exploration could be conducted on one of the questions in the Chapter Three survey asked about influences on consent and how common or least common those influences are. The question highlighted those 99 participants in the study thought intoxication was the most common influence on consent. Further work could be applied to this by looking into whether there should be a limit (similar to a drink drive limit) for engaging in intercourse where exceeding this limit the victim cannot consent England and Wales the alcohol limit for drivers is 80 milligrams of alcohol per 100 millilitres of blood or 35 micrograms per 100 millilitres of breath (GOV.UK, 2021). For example, if applied to this concept, a victim of alleged sexual assault could state that they could not have consented if they provided a breath test of over 35 micrograms per 100 millilitres. However, unlike drink driving where an individual can be caught driving a car (and a test taken almost immediately), intercourse occurs between two people and usually (for acquaintance sexual assault) acknowledgment of what occurred happens later on, and potentially the alcohol in their system will have dissipated. The other limitation to this concept is that of how different amounts of alcohol affects different people. According to Paton (2005) there are several factors that affect how different individual are with alcohol, such factors are; sex, size of the individual, previous exposure to alcohol and

whether they have an empty stomach or not. All these factors will affect an individual's decision making and the level of which they proceed beyond the capacity to consent. Therefore, to potentially counteract this problem, Song and Fernandes (2017) highlight the symptoms of consuming intoxicating substances that can be used in drug-facilitated sexual assault (DFSA), such as vomiting and nausea. As someone cannot be present to take a breath test to determine if they are above or below a level to consent, seeing physical signs (vomit) of the alcohol and drugs having an adverse effect could provide the evidence that this person is unable to consent, therefore any sexual acts upon them is an offence.

The second area for further work is that of the stain age prediction study. In this study, only a couple of variables were focused on such as the time period each sample was left to degrade. As seen in Chapter Five, some of the markers were expressed highly for a couple of days then immediately plateaued. This is an area for further work where the time period for degradation before extraction could be decreased to over hours. There are articles such as Doty, Muro and Lednev (2017) that have predicted the age of bloodstains over hours, leading up to years suggesting there is a need to conduct this over a period of hours. In this study, only 5 markers were used; GAPDH, PRM1, PRM2, KLK3 and TGM4, Chapter Five shows that a couple of the markers may not be suitable for stain age prediction based on the variability of the fold change. To combat this for further work, using other sperm and seminal fluid markers could be used such as Semenogelin 1 and 2 and Transition protein 1 (Haas et al, 2013; Lindenbergh et al, 2013; Sakurada et al, 2009 and Albani and Fleming, 2018). However, it is not just mRNA markers that can be used, there is also room for further research into stain age prediction using miRNA markers (Glynn, 2020).

There are also some generic changes that can be made to the study into stain age prediction as a whole, firstly, increase the population size from 5 different individuals used in this study. Secondly, replicate the study using other body fluids whether that be blood, vaginal fluid, saliva, or even nasal material (Van den Berge et al, 2016; Anderson et al, 2005; Bauer, Polzin and Patzelt, 2003 and Alshehhi and Haddril, 2020). Finally, in this study the variable of environmental conditions was kept the same for all samples, room temperature and in a dark cupboard. Obviously, with forensic crime scene samples the conditions are not going to be regulated, and therefore may impact degradation, a concept that is discussed in depth in Chapter Five. Further work could be conducted with changing of the environmental conditions to replicate crime scenes. For example, changing of temperature, storage conditions i.e., light, and dark but also whether the sample is stored as a stain or as a liquid.

In the stain age prediction study conducted in Chapter Five, vaginal fluid was added to a sample of semen to determine whether mixed sample affect the gene expression level of semen specific markers. Mixed samples contain different components that may inhibit various different elements of the experimental process such as PCR. Further work could be conducted to determine potential inhibitors. The presence of PCR inhibitors in a sample, unless removed completely during DNA extraction protocols, can result in a complete failure to amplify (Butler, 2010). In cases of sexual offences, there is chance that biological sample could contain blood, vaginal fluid or even lubricants. Inhibitors, such as haemoglobin, urea or EDTA found in lubricants, can affect the process (Li, 2008). Some inhibitors will affect cell lysis, therefore will influence how well DNA/RNA extraction occurs. Others will bind to *TAQ polymerase* ultimately impacting its ability to function during amplification (Butler, 2010) and Goodwin, Linacre, and Hadi (2007)



suggests chemicals such as EDTA (Ethylenediaminetetraacetic acid) will bind to the ions found in a PCR reaction. A potential study that could be conducted would look at the quantification data after extraction, after reverse transcription and after running on a gel to determine whether a mixed sample affects the quantity of RNA and if it inhibits the PCR process.

The final further work element that could be applied to the stain age prediction study is that of introducing machine learning and artificial intelligence into a prediction model. The aim of Chapter Five is to determine the age of a degraded sample based on the level of gene expression of a specific marker. Additional work would include developing a machine learning model and inputting all of the data obtained from Chapter Five and having an unknown sample with a calculated gene expression levels of a number of markers be compared against the original data set to calculate day of deposition. Microsoft (2020) suggest there are 6 steps to developing a machine learning prediction model as seen in Figure 7.1 below.

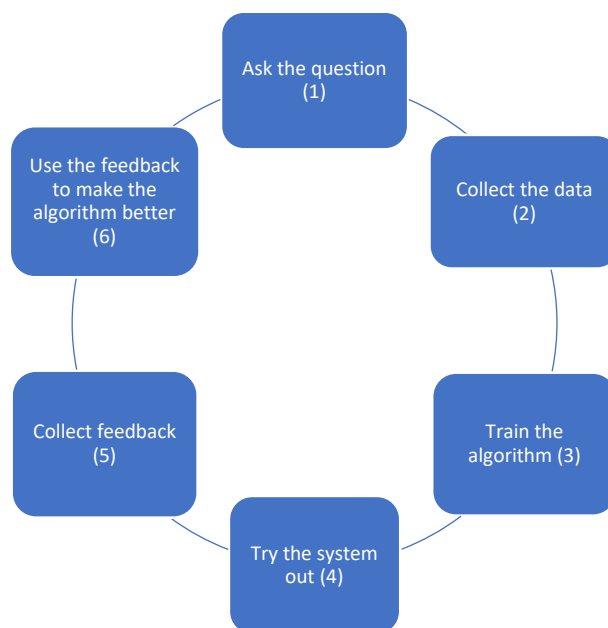


FIGURE 7.1: A BRIEF CYCLE OF MACHINE LEARNING

Stage 1 – Ask the question. This is essentially the aim of the study that is being conducted, for example, as seen in Chapter Five, is it possible to show that different body fluid specific primers degrade over time at different rates. Then can those rates be used to determine the time since deposition of a biological stain.

Stage 2 – Collect the data. This stage is the conducting of the study and retrieve the data. This data can then be inputted onto the machine learning software programme.

Stage 3 – Train the algorithm. This is where the algorithm is coded to do a specific act. For example, an algorithm may be coded so that when data is inputted, a prediction would be generated.

Stage 4 – Try out the system. This step applies a piece of data (unknown sample) to work out if the algorithm/machine learning system will process the data and generate a prediction.

Stage 5 – Collect the feedback. This stage relies on the output from the machine learning software.

Stage 6 - Use the feedback to make the algorithm better. This step is based on the feedback from the generated output that can be used so that the machine learning software learns. For example, if the stage 5 output prediction is accurate and correct, this step can be used to introduce variables that the system can adapt to. These variables will then be introduced in step 1 and 2, and the cycle repeats.

This cycle would then repeat, until various different markers, time periods and variables have been mapped out so that an unknown sample taken from a crime scene can be applied and a time of deposition generated.

This final area of further work that could be conducted pertains to the Pre-Jury Screening tool study. As this study only researched the acceptance of rape myths in society with

the aim of aiding with the jury members of a court case, further work could involve using mock juries. A number of articles such as Chalmers, Leverick and Munro (2021) have used mock juries to research jury deliberation in Scottish rape trials, and in this study 863 mock jurors were used. In total 342 participants were recruited for the PJST study and of those two participants were deemed to be extremely likely to believe in myths and misconceptions. Therefore, it is likely that at least five participants in the study above may fall into this category and the Pre-Jury Screening Tool would aid in identifying these negative views.

As stated previously, in other chapters many people have a fear that they will not be believed both by the jury in court but also by the police at the time of reporting. Therefore, it may be an interesting further work element to disseminate the Pre-Jury Screening Tool into police forces in the UK to understand whether there is any rape myth acceptance present within the force. This could then aid with the attrition levels that surround sexual offences and rape as the CSEW reports suggest that only 6.1% of all reported rapes lead to a conviction. The Crown Prosecution Service show that 9.8% of all reported sexual offences lead to a victim retraction due to a fear of not being believed, which a tool like this could aid with.

The area of sexual offences and consent is an overly complex and difficult field to research, both for its sensitivity but also for the fact that consent is given between two individuals and debate over that would ultimately come down to one word against another. It is hoped that this thesis provides new knowledge but also ways to help with sexual assault and rape cases.

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## Appendices

## Appendix A

### Misconceptions of sexual offences and consent survey information sheet

#### *Name of project – Absences of consent.*

My name is Thomas Bird, and I am a PhD researcher looking into the common absences of sexual consent and from this aim to develop forensic strategies to address the defences in lack of consent. To determine what are the common absences of consent when it comes to intercourse, I have designed this questionnaire. I aim to gather a section of the population's views on consent, from those who are invested in sexual offences in a research/employment capacity or to those that are not. The data from this questionnaire will inform the studies I wish to perform surrounding consent throughout my PhD.

#### *Information about the project.*

This section of my PhD will require you to complete a questionnaire on all things sexual offences ranging from UK statistics, absences of consent in literature to rape myths and rape culture. This questionnaire comprises of both multiple-choice questions and some questions which require a written answer.

#### *Your inclusion as a participant.*

Your inclusion as a participant will require you to consent to the completion of the questionnaire and the subsequent data analysis that will be carried out based on your answers. As a participant, your identification will remain completely anonymous, and you will have the option to omit answering any question you do not wish to answer. You may withdraw at any point during the questionnaire, although as the questionnaire is anonymous removal of your answered questions will not be possible, therefore may still be used for the purposes of data analysis.

#### *The questionnaire.*

The questionnaire will involve a series of questions relating to sexual offences. This should take only (insert time here) to complete. The multiple-choice questions just require a ticking of a box. The written questions require a sentence or more (if you want to go into depth about your answer). One of the questions will require you to rank options using numbers 1 – 8 (1 being the most common, 8 being the least) using drag

and drop. Once the questionnaire has been completed the answers will be compiled and data analysis carried out. In this questionnaire, those that have reported crimes to the police shall be acknowledged as victims and those committing the crimes shall be acknowledged as perpetrators.

*Confidentiality.*

In this study your participation is completely voluntary and therefore you can withdraw from the questionnaire at any time. However due to the anonymity of the questionnaire the information you input before withdrawing may still be collected. The questionnaire is completely anonymous, with no information regarding your identity recorded. Any data collected from this questionnaire will continue to remain anonymous and confidential and will only be used for the purposes of this study.

*Further questions and contact details.*

If you have any questions or queries about this questionnaire or would like further information about the studies being carried out, then do not hesitate to contact me on:

Name: Thomas Bird

Email address: [Thomas.bird@research.staffs.ac.uk](mailto:Thomas.bird@research.staffs.ac.uk)

If you would prefer to contact my supervisors regarding the questionnaire, then contact them on the following:

Name: Dr Laura Walton-Williams

Email address: [L.M.Walton@staffs.ac.uk](mailto:L.M.Walton@staffs.ac.uk)

Name: Dr Graham Williams

Email address: [Graham.Williams@staffs.ac.uk](mailto:Graham.Williams@staffs.ac.uk)

University address: School of Law, Policing and Forensics, Staffordshire University, Leek Road, Stoke-on-Trent. ST4 2DF.

If any of the questions during this questionnaire affect you and you require some support, then there are a number of helplines and services you can get in contact with.

(United Kingdom bases services)

24 hour - National Domestic Violence Helpline: 0808 2000 247

Rape Crisis National Helpline: 08088029999

SARC – Sexual Assault Referral Centres throughout the United Kingdom.

Samaritans helpline 116 123



### *Consent*

- I understand that my participation is voluntary, and completion of this questionnaire gives consent for my data to be used in this study.
- I understand that the data will be kept confidential and secure and will be completely anonymous.
- I understand that I will be asked generalised questions of a sexual nature, but those will not be personal to the participant.
- I understand if I have any questions or concerns that I can contact the researcher or supervisor using the contact details given.
- I agree to take part in this study.
- I confirm that I am aged 18 or over.
- By proceeding with participation, I am confirming that I wish to take part in this study and confirm that I agree to all the above statements.

By clicking the button below, you acknowledge that your participation in the study is voluntary, you are 18 years of age, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason.

Please note that this survey will be best displayed on a laptop or desktop computer. Some features may be less compatible for use on a mobile device.

I consent to taking part in this questionnaire.

I DO NOT consent to taking part in this questionnaire.



- On average what number of sexual offences in the United Kingdom do you think happen each year?

0-40,000	40,000-80,000	80,000-120,000
120,000-160,000✓	160,000-200,000	200,000+

- Of those sexual offences, how many are rapes?

0-15,000	15,000-30,000	30,000-45,000
45,000-60,000✓	60,000-75,000	75,000+

- What number of sexual offence cases are reported to the police?

0-15,000	15,000-30,000	30,000-45,000✓
45,000-60,000	60,000-75,000	75,000+

- Of those reported, what percentage lead to a conviction?

0%-10%✓	10%-20%	20%-30%	30%-40%	40%-50%	50%-60%
60%-70%	70%-80%	80%-90%	90%-100%		

- What percentage of reported sexual offences are actually false?

0%-10%✓	10%-20%	20%-30%	30%-40%	40%-50%	50%-60%
60%-70%	70%-80%	80%-90%	90%-100%		

- Of the options below, which types of sexual assaults are most likely to occur?

- Stranger attack
- Domestic setting e.g partner
- Acquaintance setting e.g on a date.



outdoor location where threats of violence are used by the perpetrator which subsequently leads to physical resistance by the victim.

Of 400 rape cases in a 2016 study, how many cases fit this “real rape” stereotype? Type your answer below.

- One of the most common rape myths is that “only strangers’ rape”, what percentage of rapes are committed by strangers?

0%-20%✓	20%-40%	40%-60%
60%-80%	80%-100%	

- Opposite to that of “only strangers’ rape”, what percentage of rapes are committed by partners/ex-partners?

0%-20%	20%-40%	40%-60%✓
60%-80%	80%-100%	

- Can consent be withdrawn during intercourse?

Yes No

If yes, why?/if not why?

- Do you know what ‘Stealthing’ is?

Yes No

You clicked no, can you explain what you think “stealthing” might be?

- Do you think that “Stealthing” (the non-consensual removal of a condom) – is rape?

Yes No Maybe Not  
sure.

Can you explain your answer?



(drag and drop)

- Intoxication
- Submission
- Deception
- Fear
- Fraud
- Coercion
- Marital and acquaintance consent (assumption that consent is granted because you are in a relationship)

## Appendix C

Wilcoxon comparisons for ranking questions in misconceptions of sexual offences and consent survey.

### Rape myths

- 1 v 2 = Women routinely lie about rape v Rapes are committed by strangers
- 1 v 3 = Women routinely lie about rape v Rapists use weapons and cause physical injury
- 1 v 4 = Women routinely lie about rape v Rapes occur outside in a dark alley
- 1 v 5 = Women routinely lie about rape v Women "cry rape" to cover up something
- 1 v 6 = Women routinely lie about rape v They ask for it
- 1 v 7 = Women routinely lie about rape v Only certain women are raped
- 1 v 8 = Women routinely lie about rape v If they were raped, they would have fought back
- 2 v 3 = Rapes are committed by strangers v Rapists use weapons and cause physical injury
- 2 v 4 = Rapes are committed by strangers v Rapes occur outside in a dark alley
- 2 v 5 = Rapes are committed by strangers v Women "cry rape" to cover up something
- 2 v 6 = Rapes are committed by strangers v They ask for it
- 2 v 7 = Rapes are committed by strangers v Only certain women are raped
- 2 v 8 = Rapes are committed by strangers v If they were raped, they would have fought back
- 3 v 4 = Rapists use weapons and cause physical injury v Rapes occur outside in a dark alley
- 3 v 5 = Rapists use weapons and cause physical injury v Women "cry rape" to cover up something
- 3 v 6 = Rapists use weapons and cause physical injury v They ask for it
- 3 v 7 = Rapists use weapons and cause physical injury v Only certain women are raped
- 3 v 8 = Rapists use weapons and cause physical injury v If they were raped, they would have fought back
- 4 v 5 = Rapes occur outside in a dark alley v Women "cry rape" to cover up something
- 4 v 6 = Rapes occur outside in a dark alley v They ask for it
- 4 v 7 = Rapes occur outside in a dark alley v Only certain women are raped
- 4 v 8 = Rapes occur outside in a dark alley v If they were raped, they would have fought back
- 5 v 6 = Women "cry rape" to cover up something v They ask for it
- 5 v 7 = Women "cry rape" to cover up something v Only certain women are raped
- 5 v 8 = Women "cry rape" to cover up something v If they were raped, they would have fought back
- 6 v 7 = They ask for it v Only certain women are raped
- 6 v 8 = They ask for it v If they were raped, they would have fought back
- 7 v 8 = Only certain women are raped v If they were raped, they would have fought back

### Reasons to report to the police.

- 1 v 2 = To protect the victim from further crimes by the offender v to stop the incident, prevent recurrence or escalation
- 1 v 3 = To protect the victim from further crimes by the offender v They believe they have a duty to do so
- 1 v 4 = To protect the victim from further crimes by the offender v to catch, punish and prevent the offender from re-offending
- 2 v 3 = To stop the incident, prevent recurrence or escalation v They believe they have a duty to do so



2 v 4 = To stop the incident, prevent recurrence or escalation v to catch, punish and prevent the offender from re-offending  
3 v 4 = They believe they have a duty to do so v to catch, punish and prevent the offender from re-offending

#### **Reasons to NOT report to the police.**

1 v 2 = For fear of retaliation v Believed that the police WOULD NOT do anything to help  
1 v 3 = For fear of retaliation v Believed that it was a personal matter  
1 v 4 = For fear of retaliation v Reported the crime to someone different than the police  
1 v 5 = For fear of retaliation v Believed that it was not important enough to report to the police  
1 v 6 = For fear of retaliation v Didn't want the perpetrator to be in trouble  
1 v 7 = For fear of retaliation v Thought that the police COULD NOT do anything to help  
2 v 3 = Believed that the police WOULD NOT do anything to help v Believed that it was a personal matter  
2 v 4 = Believed that the police WOULD NOT do anything to help v Reported the crime to someone different than the police  
2 v 5 = Believed that the police WOULD NOT do anything to help v Believed that it was not important enough to report to the police  
2 v 6 = Believed that the police WOULD NOT do anything to help v Didn't want the perpetrator to be in trouble  
2 v 7 = Believed that the police WOULD NOT do anything to help v Thought that the police COULD NOT do anything to help  
3 v 4 = Believed that it was a personal matter v Reported the crime to someone different than the police  
3 v 5 = Believed that it was a personal matter v Believed that it was not important enough to report to the police  
3 v 6 = Believed that it was a personal matter v Didn't want the perpetrator to be in trouble  
3 v 7 = Believed that it was a personal matter v Thought that the police COULD NOT do anything to help  
4 v 5 = Reported the crime to someone different than the police v Believed that it was not important enough to report to the police  
4 v 6 = Reported the crime to someone different than the police v Didn't want the perpetrator to be in trouble  
4 v 7 = Reported the crime to someone different than the police v Thought that the police COULD NOT do anything to help  
5 v 6 = Believed that it was not important enough to report to the police v Didn't want the perpetrator to be in trouble  
5 v 7 = Believed that it was not important enough to report to the police v Thought that the police COULD NOT do anything to help  
6 v 7 = Didn't want the perpetrator to be in trouble v Thought that the police COULD NOT do anything to help

#### **Influences on consent**

1 v 2 = Intoxication v Submission  
1 v 3 = Intoxication v Deception  
1 v 4 = Intoxication v Fear  
1 v 5 = Intoxication v Fraud  
1 v 6 = Intoxication v Coercion

1 v 7 = Intoxication v Marital and acquaintance consent (assumption that consent is granted because you are in a relationship)

2 v 3 = Submission v Deception

2 v 4 = Submission v Fear

2 v 5 = Submission v Fraud

2 v 6 = Submission v Coercion

2 v 7 = Submission v Marital and acquaintance consent (assumption that consent is granted because you are in a relationship)

3 v 4 = Deception v Fear

3 v 5 = Deception v Fraud

3 v 6 = Deception v Coercion

3 v 7 = Deception v Marital and acquaintance consent (assumption that consent is granted because you are in a relationship)

4 v 5 = Fear v Fraud

4 v 6 = Fear v Coercion

4 v 7 = Fear v Marital and acquaintance consent (assumption that consent is granted because you are in a relationship)

5 v 6 = Fraud v Coercion

5 v 7 = Fraud Marital and acquaintance consent (assumption that consent is granted because you are in a relationship)

6 v 7 = Coercion v Marital and acquaintance consent (assumption that consent is granted because you are in a relationship)

## Appendix D

Chi Squared test for association between demographic questions and the multiple-choice questions found in the misconceptions of sexual offences and consent survey.

Gender compared to multiple choice question*	P Value	Significant difference?	Assumption violated	Cramer's V Correlation coefficient	Effect size.
Number of sexual offences	.571	No	No	N/A	N/A
Number of rapes	.544	No	No	N/A	N/A
Number of cases reported	.122	No	Yes	N/A	N/A
Percentage that lead to a conviction	.014	Yes	Yes	N/A	N/A
Percentage of reports that are actually false	.027	Yes	Yes	N/A	N/A
Sexual assault most likely to occur	.233	No	Yes	N/A	N/A
Sexual assault most likely to be prosecuted	.020	Yes	No	.171	Small to medium effect
Rape can only be committed by a male	.080	No	No	N/A	N/A
Do you know what rape myths are?	.034	Yes	No	.179	Small to medium effect
Percentage of rapes committed by strangers	.231	No	Yes	N/A	N/A
Percentage of rapes committed by partners/ex	.356	No	Yes	N/A	N/A
Can consent be withdrawn?	.279	No	Yes	N/A	N/A
Do you know what 'Stealth' is?	.829	No	No	N/A	N/A
Is 'Stealth' rape?	.678	No	No	N/A	N/A
Is 'Upskirting' a sexual offence?	.007	Yes	Yes	N/A	N/A
Is it rape if anal sex occurs when vaginal sex was consented to?	.013	Yes	Yes	N/A	N/A
Age compared to multiple choice question*	P Value	Significant difference?	Assumption violated	Cramer's V Correlation coefficient	Effect size.
Number of sexual offences	.006	Yes	No	.197	Small to medium effect

Number of rapes	.062	No	No	N/A	N/A
Number of cases reported	.700	No	Yes	N/A	N/A
Percentage that lead to a conviction	.003	Yes	Yes	N/A	N/A
Percentage of reports that are actually false	.015	Yes	Yes	N/A	N/A
Sexual assault most likely to occur	.125	No	Yes	N/A	N/A
Sexual assault most likely to be prosecuted	.003	Yes	No	.167	Small to medium effect
Rape can only be committed by a male	.006	Yes	No	.190	Small to medium effect
Do you know what rape myths are?	.003	Yes	No	.187	Small to medium effect
Percentage of rapes committed by strangers	0.32	Yes	Yes	N/A	N/A
Percentage of rapes committed by partners/ex	.108	No	Yes	N/A	N/A
Can consent be withdrawn?	.289	No	Yes	N/A	N/A
Do you know what 'Stealthing' is?	.522	No	No	N/A	N/A
Is 'Stealthing' rape?	.118	No	No	N/A	N/A
Is 'Upskirting' a sexual offence?	.690	No	Yes	N/A	N/A
Is it rape if anal sex occurs when vaginal sex was consented to?	0.54	No	Yes	N/A	N/A
Expertise compared to multiple choice question*	P Value	Significant difference?	Assumption violated	Cramer's V Correlation coefficient	Effect size.
Number of sexual offences	.199	No	Yes	N/A	N/A
Number of rapes	.022	Yes	Yes	N/A	N/A
Number of cases reported	.607	No	Yes	N/A	N/A
Percentage that lead to a conviction	.786	No	Yes	N/A	N/A
Percentage of reports that are actually false	.495	No	Yes	N/A	N/A
Sexual assault most likely to occur	.854	No	Yes	N/A	N/A
Sexual assault most likely to be prosecuted	.252	No	Yes	N/A	N/A
Rape can only be committed by a male	.830	No	Yes	N/A	N/A
Do you know what rape myths are?	0.49	Yes	Yes	N/A	N/A
Percentage of rapes committed by strangers	.714	No	Yes	N/A	N/A
Percentage of rapes committed by partners/ex	.188	No	Yes	N/A	N/A
Can consent be withdrawn?	.888	No	Yes	N/A	N/A
Do you know what 'Stealthing' is?	.019	Yes	Yes	N/A	N/A
Is 'Stealthing' rape?	.164	No	Yes	N/A	N/A

Is 'Upskirting' a sexual offence?	.760	No	Yes	N/A	N/A
Is it rape if anal sex occurs when vaginal sex was consented to?	.521	No	Yes	N/A	N/A

## Appendix E

Bonferroni corrections – Influences on consent (Table 1) – Impact of gender on the position of influence.

- Red showing no significance. i.e., above the corrected Bonferroni correction.

1 v 2	1 v 3	1 v 4	1 v 5	1 v 6	1 v 7	2 v 3	2 v 4	2 v 5	2 v 6	2 v 7
0.0000 000	0.0000 000	0.0000 000	0.0000 000	0.0000 000	0.6773 518	0.2468 221	0.0000 000	0.0000 000	0.0000 000	0.0000 000
3 v 4	3 v 5	3 v 6	3 v 7	4 v 5	4 v 6	4 v 7	5 v 6	5 v 7	6 v 7	
0.0000 000	0.0000 000	0.0000 000	0.0000 000	0.0000 000	0.6284 191	0.0000 004	0.0000 000	0.0000 000	0.0000 000	

Bonferroni corrections – Rape myths (table 2) – Impact of gender on the position of the rape myth

1 v 2	1 v 3	1 v 4	1 v 5	1 v 6	1 v 7	1 v 8	2 v 3	2 v 4	2 v 5	2 v 6	2 v 7	2 v 8
0.000 0041	0.000 0001	0.001 0250	0.000 0038	0.003 8374	0.000 0478	0.421 7015	0.000 0000	0.000 0000	0.000 0000	0.050 0420	0.000 0000	0.000 0329
3 v 4	3 v 5	3 v 6	3 v 7	3 v 8	4 v 5	4 v 6	4 v 7	4 v 8	5 v 6	5 v 7	5 v 8	6 v 7
0.005 9564	0.013 3427	0.000 0000	0.045 9263	0.000 0000	0.909 1714	0.000 0000	0.801 7745	0.000 0115	0.000 0000	0.627 1342	0.000 0014	0.000 0000

6 v 8	7 v 8											
0.025 0149	0.000 0000											

## Appendix F

### Pre-Jury Screening Tool measure statements

The following statements assess the extent to which an individual believes perceptions surrounding consent. Use the following scale.

**1 = Strongly disagree, 2 = Disagree, 3 = Neither agree nor disagree, 4 = Agree, 5 = Strongly agree.**

**1. Consent should be obtained before any sexual activity.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**2. A lack of acknowledged consent before intercourse is fundamentally what makes this an act of rape.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**3. Any person can be raped.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**4. Only males can rape another person.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**5. Consent can be withdrawn during intercourse.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**6. It is rape if consent is given to vaginal intercourse, but anal intercourse occurs.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
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1                                  2                                  3                                  4                                  5  
**7. 'Stealthing' (the non-consensual removal of a condom part way through intercourse) is rape.**

Strongly disagree                  Disagree                  Neither agree or disagree                  Agree                  Strongly agree

1                                  2                                  3                                  4                                  5

**8. 'Upskirting' (the taking of a photograph under the clothes of another) is a sexual offence.**

Strongly disagree                  Disagree                  Neither agree or disagree                  Agree                  Strongly agree

1                                  2                                  3                                  4                                  5

**9. A verbal 'yes' is needed every time intercourse happens and needs to be clearly acknowledged by both parties.**

Strongly disagree                  Disagree                  Neither agree or disagree                  Agree                  Strongly agree

1                                  2                                  3                                  4                                  5

**10. Physical cues alone are not enough to give consent to sexual activity.**

Strongly disagree                  Disagree                  Neither agree or disagree                  Agree                  Strongly agree

1                                  2                                  3                                  4                                  5

**11. A verbal 'no' is needed for intercourse to stop.**

Strongly disagree                  Disagree                  Neither agree or disagree                  Agree                  Strongly agree

1                                  2                                  3                                  4                                  5

These next statements surround beliefs about influences on consent.

**12. Intoxication has an influence on whether consent is given or not.**

Strongly disagree                  Disagree                  Neither agree or disagree                  Agree                  Strongly agree

1                                  2                                  3                                  4                                  5

**13. Being deceived as to the nature of the sexual act about to take place would negate consent given to it.**

Strongly disagree                  Disagree                  Neither agree or disagree                  Agree                  Strongly agree

1                                  2                                  3                                  4                                  5

**14. Taking part in intercourse or a sexual act does not remove the need for consent.**

Strongly disagree                  Disagree                  Neither agree or disagree                  Agree                  Strongly agree

1                                  2                                  3                                  4                                  5

**15. Being coerced into sex, is not giving consent.**

Strongly disagree                  Disagree                  Neither agree or disagree                  Agree                  Strongly agree

1                                  2                                  3                                  4                                  5

**16. Consent is needed every time intercourse happens in marriages or relationships regardless of whether or not they have had intercourse before.**

Strongly disagree                  Disagree                  Neither agree or disagree                  Agree                  Strongly agree





**a. If the alleged rapist did not use a weapon, it cannot be called an act of rape.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**b. It cannot be called an act of rape if the woman does not have any bruising afterwards.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**c. If bruises are present, then this may be due to rougher consensual intercourse rather than rape.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**20. If someone says that they were raped, they should have prevented it by fighting back.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**a. If someone does not physically fight back, it cannot be classed as rape.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**b. If someone does not want sexual intercourse, they should do everything in their power to prevent it.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**c. If someone does not say 'no' it cannot be considered as rape**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**21. Only certain people are raped.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**a. If a woman acts provocatively, eventually she will receive sexual attention.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**b. Women that lead men on to unwanted sexual attention, cannot be surprised if it was to lead to intercourse.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**c. Younger women are more likely to put themselves into situations where they are likely to be raped.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**22. People who are victims of a sexual assault have done something to deserve it.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**a. If a person wears provocative clothing, they are asking for unwanted sexual attention.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**b. If a person is raped whilst drunk, they are somewhat responsible for letting things get out of hand.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**c. If a woman goes into a room alone with a man, it is her own fault if she is raped.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

These next statements assess the validity and need for biological evidence in cases taken to court.

**23. The presence of biological evidence in cases of alleged rape is of greater value than determining if there was a lack of consent.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**24. A lack of biological evidence will make proving an act of non-consensual sexual intercourse more difficult.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5

**25. Having biological evidence present makes proving an act of non-consensual sexual intercourse easier.**

Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1	2	3	4	5



## Appendix G

### Scale reliability of Pre-Jury Screening Tool

Question	Value	Result
<b>Subscale 1: Perceptions surrounding consent</b>		
1	R=.549 P=.000	Kept
2	R=.424 P=.000	Kept
3	R=.517 P=.000	Kept
4	R=.357 P=.000	Kept
5	R=.637 P=.000	Kept
6	R=.553 P=.000	Kept
7	R=.598 P=.000	Kept
8	R=.590 P=.000	Kept
9	R=.379 P=.000	Kept
10	R=.382 P=.000	Kept
11	R=-.182 P=.000	Removed due to negative correlation
<b>Subscale 2: Influences on consent</b>		
12	R=.401 P=.000	Kept
13	R=.573 P=.000	Kept
14	R=.574 P=.000	Kept
15	R=.623 P=.000	Kept
16	R=.552 P=.000	Kept
<b>Subscale 3: Beliefs about rape myths</b>		
17	R=.140 P=.000	Kept
18	R=.417 P=.000	Kept
19	R=.401 P=.000	Kept
20	R=.537 P=.000	Kept
21	R=.700 P=.000	Kept

22	R=.631 P=.000	Kept
23	R=.559 P=.000	Kept
24	R=.672 P=.000	Kept
25	R=.412 P=.000	Kept
26	R=.580 P=.000	Kept
27	R=.564 P=.000	Kept
28	R=.431 P=.000	Kept
29	R=.681 P=.000	Kept
30	R=.674 P=.000	Kept
31	R=.651 P=.000	Kept
32	R=.541 P=.000	Kept
33	R=.570 P=.000	Kept
34	R=.721 P=.000	Kept
35	R=.567 P=.000	Kept
36	R=.637 P=.000	Kept
37	R=.725 P=.000	Kept
38	R=.695 P=.000	Kept
39	R=.640 P=.000	Kept
<b>Subscale 4: Validity and need for biological evidence</b>		
40	R=-.204 P=.000	Removed due to negative correlation
41	R=.002 P=.488	Removed due to non- significant correlation
42	R=.042 P=.229	Removed due to non- significant correlation

## Appendix H

### Discriminative analysis of scale items in Pre-Jury Screening Tool

Question	Value	Result
1	Levene's test = Significant Equal variances not assumed = -6.525 P=.000	Kept
2	Levene's test = Significant Equal variances not assumed = -6.986 P=.000	Kept
3	Levene's test = Significant Equal variances not assumed = -5.161 P=.000	Kept
4	Levene's test = Significant Equal variances not assumed = -3.270 P=.001	Kept
5	Levene's test = Significant Equal variances not assumed = -9.683 P=.000	Kept
6	Levene's test = Significant Equal variances not assumed = -11.280 P=.000	Kept
7	Levene's test = Significant Equal variances not assumed = -11.317 P=.000	Kept
8	Levene's test = Significant Equal variances not assumed = -7.082 P=.000	Kept
9	Levene's test = Not significant Equal variances assumed = -7.869 P=.000	Kept
10	Levene's test = Not significant Equal variances not assumed = -8.472 P=.000	Kept
11	XXX	XXX Removed previously
12	Levene's test = Not significant Equal variances assumed = -5.313 P=.000	Kept
13	Levene's test = Significant Equal variances not assumed = -10.272 P=.000	Kept
14	Levene's test = Significant Equal variances not assumed = -11.590 P=.000	Kept
15	Levene's test = Significant Equal variances not assumed = -9.809 P=.000	Kept
16	Levene's test = Significant Equal variances not assumed = -9.773 P=.000	Kept

17	Levene's test = Not significant Equal variances assumed = -1.466 P=.1.45	Removed as it does not significantly discriminate.
18	Levene's test = Not significant Equal variances assumed = -8.663 P=.000	Kept
19	Levene's test = Significant Equal variances not assumed = -8.622 P=.000	Kept
20	Levene's test = Significant Equal variances not assumed = -6.866 P=.000	Kept
21	Levene's test = Significant Equal variances not assumed = -11.660 P=.000	Kept
22	Levene's test = Significant Equal variances not assumed = -13.041 P=.000	Kept
23	Levene's test = Not significant Equal variances assumed = -12.504 P=.000	Kept
24	Levene's test = Significant Equal variances not assumed = -14.459 P=.000	Kept
25	Levene's test = Significant Equal variances not assumed = -6.256 P=.000	Kept
26	Levene's test = Significant Equal variances not assumed = -6.561 P=.000	Kept
27	Levene's test = Significant Equal variances not assumed = -5.666 P=.000	Kept
28	Levene's test = Not significant Equal variances assumed = -8.803 P=.000	Kept
29	Levene's test = Significant Equal variances not assumed = -10.194 P=.000	Kept
30	Levene's test = Significant Equal variances not assumed = -7.035 P=.000	Kept
31	Levene's test = Significant Equal variances not assumed = -10.520 P=.000	Kept
32	Levene's test = Significant Equal variances not assumed = -6.216 P=.000	Kept
33	Levene's test = Not significant Equal variances assumed = -17.179 P=.000	Kept
34	Levene's test = Significant Equal variances not assumed = -15.880 P=.000	Kept



35	Levene's test = Significant Equal variances not assumed = -16.622 P=.000	Kept
36	Levene's test = Significant Equal variances not assumed = -6.180 P=.000	Kept
37	Levene's test = Significant Equal variances not assumed = -13.101 P=.000	Kept
38	Levene's test = Significant Equal variances not assumed = -10.021 P=.000	Kept
39	Levene's test = Significant Equal variances not assumed = -5.622 P=.000	Kept
40	XXX	XXX Removed previously
41	XXX	XXX Removed previously
42	XXX	XXX Removed previously

## Appendix I

Statistical analysis – Comparing days of degradation within each primer.

### Test for normality.

GAPDH = .003

PRM1 = .006

PRM2 = .493

KLK3 = .017

TGM4 = .034

P value (GAPDH) = .836

GAPDH – Kruskal-Wallis (Post hoc analysis)								
	Fresh	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Fresh		1.000	1.000	1.000	1.000	1.000	1.000	1.000
Day 1	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Day 2	1.000	1.000		1.000	1.000	1.000	1.000	1.000
Day 3	1.000	1.000	1.000		1.000	1.000	1.000	1.000
Day 4	1.000	1.000	1.000	1.000		1.000	1.000	1.000
Day 5	1.000	1.000	1.000	1.000	1.000		1.000	1.000
Day 6	1.000	1.000	1.000	1.000	1.000	1.000		1.000
Day 7	1.000	1.000	1.000	1.000	1.000	1.000	1.000	

P value (PRM1) = .755

PRM1 – Kruskal-Wallis (Post hoc analysis)								
	Fresh	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Fresh		1.000	1.000	1.000	1.000	1.000	1.000	1.000
Day 1	1.000		1.000	1.000	1.000	1.000	1.000	1.000
Day 2	1.000	1.000		1.000	1.000	1.000	1.000	1.000
Day 3	1.000	1.000	1.000		1.000	1.000	1.000	1.000
Day 4	1.000	1.000	1.000	1.000		1.000	1.000	1.000
Day 5	1.000	1.000	1.000	1.000	1.000		1.000	1.000
Day 6	1.000	1.000	1.000	1.000	1.000	1.000		1.000
Day 7	1.000	1.000	1.000	1.000	1.000	1.000	1.000	

P value (PRM2) = .000

PRM2 – ANOVA (Post hoc analysis)								
	Fresh	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Fresh		1.000	.735	.405	1.000	1.000	.009	.002
Day 1	1.000		.031	.014	.054	.144	.000	.000
Day 2	.735	.031		1.000	1.000	1.000	1.000	1.000
Day 3	.405	.014	1.000		1.000	1.000	1.000	1.000
Day 4	1.000	0.54	1.000	1.000		1.000	1.000	1.000
Day 5	1.000	.144	1.000	1.000	1.000		1.000	.628
Day 6	.009	.000	1.000	1.000	1.000	1.000		1.000
Day 7	.002	.000	1.000	1.000	1.000	.628	1.000	

P value (KLK3) = .001

KLK3 – Kruskal-Wallis (Post hoc analysis)								
	Fresh	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Fresh		.842	.574	.006	.012	.111	.637	.618
Day 1	.842		.717	.010	.022	.163	.502	.485
Day 2	.574	.717		.027	.053	.301	.301	.289
Day 3	.006	.010	.027		.785	.240	.001	.001
Day 4	0.12	.022	.053	.785		.367	.003	.003
Day 5	.111	.163	.301	.240	.367		.039	.036
Day 6	.637	.502	.301	.001	.003	.039		.979
Day 7	.618	.485	.289	.001	.003	.036	.979	

P value (TGM4) = .000

TGM4 – Kruskal-Wallis (Post hoc analysis)								
	Fresh	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Fresh		.043	.095	.675	.600	.685	.916	.007
Day 1	.043		.000	.014	.133	.105	.055	.000
Day 2	.095	.000		.212	.028	.038	.076	.296
Day 3	.675	.014	.212		.345	.410	.600	.022
Day 4	.600	.133	.028	.345		.904	.675	.001
Day 5	.685	.105	.038	.410	.904		.765	.002
Day 6	.916	.055	.076	.600	.675	.765		.005
Day 7	.007	.000	.296	.022	.001	.002	.005	

Statistical analysis – Comparing each primer with each day of degradation.

**Test for normality**

Fresh = .000                      Day4 = .010  
 Day1 = .000                      Day5 = .000  
 Day2 = .015                      Day6 = .000  
 Day3 = .001                      Day7 = .004

P value (Fresh) = .000

Fresh – Kruskal-Wallis (Post hoc analysis)					
	GAPDH	PRM1	PRM2	KLK3	TGM4
GAPDH		.162	.750	.000	.057
PRM1	.162		.280	.000	.001
PRM2	.750	.280		.000	.026
KLK3	.000	.000	.000		.004
TGM4	.057	.001	.026	.004	

P value (Day1) = .000

Day1 – Kruskal-Wallis (Post hoc analysis)					
	GAPDH	PRM1	PRM2	KLK3	TGM4
GAPDH		.639	.456	.000	.080
PRM1	.639		.782	.000	.200
PRM2	.456	.782		.000	.315
KLK3	.000	.000	.000		.000
TGM4	.080	.200	.315	.000	

P value (Day 2) = .000

Day2 – Kruskal-Wallis (Post hoc analysis)					
	GAPDH	PRM1	PRM2	KLK3	TGM4
GAPDH		.987	.014	.000	.002
PRM1	.987		.013	.000	.002
PRM2	.014	.013		.000	.558
KLK3	.000	.000	.000		.002
TGM4	.002	.002	.558	.002	

P value (Day3) = .000

Day3 – Kruskal-Wallis (Post hoc analysis)					
	GAPDH	PRM1	PRM2	KLK3	TGM4
GAPDH		.471	.018	.000	.048
PRM1	.471		.002	.000	.007
PRM2	.018	.002		.002	.700
KLK3	.000	.000	.002		.000
TGM4	.048	.007	.700	.000	

P value (Day4) = .000

Day4 – Kruskal-Wallis (Post hoc analysis)					
	GAPDH	PRM1	PRM2	KLK3	TGM4
GAPDH		.808	.017	.000	.110
PRM1	.808		.031	.000	.175
PRM2	.017	.031		.001	.426
KLK3	.000	.000	.001		.000
TGM4	.110	.175	.426	.000	

P value (Day 5) = .000

Day5 – Kruskal-Wallis (Post hoc analysis)					
	GAPDH	PRM1	PRM2	KLK3	TGM4
GAPDH		.987	.014	.000	.016
PRM1	.987		.013	.000	.015
PRM2	.014	.013		.000	.960
KLK3	.000	.000	.001		.001
TGM4	.016	.015	.960	.000	

P value (Day6) = .000

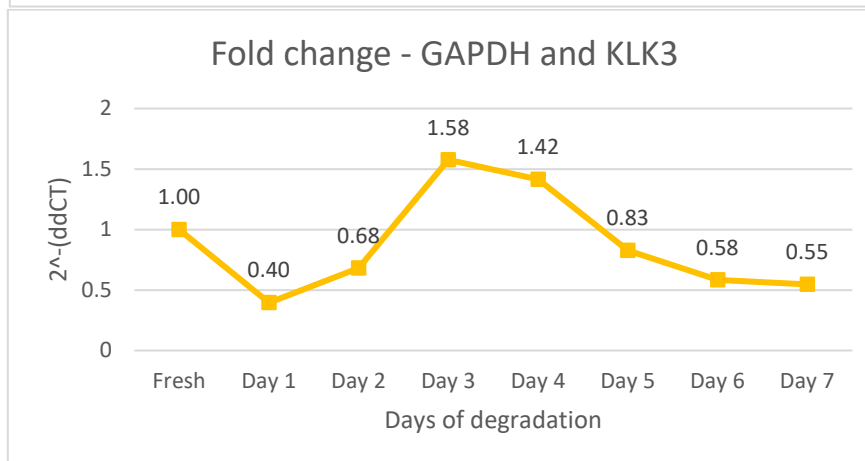
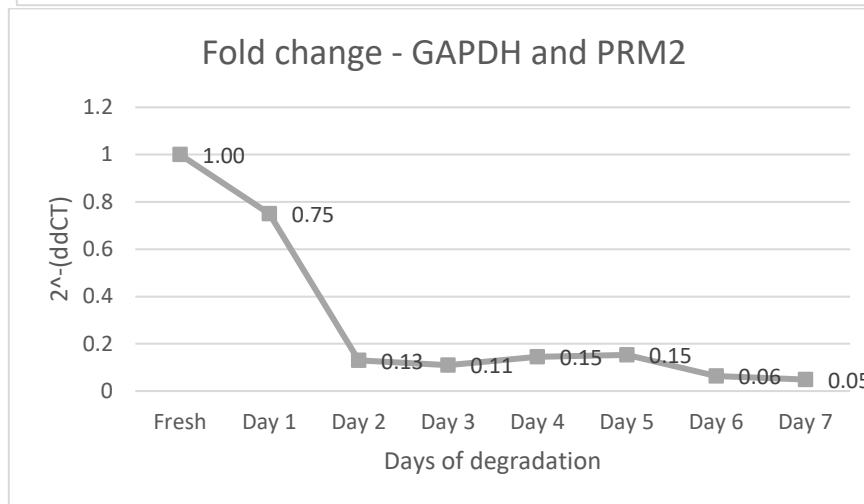
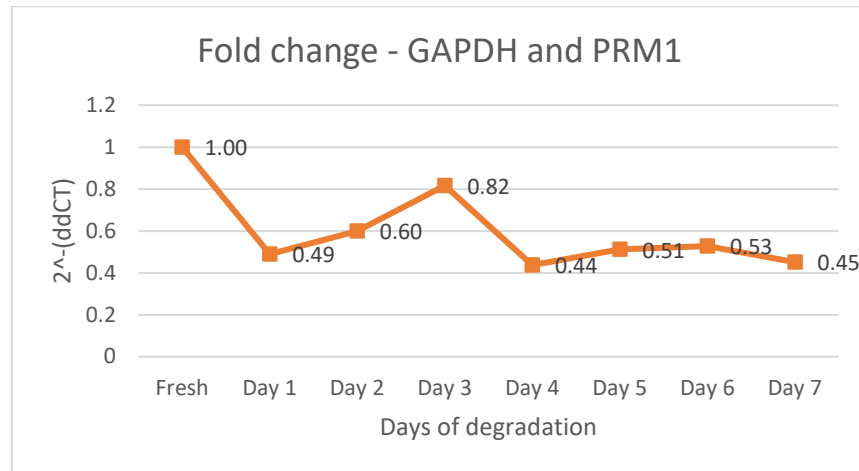
Day2 – Kruskal-Wallis(Post hoc analysis)					
	GAPDH	PRM1	PRM2	KLK3	TGM4
GAPDH		.651	.007	.000	.147
PRM1	.651		.002	.000	.057
PRM2	.007	.002		.004	.212
KLK3	.000	.000	.004		.000
TGM4	.147	.057	.212	.000	

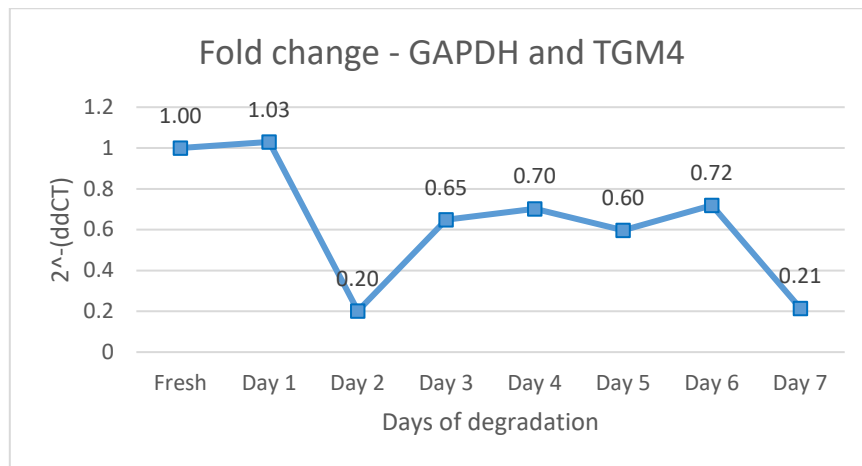
P value (Day7) = .000

Day2 – Kruskal-Wallis (Post hoc analysis)					
	GAPDH	PRM1	PRM2	KLK3	TGM4
GAPDH		.847	.004	.000	.033
PRM1	.847		.002	.000	.002
PRM2	.004	.002		.001	.960
KLK3	.000	.000	.001		.002
TGM4	.003	.002	.960	.002	

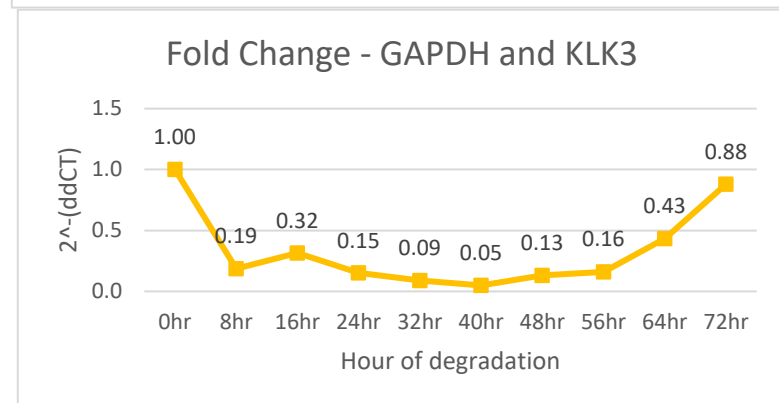
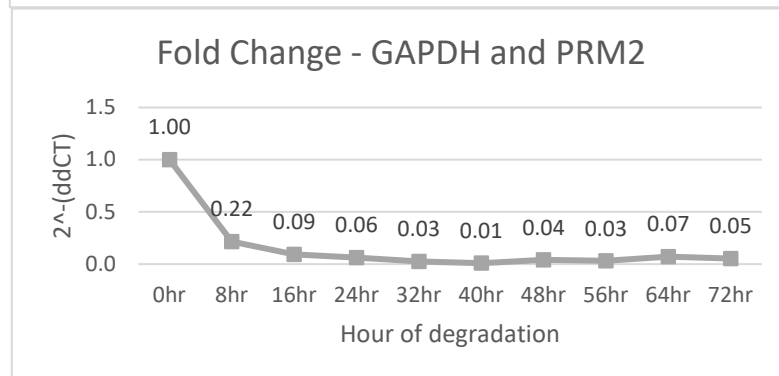
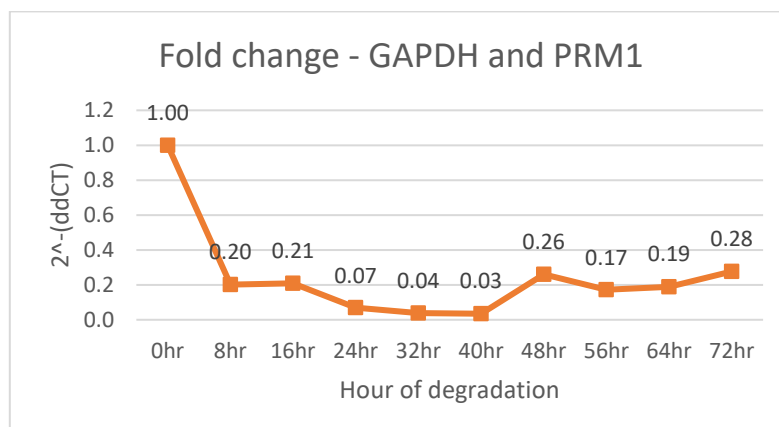
## Appendix J

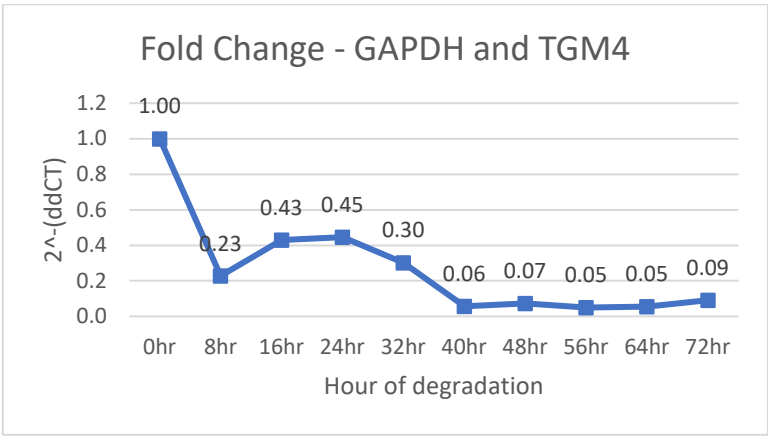
Fold change for main study over a 7-day period for each of the markers.



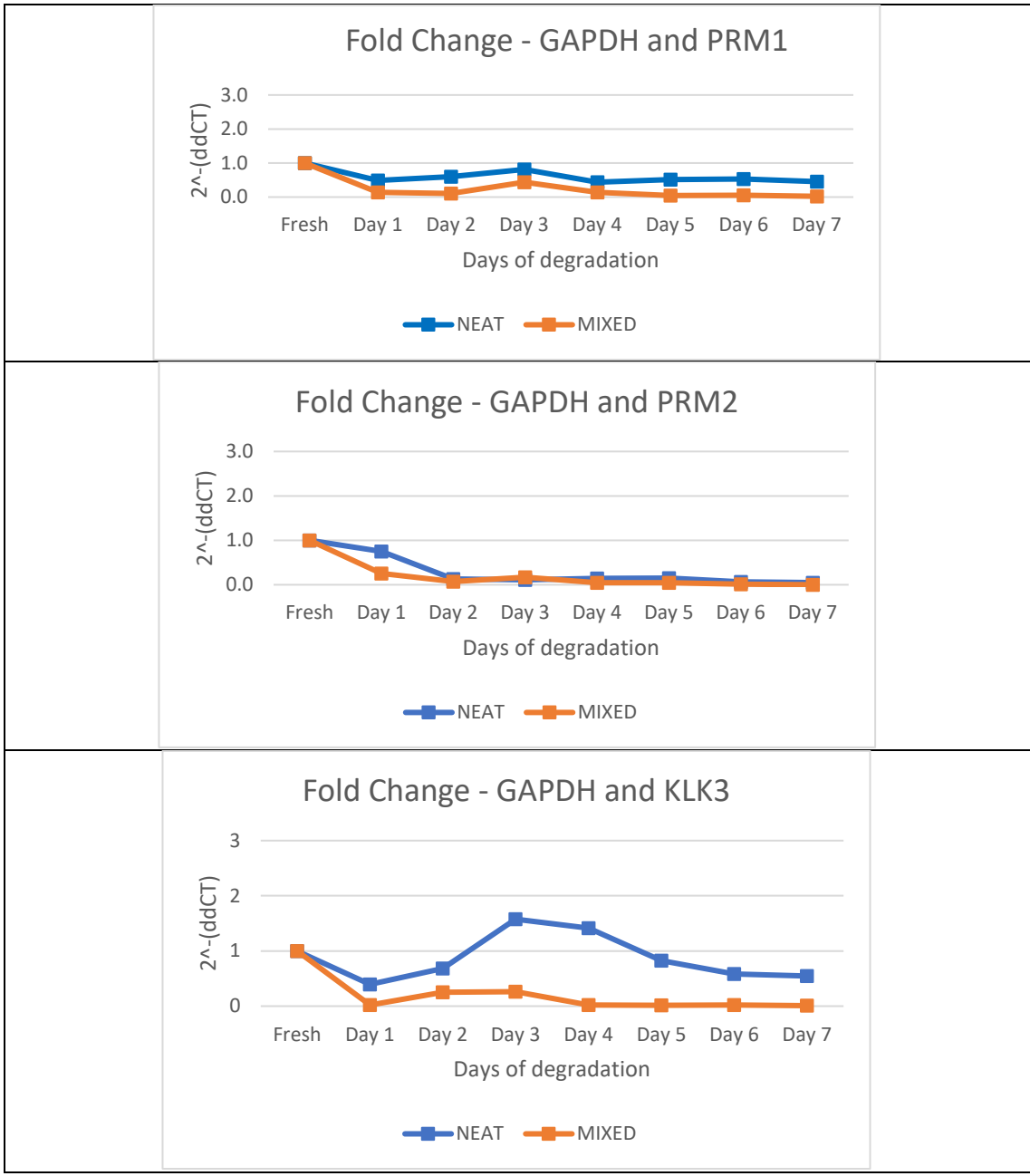


Fold change for the 3-day study for each of the markers

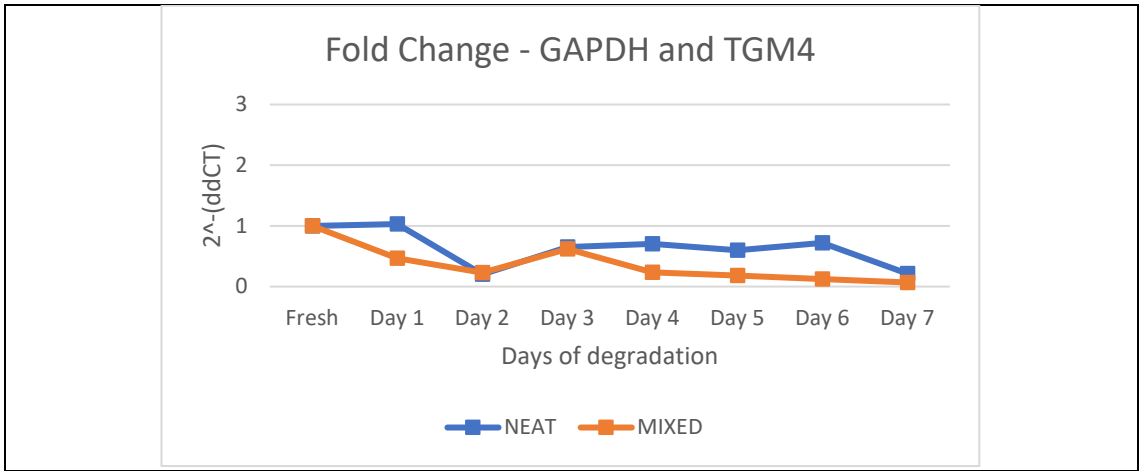




Fold change for the mixed study of each of the markers

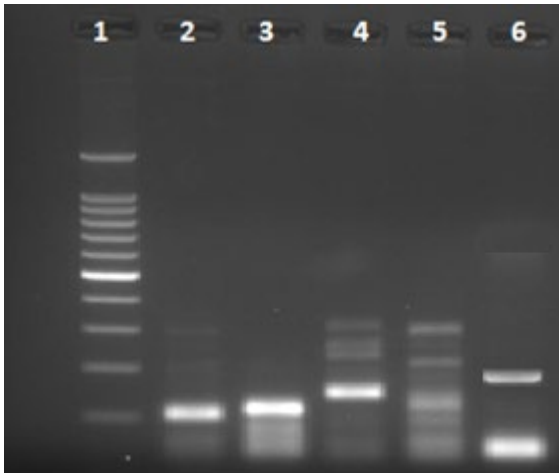






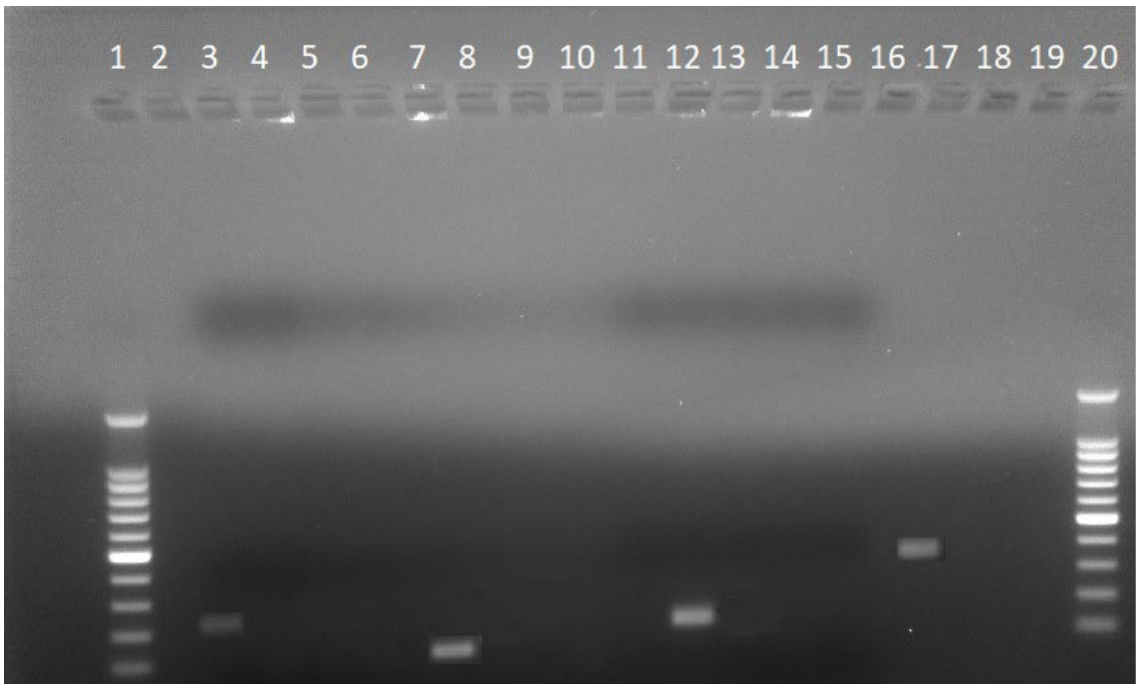
## Appendix K

Gel images for concentrations



Gel showing the differing concentrations used for the primers ranging from 50nM/ $\mu$ L to 250nM/ $\mu$ L (wells 2 to 6)

Gel image for body fluid specificity.



Gel image showing the markers chosen being semen specific compared to blood, saliva, and vaginal fluid. (Wells 2-5 PRM1 wells – body fluid - blood (2), semen (3), saliva (4) and vaginal fluid (5)). (Wells 6-9 – PRM2 wells – Body fluid - blood (6), semen (7), saliva (8) and vaginal fluid (9)). (Wells 10-13 – TGM4 wells – body fluid - blood (10), semen (11), saliva (12) and vaginal fluid (13)). Well 14 mis pipette. (Wells 15-18 – KLK3 wells – body fluid - blood (15), semen (16), saliva (17) and vaginal fluid (18)).