EFFECTS OF GENETIC AND EXPERIENTIAL EXPLANATIONS FOR KILLING ON SUBSEQUENT BUG-KILLING BEHAVIOUR AND MORAL ACCEPTANCE OF KILLING

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ABSTRACT

This study examined people's attitudes towards killing bugs and their bug-killing behaviour in the context of nature vs. nurture explanations of bug killing. Previous research shows that exposure to genetic (i.e., nature) explanations could have undesirable effects on people's attitudes and behaviour, compared to the exposure to experiential (i.e., nurture) explanations. Genetic explanations for killing may affect attitudes towards killing and killing behaviour, because they suggest that killing behaviour is predetermined or programmed by nature. Such explanations may also be used by individuals to overcome guilt and dissonance from prior killing or killing in which they are about to participate. This study tested the idea that exposure to genetic explanations for bug killing would lead people to view killing bugs as more morally acceptable, as well as lead them to kill more bugs. A sample of university students was randomly assigned into three conditions, in which they read either genetic or experiential explanations for why people kill bugs or read a neutral passage. The study utilised a procedure in which participants were led to believe that they were killing bugs (although in actuality no bugs were killed), to observe their killing behaviour in a self-paced killing task. Half of the participants were also asked to kill a bug prior to the self-paced killing task. Results showed that participants who read genetic explanations viewed bug killing as more morally acceptable, compared to participants who read experiential explanations, and this occurred particularly among those who engaged in the prior killing task. However, no similar effects emerged for the number of bugs killed, though there was a positive correlation between the moral acceptance of bug killing and the number of bugs killed. Implications of genetic explanations with respect to aggression and killing are discussed.

CHAPTER ONE

INTRODUCTION

1.1 Background

Killing is seen as the most destructive of all human behaviours and research shows that, along with torture, it is the most disapproved of all aggressive acts (Lagerspetz & Westman, 1980). Yet, the twentieth century alone has witnessed the killing of more than 200 million people, mostly in acts of genocide, massacres and extrajudicial executions (Rummel, 1986, 1995). While some theories emphasise existing social and cultural aspects to explain the origin, causes and prevalence of human aggression and killing (e.g., see Bandura, 1973; Berkowitz, 1993), others stress on biological, genetic and evolutionary mechanisms – whether they call it a “killer instinct,”[1] “party-gang traits” (Wrangham & Peterson, 1997, p. 167) or a “warrior gene” (e.g., see Gibbons, 2004). As apparent, these latter types of theories portray a very deterministic and pessimistic view of human nature because they suggest that humans are predisposed to aggression and killing. In fact, the renowned psychologist, Freud (1930/1989), who also associated aggression with instincts, believed that aggression is unavoidable and later in his life he became pessimistic about achieving peace in the world (Lippa, 1994, p. 434). This raises an important question – can such theories of killing affect people’s attitudes towards killing, or, more importantly, their killing behaviour?

[1] The phrase “killer instinct” is often used in reference to Konrad Lorenz’s work on aggression and instinct theory, although it is not known whether Lorenz himself used the phrase. For example, some of the copies of his book *On Aggression* carry the blurb “The Revolutionary study of the “killer instinct” in animals and man –The New York Times”.

Like many other issues of human behaviour or human nature, most theories and explanations of aggression and killing could fall into two different categories, genetic and experiential. By "genetic explanations" I refer to those theories and explanations that portray killing and other aggressive behaviours as inborn and innate. In contrast, "experiential explanations" refer to those theories and explanations that emphasise cultural or social factors, depicting killing and other forms of aggression as more malleable responses, and products of experience, socialisation and learning. Although many scholars now believe in the interaction between genetic and experiential factors, this issue, as depicted by the old nature-nurture debate, is still contentious. That is, scholars differ over the extent to which human behaviour is influenced by genes and experience, or the extent to which they emphasise one explanation over the other, as well as the implications that may follow by endorsing one aspect or the other (e.g., see Dupré, 2003; Eric, 2006; Herrnstein, 1990; Suzuki & Aronson, 2005; Dar-Nimrod, 2007).

The present research investigates killing behaviour in humans in the context of genetic versus experiential explanations. However, the purpose is not to engage in or evaluate the nature-nurture debate with respect to aggression or killing, but to study the potential implications of presenting one explanation for killing to the exclusion of the other. Critics of genetic proposals of human behaviour (e.g., S. D. Nelson, 1975) have long been concerned that genetic explanations may have negative psychological, social and political implications. For example, it may be possible that when such explanations are presented in isolation, they are more likely to constrain the way people think about harmful behaviours and so, they may be more likely to justify or perpetuate these behaviours.

If the above suggestions regarding genetic explanations are true, then the possibility exists that genetically-oriented scientific endeavours that aim to understand and so ultimately reduce aggression or killing may backfire—it may be that genetic explanations for killing behaviour create a tendency in people to approve of or accept killing more, as well as kill more. However, to date, no laboratory investigations have been conducted to understand the possible psychological effects of genetic explanations on people's attitudes about killing (e.g., moral acceptance of killing) or killing behaviour itself. Therefore, this study will mainly focus on exploring the effects of genetic explanations on killing behaviour and moral acceptance of killing, and their implications.

1.2 Genetic Explanations of Aggression and Killing

Genetic explanations have been applied in various forms to explain the causes of aggression, including killing behaviour in humans. These explanations range from the instinct theories that date back to Freud and Lorenz, to more recent hypotheses that are based on findings that link aggressive or violent behaviours with specific hormones and genes.

According to instinct theories, humans and other animals have innate aggressive impulses or drives that must be somehow released (Freud, 1930/1989; Lorenz, 1966). According to Freud, these instincts can only be suppressed at the expense of the individual's own pleasures. Lorenz went on to suggest that many of the social and psychological problems that human beings are facing today could be a result of the inadequate discharge of these aggressive impulses. Thus, according to Lorenz, killing among humans appears to be an excessive form of discharging these innate aggressive impulses; and although there are also social instincts or inhibitions against killing, the rapid cultural and social developments, including the invention of hi-tech weapons, has upset the balancing mechanism.

Whereas instinct theories suggest that aggressive behaviours are innate and impulsive, theories based on evolution and evolutionary psychology try to understand why and how such instincts first originated in us. According to evolutionary theories, aggression is a behaviour inherited from our ancestors, who were successful in adapting to certain problems by means of these behaviours (Buss & Shackelford, 1997). In fact, Buss (2005, pp. 36, 240), asserts that the human mind has evolved with certain adaptations that motivate us to kill. According to these evolutionary theories, killing becomes the perfect behavioural strategy, especially for males, under certain circumstances. Wrangham and Peterson (1997) stated in more explicit terms that we are "cursed with demonic males" (p. 167). The authors explain this as follows:

> why are human males given to vicious, lethal aggression? Thinking only of war, putting aside for the moment rape and battering and murder, the curse stems from our species' own special party-gang traits: coalitionary bonds among males, male dominion over an expandable territory, and variable party size. The combination of these traits means that killing a neighbouring male is usually worthwhile, and can often be done safely. (p.167)

Similarly, in a more recent proposal, Nell (2006) suggests that killing and other cruel behaviours are products of our evolutionary past that became reinforced during predation. This reinforcement was brought about by what Nell calls the "pain-blood-death" (p. 212) complex that involves certain stimuli, such as the sight and sounds of the prey's struggle to escape and the sight of its blood while being eaten alive. According to Nell, these reinforcers may have become attached, for example, to modern day warfare during the transition from predation and consumption to non-nutritional killing. Thus, wars and other aggressive behaviours that cause most of the non-nutritional killings could be explained as products of predatory adaptations that we have inherited from our evolutionary ancestors.

In addition to these evolutionary theories, the advancement of technology has enabled scientists to look more deeply into the biological and genetic make up of animals to study aggressive behaviours. A number of studies suggest that certain hormones, neurotransmitters and genes are associated with aggressive and violent behaviours. For example, the deletion of a gene that produces nitric oxide, which functions as a neurotransmitter, or the inhibition of the enzyme which specifically secretes nitric oxide, was associated with an increase of aggression in mice (R. J. Nelson, 1995; Trainor, Workman, Jessen, & Nelson, 2007). Similarly, a defect in the gene that produces the enzyme monoamine oxidase-A (MAO-A) that is responsible for regulating certain neurotransmitters in the brain was linked to aggressive behaviour in mice (Cases et al., 1995) and also to aggressive behaviours in members of a particular family with known impulsive aggression (Brunner, 1993). This gene found on the X chromosome is now more popularly known as the "warrior gene" (Gibbons, 2004). Accordingly, a number of subsequent studies have carried out research in the light of the MAO-A gene's association with harmful and aggressive behaviours, such as for example, in exploring the link between maltreated children and aggression (Caspi et al., 2002), or in studying aggressive or risk-taking behaviours among different ethnicities (see Lea & Chambers, 2007).

Although there are several variations in the different genetic explanations discussed above, they all suggest that aggressive behaviours and killing are largely inborn or inherited. Similarly, all these explanations underline the deterministic nature of human aggression. Moreover, although theories such as the instinct theory have been refuted or considered as outdated among the scientific community (Myers, 1999), research suggests that they are still popular among the general public and are influential in shaping people's attitudes and behaviours (e.g., Bushman, 1999).

So, it seems that with the advancement of science, older concepts such as the killer instinct or warrior instinct have become obsolete, but only to be replaced by concepts such as the warrior gene, and the essence of genetic explanations and its message to the public still remain the same. In fact, as it will be evident in the next section, genetic explanations of human behaviour have gained more popularity in recent times.

Therefore, before reviewing the possible psychological effects of genetic explanations, firstly, in the following section, I will analyse the influence of genes at both the societal and at the individual levels.

1.3 Popularity and Influence of Genetic Explanations

In August 2006, the news media in New Zealand and Australia were filled with reports of research in which scientists had found that Maori men have an over-representation of the warrior gene, thereby suggesting that Maoris are predisposed to violence and aggression (e.g. "Maori 'warrior'," 2006; "Warrior gene," 2006). These reports were based on the findings presented at a genetic conference in Australia by the New Zealand researcher Dr. Rod Lea and his colleagues (Lea, Hall, Chambers, & Griffiths, 2006). The study was later criticised by other researchers on several scientific and methodological grounds. These include the lack of substantial evidence to make direct associations between MAO-A and aggression, the use of a small sample in the study, and the subsequent generalization (see Merriman & Cameron, 2007). Although the authors later claimed that their study was misunderstood and misquoted (Lea & Chambers, 2007), by then it had been widely covered by the media, especially in New Zealand, receiving much public attention and leading to controversy and debate (e.g., see Bennetts & McLean, 2006).

The warrior gene hypothesis and the example of the research based on it mentioned above illustrate the popularity of genetic explanations with the public, as well as the sensitiveness of these genetically-oriented explanations. Moreover, during the last few decades, perhaps with the advancement of science and technology, genetic explanations as a basis for understanding human nature and human behaviour have gained popularity (Have, 2001; Lippman, 1991). For instance, the Human Genome Project and related undertakings are seen as revolutionising the fields of biomedicine, health sciences and behavioural sciences (Phelan, 2005). According to Lippman, we are going through a *geneticization* process where individual differences and explanations and origins of behaviours or disorders are popularly told in genetic and hereditary terms. These views that suggest that we are essentially and ultimately products of our genetic makeup are often referred to as *genetic essentialism* (Nelkin & Lindee, 1995; Phelan, 2005).

Likewise, genetic explanations are becoming more widely accepted by the general public (Conrad, 1997). For example, a Gallup poll suggests that in 1987, 60 percent of Americans believed that alcoholism is inherited, whereas a similar poll five years before showed that the majority did not believe that alcoholism is inherited (Peele, 1990). The extent to which society and popular culture are preoccupied with genes and genetic information has led some scholars to state that the gene has become a cultural icon of the modern world (Nelkin & Lindee, 1995).

A major contributor to this popularity of genes and genetic explanations seems to be the media. As Conrad (1997) suggests, genetics seems to make good news. However, often that involves oversimplifying or misrepresenting the actual scientific claims on one hand and exaggerating or over-generalising inferences on the other hand. For example, although specific instincts, drives or genes do not solely determine, cause or control our characters and behaviours, and although theorists would usually acknowledge the influence of social, cultural and environmental factors (e.g., Buss, 2005; Lorenz, 1966; Wrangham & Peterson, 1997), it has been alleged that such information is not delivered to the public or portrayed in a manner that is congruent with the actual scientific findings (Conrad, 1997). One main reason for such incongruence could be that the scientific information that is passed to the public through the popular media is not regulated and constrained in the same manner as in scientific journals or peer reviewed articles (Conrad, 1997; Rothstein, 2005). In addition, such media reports are often based on preliminary findings where researchers use media outlets to announce their findings hastily (Rothstein, 2005). Moreover, the prevalent political ideologies in a society can also influence the way the media report such findings (Brescoll & LaFrance, 2004), thereby affecting the way this information is disseminated to the public.

The reason genetic explanations have become so invasive and powerful could also be that despite the pessimistic and deterministic view of human nature that they portray, there are certain aspects of genetic explanations that may appeal to people. Firstly, as Rothstein (2005) suggests, genetic explanations of human behaviour may appear to individuals to be “high tech” compared to experiential explanations. The reason could be that genetic explanations are based more on “harder” sciences such as biology and neuroscience that may be seen as more “concrete” or “tangible”, compared to the social sciences on which experiential explanations are based (Nelson, 1975). Secondly, in genetic explanations, specific human behaviours such as killing are linked to corresponding instincts, genes or hormones, in contrast to experiential explanations that are based on experience, cultural influences or learning mechanisms. In other words, as Conrad (1997) suggests, genetic explanations provide primary causes and specificity about behaviours. It may be that people in general prefer to think about the causes of behaviour and social problems in simple and direct terms (Nelson, 1975). Thus, genetic explanations of human aggression and killing may appeal to individuals because in addition to the perceived scientific aspects, they are often simple and easy to understand in their more basic forms.

In sum, the popularity and influence of genetic explanations in society can be largely attributed to the advancement and success of genetic research and its disproportionate and often inaccurate presentation by the media. Moreover, I have presented some possible reasons, despite the deterministic and pessimistic nature of genetic explanations, that the general public may still be attracted to genetic explanations. Thus, regardless of the level of accuracy in genetic explanations, media reports and public perceptions of genetic explanations, these factors may further promote the popularity of genetic explanations.

In the next section, I will discuss the possibility that genetic explanations of human nature or human behaviour may have psychological and behavioural implications, and then present some of the relevant research literature.

1.4 Effects of Genetic Explanations on People's Attitudes and Behaviour

Given the popularity that genetic explanations seem to be enjoying, it is particularly critical to examine whether the adopting of these explanations affects the way people think or act.

As mentioned earlier, the concern with emphasizing genetic explanations to the exclusion of experiential explanations is that, because genetic explanations suggest that human behaviours are predetermined, thereby supporting a genetic essentialist view of human nature, they are more likely to constrain the way people think and act. For example, several scholars have suggests that theories about human nature can have effects on their subject matter and lead to a *self-fulfilling prophecy* (Dupré, 2003; Nelson, 1975). A self-fulfilling prophecy is “in the beginning, a *false* definition of the situation evoking a new behaviour which makes the original false conception come *true*” (Merton, 1949, p. 181). Therefore, convincing people that aggression or killing is in their nature or genetic makeup, as many genetic explanations suggest, may lead people to think and act in ways that confirm these ideas.

This self-fulfilling effect of genetic explanations may occur for several reasons. One is that when people accept a certain behaviour as something instinctually or genetically programmed into them, they may view it as the way it ought to be, and so accept and act on these behaviours more readily. Similarly, as suggested earlier, genetic explanations may lead people to think pessimistically about themselves, others and the problems of the world. In turn, this may lead to a feeling that these behaviours cannot be altered, and so may lead again to the accepting of and/or acting upon these behaviours more readily.

However, theorists espousing genetic-related explanations for behaviour respond to the above suggestion by arguing that science is and should be value free and therefore, drawing moral or ethical conclusions from scientific findings is committing a *naturalistic fallacy* (cited in Dupre, 2003; Postmes, 2003). A naturalistic fallacy refers to “the mistake of deriving what ought to be from what is, or occasionally vice versa” (Coleman, 2001, p. 478). In the current context, one would be committing a naturalistic fallacy if they assume that just because aggression or killing is genetic or natural, it is moral or justifiable. The argument is meant to remind us that genetic explanations of killing and other human behaviours should not necessarily affect our moral judgments or behaviours because they do not necessarily imply that these behaviours are right or justified.

However, although this argument suggests that we should not view genetic explanations as the way things ought to be, people may nevertheless respond in that manner when learning about these explanations. Several studies suggest that explanations rooted in genetic, biological and evolutionary theories may still have implications for people's views, attitudes or judgements about themselves, others and about the problems of the world**.**

For example, a study by Brescoll and LaFrance (2004) found that exposing participants to biological explanations about gender differences resulted in more stereotyping about gender, as compared to the exposure to sociocultural explanations. The researchers also found that sociocultural explanations increased participants' beliefs about the mutability of such gender differences, whereas biological explanations did not have such an effect. The study used fictional explanations presented as a newspaper report about a gender difference in the ability to identify plants, referring either to biological or sociocultural factors as the cause of the difference.

Furthermore, a recent study by Dar-Nimrod and Heine (2008) suggests that exposing people to genetic explanations leads the participants to judge a sex offender more leniently. According to the authors, the explanations focused on the issue of gender differences in mate selection, based either on evolutionary arguments or social arguments. Similarly, a study by Monterosso, Royzman, & Schwartz (2005) suggests that genetic explanations may facilitate people to judge undesirable behaviours more leniently. The study examined participants' judgements of the responsibility of actors who were depicted as having committed a socially or personally undesirable behaviour, such as setting fire to a building or overeating, respectively, when their misdeeds were explained either physiologically or experientially. Physiological explanations, such as a chemical imbalance or genetic abnormality, led participants to exonerate the anti-social actors, in contrast to experiential explanations such as abusive parents. These studies support the suggestion that genetic explanations may have negative implications for people's attitudes and judgements.

Moreover, some studies also indicate that genetic explanations could also affect people's behaviour or performance. One such example is a study by Dar-Nimrod and Heine (2006) which investigated whether women's maths performance could be affected by exposing them to either genetic or experiential explanations for the stereotype of women's underachievement in maths. The results of this study indicated that the deficit in women's maths performance is reduced when women are presented with experiential accounts of the origins of the stereotyping as compared to the genetic accounts. A possible reason for such effects may be that genetic explanations lead people to believe that their behaviour is more fixed or less malleable. In fact, Aronson, Fried, and Good (2002), in testing a method of helping African-American students to resist underperformance, encouraged participants in the experimental group to view intelligence as a malleable rather than a fixed capacity. According to the authors, these participants reported a greater enjoyment of the academic process and greater academic engagement and obtained higher grade point averages than their counterparts in control groups.

The studies mentioned above indicate that genetic explanations could result in a self-fulfilling effect, possibly because such explanations lead people to unwittingly commit a naturalistic fallacy, as well as adopt pessimistic and deterministic views about moral and behavioural issues. A second reason that genetic explanations may have a self-fulfilling effect is that they may be used to justify undesirable behaviours that one has already committed or will have to commit in the future. In other words, because genetic explanations suggest that behaviours are more immutable and determined, they perhaps provide better excuses for such behaviour. One line of evidence which is consistent with this possibility comes from a series of studies and findings by Postmes and colleagues that examined the implications of endorsing theories rooted in biology about gender differences (Postmes, 2003). According to Postmes, these studies suggest that evolutionary explanations are associated with certain ideologies and behavioural intentions that seek to legitimate and perpetuate gender inequality.

In the next section, I will discuss in some detail the possibility that genetic explanations may also influence people’s attitudes towards killing and their killing behaviour in a way that may perpetuate aggression or killing.

1.5 Possible Effects of Genetic Explanations on Killing Behaviour and Attitudes on Killing

As evident from the types of genetic explanations discussed in section 1.2, a major underlying feature of genetic explanations is that they suggest that our behaviours are predetermined and thereby suppose a deterministic view of human nature. In other words, genetic explanations suggest that we are in a certain way because we are programmed to be that way. Previous research findings discussed above support the claim that genetic explanations for human behaviour have implications for people's attitudes, judgments and behaviours. They also support the possibility that such deterministic ideas about different aspects of human nature and human behaviour could affect corresponding behaviours and attitudes. Therefore, genetic explanations of killing may also affect people's moral acceptance level and behaviour with respect to killing.

As with genetic explanations for other behaviours, different reasons may exist for why genetic explanations of killing behaviour may facilitate killing and lead people to accept killing as morally more justifiable.

First, since genetic explanations suggest that people are innately aggressive (Lorenz, 1966), their minds are adapted to kill (Buss, 2005), or that there are certain genes and hormones responsible for killing, exposure to such knowledge may lead people to think that killing is somewhat acceptable—that what is natural or genetic is the way things ought to be—thereby committing a naturalistic fallacy. The research discussed above suggests that explanations espousing such genetic ideas have effects on people's attitudes towards morally related issues; for example, on how people attribute responsibility for undesirable behaviours (Monterosso et al., 2005) or pass judgements on such offenders (Dar-Nimrod & Heine, 2008). Therefore, if killing is seen as something in our nature, people may find it more morally right and more acceptable.

Moreover, committing this naturalistic fallacy may also facilitate people to engage in more killing. Cross cultural surveys conducted across 19 countries and four areas of the United States indicated that differences in moral acceptance of killing were associated with differences in actual killing rates among these populations (McAlister, 2006). The study was based on interviews and questionnaires administered to students and adults about their attitudes towards justifications of killing and were compared to the national/regional homicide rates among those populations. Although, as the author has also acknowledged, the survey did not conclusively indicate that the two factors are strongly related, it suggests that the acceptability of killing and actual killing rates could be associated. Therefore, if genetic explanations lead people to commit a naturalistic fallacy, thus facilitating the moral acceptance of killing, it may also be accompanied by an increase in killing behaviour.

As mentioned earlier, another reason that genetic explanations may perpetuate relevant attitudes and behaviours is because these explanations may provide particularly compelling justifications for people's own behaviours that need justifying. In the case of killing, it seems plausible that genetic explanations may facilitate the acceptability of killing and killing behaviour, because such explanations can be appropriated to justify people's own behaviours or behaviours to be committed in the future, as discussed below.

War accounts and documents suggest that people are often reluctant to engage in killing and that the military has to train people to kill, including psychologically undermining their passiveness and reluctance to kill (Bourke, 1999). This could be because killing is considered to be such a disapproved of and aggressive act (Lagerspetz & Westman, 1980), so to simply engage in or accept killing would create dissonance against an individual's own positive self-image (Bandura, 1999; Chirot & McCauley, 2006). As Chirot and McCauley suggest, such reluctance and the need for justification may be particularly true in genocides or political mass killings, in which the enemy does not pose a direct or personal threat to the individual. However, genetic explanations help to portray a pessimistic or negative self-image by assuming that we are all aggressive in nature (for example, as suggested by the instinct theory) or that specific human populations or individuals are aggressive (for example, as suggested by the warrior gene hypothesis). Therefore, genetic explanations of killing could make these acts more likely to be justified, accepted and to occur.

Similarly, since scholarly documents and personal accounts of war provide evidence that killing has a severe psychological impact, including guilt and dissonance in individuals who have engaged in killing (see Bourke, 1999; Baum, 2004), genetic explanations could serve to overcome such guilt and dissonance, thereby leading to further killing. This is because genetic explanations for killing attribute the causality of such acts to factors outside the individual’s control. In fact, after the Vietnam War, American military psychiatrists started a process of “deresponsibilizing” veterans to ease their feelings of guilt and remorse by emphasising and attributing external causes for their killing, such as aggressive impulses (Bourke, 1999, p. 239). Although this may help to relieve the veterans of their distress, deresponsibilizing in this way could lead them to engage in more killing in the future. Previous theorizing as well as experimental research suggest that killing may perpetuate itself as a means to justify and ease the guilt and dissonance of the initial killing (Lifton, 1986; Martens, Kosloff, Greenberg, Landau, & Schmader, 2007). Therefore, genetic explanations may facilitate the overcoming of such guilt by justifying these behaviours as being outside their control. This process may in turn promote a perpetuation of killing and the attitude that killing is morally acceptable.

1.6 The Present Study

The present study aims to test the idea that the exposure to genetic explanations for killing may change people’s attitudes so that they view killing as more morally acceptable, as well as exacerbate their killing behaviour. Genetic explanations of killing may affect killing behaviour and attitudes because they suggest that killing is in our nature and thus, it is moral or acceptable to kill. This may well make the individual more likely to engage in killing. Genetic explanations could also serve to increase killing and change attitudes, because they may be readily used to overcome guilt and dissonance over killing that people have already participated in or are about to participate in, and so make killing more likely to occur in the future.

To test the effects of genetic explanations on killing behaviour and moral acceptance of killing, participants were randomly assigned to one of three conditions in which they were exposed to either genetic explanations for killing behaviour, experiential explanations for killing behaviour or a control condition without any explanation for killing. Since I specifically intended to study killing behaviour and its associated psychological aspects, one obvious challenge was finding a methodology to study such behaviours in a direct, systematic and ethical way. Martens et al. (2007) developed a procedure to study killing behaviour in the laboratory in which participants are made to believe that they are killing bugs in an extermination task, though in actuality no bugs are killed. It involves participants tipping bugs into a supposed extermination machine (made from a modified coffee grinder) and then switching on the machine. I utilised this bug-killing paradigm which enabled me to study killing behaviour in the laboratory as directly as possible, within the ethical and moral limits of experimentation.

Specifically, participants were asked to take part in an extermination task in which they tipped bugs, one at a time, into an extermination machine over a period of 20 seconds. This task was self-paced, that is, they were not instructed to put in a lot of bugs or a few bugs. The dependent measures were the number of bugs each participant tipped into the machine during this 20-second task, and the participants' subsequent rating of the extent to which they felt that killing bugs and other lower animals for scientific purposes is morally justifiable. Before this extermination task, participants were exposed either to genetic, experiential or control explanations for the causes and origins of bug-killing behaviour in humans. In addition, we manipulated whether participants engaged in an initial killing task, presented ostensibly as a practice trial.

It was specifically predicted that if genetic explanations have a self-fulfilling effect, then presenting participants with genetic explanations for bug-killing should lead them to engage in more killing and to view bug-killing as more morally acceptable, as compared to presenting an experiential explanation or no explanation for killing. In addition, one reason genetic explanations may take hold and affect people is that they are particularly useful for justifying behaviour that would otherwise cause guilt or shame. Thus, perhaps the effect of the genetic explanation would be most pronounced among participants who engaged in the practice initial killing, that is, who engaged in two killing tasks. Perhaps these participants who killed in two different tasks might feel even more need to justify their actions by way of changing their views on the moral acceptability of killing bugs and by actually killing more bugs in the second killing task. This reasoning also suggests that an increase in the moral acceptability of killing would be accompanied by an increase in killing or vice versa. Therefore it was also predicted that there would be a positive correlation between the level of moral acceptance of killing and the number of bugs killed.

CHAPTER TWO

METHOD

2.1 Participants

This study used a student sample from the University of Canterbury, recruited through advertising on the University's notice boards and the website of the Stage One Participation Pool of the Psychology Department. All but one participant were paid 10-dollar shopping vouchers as incentives. The other participant was from the Participation Pool, and received course credit for participating in the experiment.

A total of 106 students from different departments of the University turned up for the study. From them, five discontinued the experiment after reading the information sheet and the consent form – they either did not want to "kill" bugs on moral or religious grounds, or did not feel comfortable "killing". Also, seven participants were excluded from the analyses because it was found that they had participated in similar bug-killing experiments before. Another six participants were excluded from the analyses because they did not follow the directions properly. Therefore, a total of 88 participants (34 male, 54 female) were considered for the final analysis. They ranged in age from 18 to 49, with a mean age of 23.88.

2.2 Design

This study used a 3 (explanation type: genetic vs. experiential vs. control) × 2 (practice type: practice kill vs. no-practice kill) between subjects factorial design. The dependent variables were the number of bugs killed (as measured by the number of bugs each participant tipped into the machine during a self-paced 20-second extermination task) and the moral acceptance of killing bugs (as measured by the participants' rating on the question that asked the extent to which they felt that killing bugs and other lower animals for scientific purposes is morally justifiable).

Participants were randomly assigned to the six different conditions. Random assignment was achieved by shuffling the document packets (in groups of 6, containing 1 of each condition) and assigning packets from the shuffled batch to each participant in the order in which they arrived to take part in the study. The experimenter was blind to the explanation type that was assigned, but not to the killing type, as the latter involved providing different instructions to different killing type conditions.

2.3 Materials and Procedure

2.3.1 Introducing the experiment and cover story

The experiment was conducted with one participant at each session. Upon arrival in the laboratory, the experimenter introduced himself to each participant as a research student at the Psychology Department and said, "Along with my colleagues, I'm researching in the area of the psychology of killing. Our work includes conducting experiments on killing in the laboratory as well as writing and contributing to journals and textbooks. Our experimental work mainly involves studying cases where lower animals like bugs kill each other and cases where humans kill lower animals. So today you are invited to participate in two small projects that I'm currently involved in." This cover story was used to prevent participants from becoming aware that there was manipulation in the study. They were told that the first study (which was actually designed to manipulate the explanation type) involved getting feedback from students on some texts regarding killing behaviour that were being considered for inclusion in a chapter in an upcoming psychology book on killing. Participants were also told that the second study (which was actually designed to observe the number of bugs each participant killed) involved participating in an experiment for studying killing. Participants were told that the purpose of this second experiment was to understand peoples' experiences when engaging in killing. At this stage, participants were informed that the second study specifically involved a short bug-killing task in the laboratory. They were then asked to read and sign a consent form if they wished to participate in these studies.

2.3.2 Explanation type manipulation

Depending on the condition to which the participant belonged, each participant was first given either the genetic, experiential, or control passages as stimuli material for the explanation type, before they were asked to engage in the killing tasks. The passages in the genetic and experiential conditions contained either exclusively genetic or exclusively experiential explanations for bug killing behaviour in humans, respectively. The passages in the control condition contained fictional information about a research finding which provided a control explanation topic—that of bugs killing other bugs. After each paragraph and at the very end of each set of paragraphs, there were multiple choice questions relating to the clarity, content, ease of understanding and the participant's interest in reading the passage. These genetic, experiential, and control passages, and the questions, are described in detail in section 2.4 below (also see Appendix A, B and C for the complete explanation questionnaires). To ensure that the participants took the materials seriously and to help the explanations appear scientifically backed, participants in all three conditions were told: "In this project we want to get some feedback for some materials that we are preparing to publish in a psychology textbook about killing. So I'll give you some paragraphs. And we want to get your feedback to see how clear and easy to understand they are. And you are ideal participants because you are university students who are at least slightly interested in psychology, and that's the type of people that these materials are going to be used by." Participants then read the passages and answered the comprehension questions in private, while the experimenter waited at the other end of the room, which was partially separated.

2.3.3 Killing procedures

When participants finished the comprehension task described above, they were given a brief overview of the purported second study. They were told: "In this second project you are invited to participate in one of our practical experiments on killing. Here we are investigating people's experiences while engaging in killing bugs. Before and after a short bug-extermination task, I'll give you short questionnaires about the experience." Participants were then led to the extermination area, which was at the other end of the room partially separated by a sliding door, where the bugs and the extermination machine were placed on a desk. In each session, 20 small slaters or woodlice, measuring about 1 cm in length, were placed in small clear plastic cups, with one bug in each cup. All these cups were placed in a flat tray beside the extermination machine. An additional bug was placed in a similar cup, ready for the practice task, for participants in the practice killing condition. The bug-killing machine was made from a coffee grinder, a piece of tubing and a plastic funnel. The tube was inserted into the side of the grinder's bowl, and the plastic funnel sat at the other end of the tube. The grinder had a lid and fully concealed sides. Thus, it appeared from the outside that the tube led from the funnel to the blades of the grinder directly. However, the base of the tube where it was inserted into the grinder was fixed with a stopper, which actually stopped bugs from entering the grinder (see Appendix D for a picture of the machine).

In the extermination area, all the participants were first introduced to the apparatus and the killing procedure. Participants were told: "First, I'm going to have you familiarise yourself with our extermination materials and procedure." Under the pretence of familiarising them with the materials and the killing procedure, participants in the practice killing condition were additionally asked to kill a bug, before they were given the actual self-paced killing task during which we measured the number of bugs killed. During the familiarisation, they were instructed as follows: "So right now, I just want to ask you to dump this bug into the grinder to familiarise yourself with the procedure ....OK, the next step is to turn on the exterminator by pressing that button for at least three seconds. So please go ahead and do that….So that's the procedure." Participants who were in no-practice killing conditions were also familiarised with the equipment and the procedure, but they were not asked to kill a bug for practice.

In the next stage, all the participants were asked to engage in the self-paced killing procedure that was designed to measure the number of bugs killed by each participant—one of the two main dependent variables of the experiment. Participants were told: “OK, now I’ll give you the extermination experience on your own and after that I’ll give you questionnaires regarding your experience and other aspects of the study.” Participants were given a digital timer and were instructed that, when the experimenter left the extermination area, they could begin the bug-extermination task by first putting some bugs into the grinder one at a time for a 20-second period, before switching on the machine. Participants were specifically instructed as follows: “What you shall do is put some bugs into the grinder one at a time for a 20-second period. That way everybody in the study has the same length of extermination experience. Please do this task continuously at your own pace over a 20-second period. Here’s a timer. When I close the door, you can just start the timer and put bugs into the grinder. When the 20 seconds is up the alarm will go off. At that point, stop the timer and turn on the grinder for at least three seconds.”

All the instructions given to the participants throughout the experiment, including the cover stories for the explanation stimulus and the killing procedures, were kept the same, except the instruction to kill a bug for practice which was instructed only to participants in the practice-kill condition.

2.3.4 Measuring moral acceptance and other measures

Following the bug-killing task, participants were guided back to their original location, the other end of the room, where they were asked to fill in a questionnaire which also included the scale to measure the level of moral acceptance—the other main dependent variable of the experiment. The first two questions were about the participant's perceived choice during the killing task and aimed to check the extent to which the self-paced killing task was self-paced, by comparing participants' perceptions of choice between the initial practice killing task and the self-paced killing task. The questions were: "During the 20-second timed extermination procedure, to what extent did you feel that the number of bugs you put in was your choice?" which was included for all participants; and "In the first task when you familiarised yourself with the extermination procedure, to what extent did you feel that putting the bug into the machine was your choice?" which was only included for participants in the practice killing condition. Next was the moral acceptance question which asked: "To what extent do you feel that killing bugs and other lower animals for scientific purposes is morally justifiable?" It was to be answered on a bipolar scale of 1 (not at all) to 9 (completely). These items were followed by a question which measured the believability of the paragraphs for the participants. It asked: "To what extent do you believe the information presented in the paragraphs on killing behaviour that we presented at the beginning for your feedback?" The last items on this questionnaire were about participants' age and gender.

2.3.5 Debriefing

At the end of all the experimental procedures, participants were debriefed on the deceptive components of the experiment and why they were necessary for the experiment. This was done in a sensitive manner and it was particularly stressed that they had not killed any bugs and that the important factor of the study was the manipulation of the type of explanations and to see their supposed effects. Participants in the genetic and experiential explanation conditions were informed that the information in the passages were not based on research findings or evidence even though similar theories may exist with regards to other behaviours, and participants in the control/neutral explanation condition were informed that the information in the passage was fictional. Participants were also informed that many scientists believe in the interaction of genetics and experience, rather than a sole factor. They were also briefed about the objectives of the study and its potential applications and benefits. Participants were then invited to express any concerns about the experiment and were then provided with a re-consent form for them to either allow us to use their data or request that it be destroyed.

When each of the participants left, the experimenter recorded the number of bugs the participant placed in the extermination machine during the self-paced task.

2.4 Stimulus Materials for Explanation Types

Three separate sets of passages, each containing three paragraphs, comprised the three different “explanation” conditions—the genetic, experiential, and neutral/control explanations. Consistent with the cover story, the passages in all three conditions were introduced by a rubric mentioning that the paragraphs were excerpts that were being considered for an upcoming psychology textbook on killing. Participants were asked in written instructions to read the materials carefully with special attention to content and meaning, and answer the questions honestly, saying that it would ultimately help to determine the effectiveness of the contents that we intended to include in the textbook.

The passages in the two experimental conditions consisted of information and explanations regarding the origins and causes of bug killing behaviour in humans. As the sample paragraphs given below highlight, the passages in these two conditions were largely identical (including their sentence structure, presentation and length), except for those words or phrases that specifically portrayed the relevant type of explanation. They were written in such a way that they sounded similar to the existing genetic and experiential explanations, such as those discussed in the introduction section. The control passage provided an alternative reading task on a neutral explanation topic—that of bugs killing other bugs. Ensuring that participants in the control group also read information that contained words such as “killing” and “bugs” meant that participants in any specific group were not affected by these words alone because all groups read information containing these words.

The passage in the genetic condition contained three separate paragraphs with exclusively genetic explanations for bug killing behaviour in humans. One paragraph read, for example, “Bug killing behaviour has evolved in us long ago, and appears to have been reinforced during our evolutionary past. Thus it is a part of our genetic make-up because it helped our ancestors to stay safe from bugs and similar animals that could prove poisonous or harmful. In turn, today, our genes tell us that we should keep our homes and work places free from bugs. Given that exterminating bugs that occupy our habitats have played a survival role since prehistoric times, humans have all inherited a specific genetic code that directs us to engage in bug killing and similar behaviours" (see Appendix A for the complete questionnaire for the genetic condition).

The passage in the experiential condition contained three separate paragraphs with exclusively experiential explanations for bug killing behaviour. One paragraph read, for example, "Bug killing behaviour has been present and taught in our cultures for a long time, and appears to have been reinforced by our historical situations. Thus, it is a part of our cultural make-up because it has helped our ancestors to stay safe from bugs and similar animals that could prove poisonous or harmful. In turn, today, our culture and society tells us that we should keep our homes and work places free from bugs. Given that exterminating bugs that occupy our habitats have played a survival role since prehistoric times, for a very long time humans have been taught specific cultural prescriptions and values that direct us to engage in bug killing and similar behaviours" (see Appendix B for the complete questionnaire for the experiential condition).

The passage in the control/neutral condition contained three separate passages containing fictional information about a research finding. One passage read, for example: "There is no doubt that the moon continues to influence several aspects of nature and living organisms. Interestingly, some correlational studies suggest that the full moon has an influence on the behaviour of bugs and other small animals. One such study has shown that killing behaviour among bugs occurs only during a full moon. However, scientists have yet to analyse whether such findings definitively show that a full moon causes killing among bugs and other similar animals. Therefore, further studies are needed to explore the effects of the full moon on killing behaviour among bugs and other animals" (see Appendix C for the complete questionnaire for the control/neutral condition).

After each paragraph and at the very end of each explanation passage were multiple choice questions relating to the clarity, content, ease of understanding and the participants' interest in reading the passage. In addition to bolstering the cover story (that the purpose of this part of the study was to get feedback for these excerpts), these questions were designed to ensure that participants read their respective passage carefully and understood them. One comprehension question specifically served as a manipulation check. In the experiential condition, this question was, "According to the three paragraphs above, bug-killing behaviour in humans is caused by…." This was followed by the following choices for the genetic condition: "a. culture and learning; b. genes; c. diet; d. dreaming." In the experiential condition the choices were arranged as: "a. genes; b. culture and learning; c. diet; d. dreaming." In the control condition, the question was, "According to the three paragraphs above, bugs kill bugs during….".This was followed by the following choices: "a. daytime; b. full moon; c. night; d. weekend." Correct responses to these questions meant that participants had comprehended the respective passage and its intended message.

CHAPTER THREE

RESULTS

3.1 Manipulation Checks

The manipulation check to analyse whether participants comprehended the explanation or information given in the respective genetic, experiential and control conditions showed that 98.9% of the participants identified the correct answer to the comprehension question. This suggests that the passages in all the conditions delivered their intended messages to the participants.

To check whether, the self-paced killing task was relatively self-paced compared to the practice killing task for participants who killed one bug initially, their perceived choices during these tasks were analysed in a 2-way (choice: practice killing vs. self-paced killing) repeated measures ANOVA (An alpha level of .05 was used for all statistical tests in the present study). As expected, participants felt that the number of bugs they put in the machine during the self-paced 20-second task was more from their choice (M = 6.35, SD = 2.29) than the bug they put in the machine for the practice killing task (M = 5.02, SD = 2.79), $F(1, 42) = 11.44$, $p = .002$. This suggests that the self-paced killing task was relatively self-initiated compared to the practice task. Also, since the mean rating of the participants' perceived choice in the self-paced killing task was above the mid line of the 9-point scale (M = 6.34, SD = 2.53), it suggests that the experiment was successful in observing participants' volitional killing behaviour, rather than solely their compliance with the experimenter.

The mean choice score for all participants during the self-paced killing task was 6.34 (*SD* = 2.53, *N* = 88).

3.2 Moral Acceptance

We first examined the hypothesis that exposing participants to genetic explanations for killing bugs would lead them to view killing as more morally acceptable, as compared to presenting an experiential explanation or no explanation for killing bugs. Further, we thought that if genetic explanations were used to justify killing behaviour, then an effect of the genetic explanation on moral acceptance might emerge particularly among those participants who engaged in an initial killing task (in the practice condition) and so had two trials of killing (rather than just one) to justify. Thus, a 3 (paragraph type: genetic vs. experiential vs. control) × 2 (practice type: practice kill vs. no-practice kill) ANOVA was performed on the moral acceptance score.

The results showed that the main effect of the paragraph type on the moral acceptance was significant, $F(2, 82) = 5.01$, p = .009. Participants in the genetic condition viewed bug killing as morally more acceptable ($M = 6.19$, $SD = 1.89$) than participants in the experiential condition ($M = 4.69$, $SD = 2.35$) and independent samples t-test showed that this difference was significant $t(58) = 2.74$, $p = .008$. Similarly, participants in the genetic condition viewed bug killing as morally more acceptable ($M = 6.19$, $SD = 1.89$) than participants in the control condition ($M = 5.29$, $SD = 1.92$) and this difference was close to significance, $t(57) = 1.83$, $p = .07$. The difference in the attitude of the participants in the experiential and control groups was not significant, $t(55) = 1.05$, $p = .30$. Therefore, as predicted, compared to the experiential and control explanations, genetic explanations led participants to view that killing bugs is morally more acceptable.

It was also predicted that the effect of genetic explanations on the moral acceptance would be most pronounced among participants who engaged in the practice initial killing because these participants engaged in *two* killing tasks and so had potentially more to justify.

Consistent with this prediction, there was a significant interaction between the paragraph type and practice type, $F(2, 82) = 3.33$, $p = .04$. The means for moral acceptance by explanation type and practice type are presented in Table 1

Table 1

Mean levels of moral acceptance score (and standard deviations) by exposure to different explanations following practice killing and no practice killing

	Explanation type					
	Genetic		Experiential		Control	
Practice type	M	SD	M	SD	M	SD
No practice killing	5.75	2.08	5.29	1.90	4.75	1.71
Practice killing	6.67	1.59	3.83	2.72	5.69	2.02

Results showed that among those participants who killed a bug in the practice task, genetic explanations increased moral acceptance (*M* = 6.67, *SD* = 1.59) compared to the experiential explanation (*M* = 3.83, *SD* = 2.72), *t*(25) = 3.38, *p* = .002. Also among those participants who killed a bug in the practice task, there was a non-significant trend of higher moral acceptance in the genetic explanations (*M* = 6.67, *SD* = 1.59) compared to the control explanation (*M* = 5.69, SD = 2.02), *t*(29) = 1.49, *p* = .15. On the other hand, as can be seen from Table 1, among participants in the no-practice killing, the means were very similar, though there was a non-significant trend for the genetic explanations to increase the moral acceptance of killing bugs (*M* = 5.75, *SD* = 2.08) compared to the control explanation (*M* = 4.75, *SD* = 2.08), *t*(26) = 1.35, *p* = .19.

These results suggest that genetic explanations led participants to view that it is morally more acceptable to kill bugs, particularly if they had engaged in the practice killing task. Perhaps those participants who killed in two different tasks needed to justify their actions more by way of changing their views on the moral acceptability of killing bugs, and the genetic explanation appeared to foster this change in moral acceptability as compared to the experiential and control explanation conditions. As Figure 1 shows, the effect of the explanation type appears to have emerged particularly among participants who killed a bug in the practice task. These combined effects of the genetic explanations and the practice killing on moral acceptance supported our prediction that the effect of genetic explanations on the morality attitude would be most pronounced among participants who engaged in the practice initial killing.

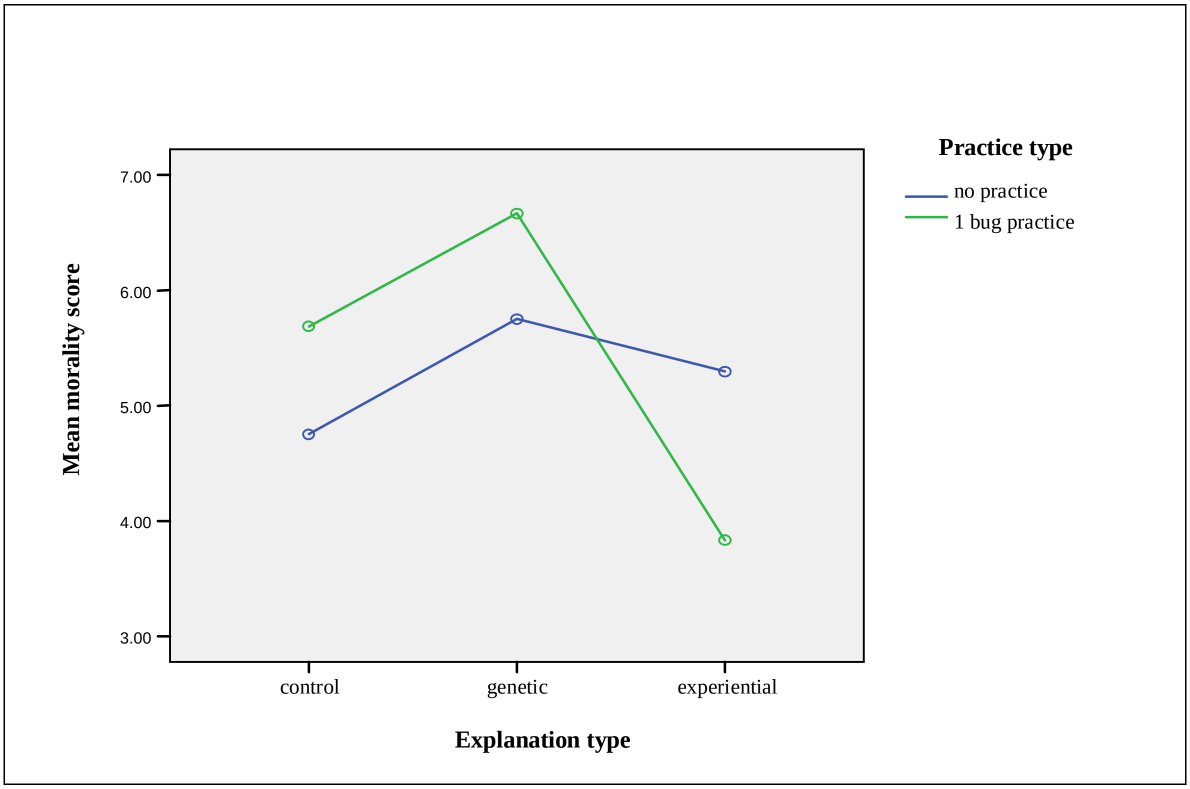

Figure 1. Mean moral acceptance score by explanation type and practice type.

Results also showed that, among participants in the practice killing condition, the effect of experiential explanations on the moral acceptance of killing (*M* = 3.83, *SD* = 2.72) was significantly lower compared to the control explanation (*M* = 5.69, *SD* = 2.02), *t*(26) = 2.07, *p* = .049. This effect was not present when participants did not engage in the practice task. It could be that having to engage in more killing tasks led these participants to ponder more on the morality of their actions and the experiential explanations served them to think that it is morally less acceptable, since experiential explanations attribute responsibility more to individuals than to nature.

Results from the ANOVA showed that the main effect of the practice type was not significant, *F*(1, 82) = .09, *p* = .76. The difference between the morality score of participants who practised (*M* = 5.51, *SD* = 2.35) and those who did not practise (*M* = 5.31, *SD* = 1.92) was very similar.

3.3 Killing Behaviour

It was hypothesized that presenting genetic explanations for killing bugs would lead participants to engage in more killing, as compared to presenting an experiential explanation or no explanation for killing. Additionally, it was thought that this effect might emerge particularly among those who killed a bug initially in the practice trial. To examine these hypotheses, a 3 (explanation type: genetic vs. experiential vs. control) × 2 (practice type: practice kill vs. no-practice kill) ANOVA was performed on the number of bugs killed by participants.

The results showed that the main effect of the explanation type was not significant, $F(2, 82) = .11$, p = .89. There was very little difference in the number of bugs killed between the genetic condition (*M* = 6.29, *SD* = 3.42), the experiential condition (M = 6.48, SD 2.85) and the control condition (*M* = 6.57, *SD* = 3.29). Thus, contrary to the prediction, exposure to genetic explanations did not increase the number of bugs killed, compared to the experiential and control explanation conditions.

It was also predicted that the effect of genetic explanations on killing behaviour would be most pronounced among participants who engaged in the practice killing task. However, no significant interaction emerged between the paragraph type and practice type $F(2, 82) = 1.36$, $p = .26$. Therefore, contrary to the prediction, the effect of genetic explanations on killing behaviour was not particularly pronounced among participants who engaged in the practice killing task.

The results also showed that the main effect of the practice type was not significant, $F(1, 82) = .71$, $p = .40$. The number of bugs killed by participants who practised killing (M = 6.19, SD = 3.15) and those who did not practise killing (M = 6.69, SD = 3.19) were very similar. The means for killing by explanation type and practice type are presented in Table 2 and plotted in a graph in Figure 2.

Table 2

Mean numbers of bugs killed (and standard deviations) by exposure to different explanations following practice killing and no practice killing

	Explanation type					
	Genetic		Experiential		Control	
Practice type	M	SD	M	SD	M	SD
No practice killing	5.81	3.51	7.00	2.83	7.42	3.26
Practice killing	6.80	3.36	5.75	2.83	5.94	3.28

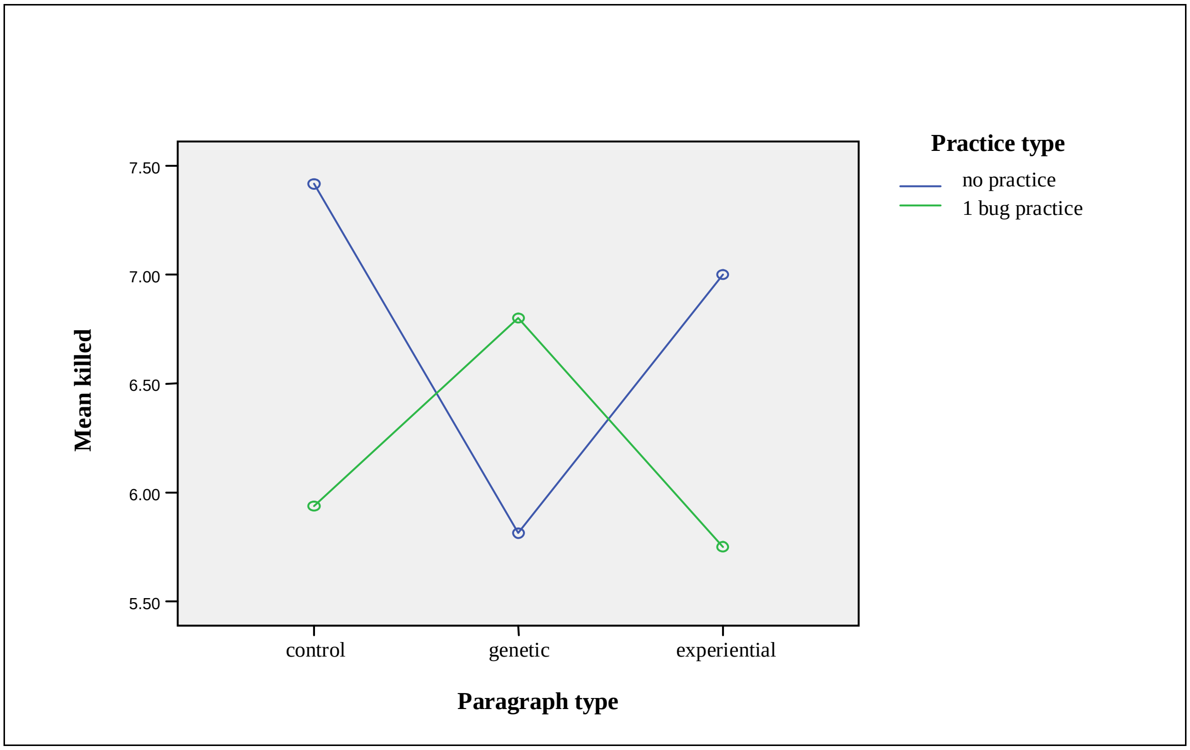

Figure 2. Mean number of bugs killed by explanation type and practice type.

3.4 Relationship between Moral Acceptance and Killing

The theorising in this study led to the prediction that the moral acceptability of killing would be related to the killing itself. Therefore, to test whether the number of bugs killed and the moral acceptance of bug killing were related, a correlation analysis was performed. The results indicate that there was a significant positive relationship between the number of bugs killed and the moral acceptance score, $r = .26$, $N = 88$, $p = .013$. This suggests that, as predicted, participants' moral acceptance of bug killing and their actual killing behaviour were related.

The existence of this correlation would perhaps suggest that the patterns of the killing means and the moral acceptance means should mirror each other. However, as Figure 1 and Figure 2 suggest, they do not mirror each other, especially among people who did not engage in an initial practice killing. Therefore, it could be that this correlation exists only in certain conditions and disappears in others, and specifically, that perhaps the correlation between actual bug killing and the moral acceptance of bug killing only emerges among those who killed a bug during the practice task. To test this possibility, separate correlation analyses were performed between moral acceptance score and number of bugs killed for participants who practised killing and for participants who did not practise killing. It was found that there was a significant correlation between the moral acceptance score and killing in the practice killing condition, $r = .44$, $N = 43$, $p = .003$, but this correlation did not exist in the no practice killing condition, $r = .08$, $N = 45$, $p = 61$. Again, this is consistent with the pattern of results seen in Figures 1 and 2 . As Figure 2 indicates, the effects of the explanation type on killing behaviour in the practice condition have a somewhat similar pattern to the effects of the explanation type on moral acceptability. But among those who did not engage in a practice kill, the pattern from the explanation type on actual killing is dissociated from the pattern of the explanation type on the moral acceptance question. Thus, it appears that although the genetic explanations were effective in changing people's attitude towards killing, perhaps they were not a strong stimulus to affect their killing behaviour, especially when people did not engage in the initial practice bug-killing.

3.5 Gender

Some previous experiments suggest that compared to females, male participants tend to aggress more, although these tendencies are not always consistent (Geen, 1998). So a t-test was performed to compare the mean moral acceptance score and the mean number of bugs killed by male and female participants in the present experiment. The results showed that the moral acceptance score of male participants (*M* = 6.03, *SD* =2.17) was significantly higher than that of female participants (*M* = 5.02, *SD* = 2.03), *t*(86) = 2.21, p = .029). Similarly, the analysis of the mean number of bugs killed by male and female participants showed that the number of bugs killed by male participants (*M* = 7.24, *SD* = 3.40) was higher than that of female participants (*M* = 5.94, *SD* = 2.93). This difference was nearly significant, *t*(86) = 1.89, p = .06.

To check whether there was any interaction between gender and the explanation type, as well as gender and the practice type, a series of factorial ANOVAs were performed on the two dependent measures. A 3 (explanation type: genetic vs. experiential vs. control) × 2 (practice type: practice kill vs. no-practice kill) × 2 (gender: male vs. female) between subjects ANOVA performed on the moral acceptance score did not reveal an interaction between gender and explanation type, *F*(2, 76) = 1.39, *p* =.26, or gender and the practice type, *F*(2, 76) = 1.13, *p* = .29. These results suggest that the effect of gender on moral acceptance was not significantly different between the control, genetic and experiential conditions, or between the practice and the no-practice killing conditions.

Similarly, a 3 (explanation type: genetic vs. experiential vs. control) × 2 (practice type: practice kill vs. no- practice kill) × 2 (gender: male vs. female) between subjects ANOVA performed on killing revealed that gender did not interact either with explanation type, F (2, 76) =.22, p = .81, or practice type, *F*(2, 76) = 2.01, *p* = .16. These results suggest that the effect of gender on killing was not significantly different between the control, genetic and experiential conditions, or between the practice and no-practice killing conditions.

In general, the results suggest that compared to females, male participants viewed bug killing as more morally acceptable and killed more bugs., Therefore, we have found some support for the notion that males may aggress more compared to females. However, since gender did not interact with the explanation type or practice type with respect to the moral acceptance level or killing, it was not included in the main analysis above.

3.6 Believability

To investigate any possible effects of explanation type and practice type on the believability score (measured by participants' rating on the extent to which they believed the information in the paragraphs), a 3 (explanation type: genetic vs. experiential vs. control) × 2 (practice type: practice kill vs. no-practice kill) ANOVA was performed on the believability score. One participant in the experiential condition did not respond to the believability item. Results showed that the main effect of the practice type on the believability was not significant, F (1, 81) = .90, p = .35. There was very little difference in the believability rating by participants who practised killing one bug (M = 5.70, SD = 2.05) and participants who did not kill a bug for practice (M = 5.40, SD 2.40). Also, there was no significant interaction between the paragraph type and practice type, F(2, 81) = 1.05, p = .36.

However, a main effect of the explanation type was nearly significant, $F(2, 84) = 2.97$, $p = .06$. Independent t–tests revealed that there was a significant difference in believability between the control condition ($M = 4.93$, $SD = 2.24$) and the experiential condition ($M = 6.32$, $SD = 2.02$), $t(54) = 2.44$, $p = .018$. The difference in believability between the control condition ($M = 4.93$, $SD = 2.24$) and the genetic condition ($M = 5.40$, $SD = 2.25$) was not significant, $t(57) = .81$, $p = .42$. Also, the difference in believability between the genetic condition ($M = 5.40$, $SD = 2.25$) and the experiential condition ($M = 6.32$, $SD = 2.02$) was close to significant, $t(57) = 1.64$, $p = .11$. This almost significant difference between the genetic and experiential explanation passages raises an important question: Did this difference arise because the experiential paragraphs were written more convincingly or because people generally think in experiential terms and so find experiential explanations more convincing? Given the fact that the two sets of paragraphs were largely identical in structure, perhaps the more plausible explanation is that people generally find experiential explanations more believable. On the other hand, given the popularity of and increase in the influence of genetic explanations in society, one might have also expected that genetic explanations would be more believable for the participants. Therefore, the reason for the experiential explanations being more believable is not very clear. One possibility is that maybe people generally think about topics, such as these, in experiential terms and therefore participants who read the experiential passage found the information to be more in alignment with their beliefs and thus rated the passage as more believable, as compared to participants who read the genetic explanations.

CHAPTER FOUR

DISCUSSION

4.1 Summary and Discussion of the Findings

4.1.1 Moral acceptance

As predicted, this study found support for the hypothesis that exposure to genetic explanations for bug killing behaviour would lead participants to view bug killing as more morally acceptable. Participants who read the genetic explanations viewed, significantly more, that it is more morally acceptable to kill bugs, as compared to participants who read the experiential explanations. Also, participants who read the genetic explanations viewed more that it is more morally acceptable to kill bugs, compared to participants who read the control explanations, and this difference was approaching significance. Similarly, this study found support for the prediction that the effects of the genetic explanations on people's attitude to bug killing would be most pronounced among participants who engaged in the practice killing task. Among participants who practised killing, there was a significant increase in the moral acceptance of killing bugs for those who read the genetic explanations, compared to those who read the experiential explanations. Also, among participants who practised killing, there was a non-significant trend of increased moral acceptability for those who read the genetic explanations, as compared to those who read the control explanations. However, among those who did not practise killing, there were no significant differences between participants who read the different explanations, though there was a non-significant trend of increased moral acceptance of killing bugs by those who read the genetic explanations, compared to those who read the control explanations.

One possible reason for the observed increase in the moral acceptance of killing among participants who were exposed to genetic explanations could be that these explanations suggested to participants that killing is in our nature or that people are programmed to be that way, thus, leading them to view that it is more moral or more acceptable to kill. In other words, genetic explanations may have led participants to commit a naturalistic fallacy. Furthermore, in this way, genetic explanations could also have served to overcome guilt and dissonance in participants who had already killed bugs. Perhaps those participants who killed in two different tasks (including the practice task) needed to justify their actions more by way of changing their views on the moral acceptability of killing bugs, and genetic explanations appeared to foster this change in the moral acceptability of killing as compared to the experiential and control explanation conditions. This explains the pronounced increase in the moral acceptance of killing among participants who killed in the practice task and who read the genetic explanations. The finding that the effects of genetic explanations on moral acceptance significantly emerged only among participants who practised an additional killing task suggests that one important effective component of genetic explanations could be that they serve to justify one's previous negative behaviour, by interacting with that behaviour and thereby exacerbating the effects.

In an additional observation, we also found that among participants in the practice killing condition, the effect of experiential explanations on the moral acceptance of killing was significantly lower, compared to those who read the control explanation. Perhaps having to engage in more killing tasks led these participants who practised killing to ponder the morality of their actions more, and the experiential explanations helped them to think that it is morally less acceptable, since the experiential explanations attribute responsibility more to individuals than to nature.

In general, the findings of the present study on the effects of genetic explanations on the moral acceptability of killing bugs are consistent with previous research findings that genetic explanations are more likely to constrain the way people think about morally related issues; such as, for example, the way people stereotype gender differences (Brescoll & LaFrance, 2004), seek to legitimate and perpetuate gender inequality (Postmes, 2003), attribute responsibility for undesirable behaviours or offenders (Monterosso et al., 2005) or how they pass judgements on such offenders (Dar-Nimrod & Heine, 2008). However, these previous studies that investigated the effects of explanation types on attitudes or judgments either focused mainly on the changes in the attitudes or judgments of participants regarding the behaviours of others (e.g., Dar-Nimrod & Heine, 2008; Monterosso et al., 2005), or behaviours as a general conception (e.g., Brescoll & LaFrance, 2004), rather than the behaviours or attitudes that are directly relevant to the participant.

4.1.2 Killing behaviour

In the present study, we also hypothesised that genetic explanations for killing bugs would lead participants to engage in more killing**,** as compared to presenting an experiential explanation or no explanation for killing. Additionally, we thought this effect might emerge particularly among those who killed a bug initially in the practice trial. However, the results failed to show any of these effects on people's killing behaviour. That is, contrary to our hypothesis, we neither found an increase in killing among participants in the genetic condition nor a pronounced effect of the genetic explanations when participants engaged in a practice killing.

This is somewhat surprising, especially since there was a significant positive correlation between the morality score and the number of bugs killed. This correlation would suggest that the effects of genetic explanations on moral acceptability and on killing should mirror each other. However, as the results discussed above indicate, genetic explanations had no significant effects on killing behaviour. However, follow-up analyses showed that a significant correlation between the moral acceptance score and killing behaviour existed only in the practice killing condition, and not in the no-practice killing condition. And the effects of the explanation type on killing behaviour for those who practised killing had a pattern more similar to the effects of the explanation type on moral acceptability. When participants engaged in a practice killing task, their killing behaviour showed a pattern that was similar to the effects of genetic explanations on moral acceptability, although it was still not significant.

Therefore, future research could extend the findings of the present study by increasing the number of bugs that participants have to kill during the practice task, to test if this, in combination with genetic explanations, shows any significant effect on people's killing behaviour. This suggestion is supported by our theorizing in the present study and the finding by Martens et al. (2007) that more initial killing would lead to more justification of these behaviours and therefore, more killing in the self-paced killing task.

Future research could also better examine the correlation showing that participants who viewed that killing bugs is morally more justifiable killed more bugs. This finding supports the previous observation from the cross-cultural correlation study by McAlister (2006), which found that the levels of moral acceptance of killing were associated with the killing rates among these those populations. Since the results from the present study were also obtained from a correlation analysis, future research could extend these findings to check for any cause-effect involved in these associations, by conducting laboratory experiments.

4.1.3 Gender

The present study found that the moral acceptance of killing bugs among male participants was significantly higher than that of female participants. These results support the findings from a cross cultural survey by McAlister et al. (2001), which suggests that the justification of killing is less common among females, compared to males. Similarly, the present study found that the mean number of bugs killed by male participants was higher than that of female participants and this difference was nearly significant. These results support the notion based on some previous studies that suggests that compared to females, male participants tend to be more aggressive, although these tendencies are not always consistent (Geen, 1998). Future research on killing or aggression may take these into consideration or further explore these effects of gender.

4.2 General Implications

The present study found that the exposure to genetic explanations for killing bugs led participants to view that it was more morally acceptable to kill bugs for scientific research. This has an important implication – despite the objection of the naturalistic fallacy argument by those who support genetic explanations, these results suggest that theories espousing genetic and evolutionary ideas about human behaviour would affect people's moral and ethical judgments. In other words, it suggests that genetic explanations would lead people to assume that, because killing is genetic or natural, then it is more moral or justifiable to kill, thus committing a naturalistic fallacy. Therefore, even if scholars researching or promoting genetic explanations emphasise and protest to their critics that their genetic findings are value-free, the present study further supports the criticism and research evidence that such explanations may nevertheless have negative social implications (eg: S. D. Nelson, 1975; Conrad, 1997; Brescoll & LaFrance, 2004; Dar-Nimrod & Heine, 2007, 2008).

Another important implication of genetic explanations due to their effects on people's moral attitude is that, although individuals who are exposed to genetic explanations of killing may not develop a tendency in themselves to kill more, their acceptance of killing may be exploited by institutions and states, because genetic explanations for killing among humans may provide certain economic or political benefits for these institutions. For example, aggressive states or military organisations may tend to promote genetic explanations of human aggression and killing behaviour to obtain public acceptance for legitimizing wars or state sponsored violence and killing (S. D. Nelson, 1975); for example, by means of emphasising that it is a natural human condition, as suggested by evolutionary and instinct theories. Additionally, if the public complains of exaggerated killings or cruel acts during conflicts, riots or warfare, authorities may try to shift the responsibility on to individual soldiers or police officers by appealing to genetic defects, hormonal imbalances and similar individual aspects, as suggested in some genetic explanations. Moreover, if genetic explanations for killing lead people to accept the justification of killing more easily, such explanations may be misused by states or groups to legitimize genocide and mass killing. According to Alvarez (2001), states inclined to commit genocide may often seek and manipulate scientific theories and ideas, as well as employ professionals in legitimizing or justifying these actions. Therefore it is crucial that scientists and professionals are mindful of the extent to which their theories and explanations may have negative social implications.

The findings of this study may have implications not only regarding the genetic essentialist explanations, but also for any other theory or idea that promotes a pre-dispositional or deterministic view of human conflict and killing. In the way the scientific community polarises and debates genetic versus experiential explanations regarding human nature and behaviour, there is a similar issue and debate within the domains of theology and philosophy based on determinism versus free will (Wallerstein, 1997). Since the present study suggests that deterministic genetic explanations may influence people's moral views, it could be assumed that similar deterministic explanations based on religious grounds may have negative implications as well. This is particularly relevant to highly religious societies, where the general public are more likely to be influenced by explanations for human conflict and problems from a religious angle. Therefore, scholars and commentators from different nations and from different domains of society should be mindful of the way their research and commentaries may be disseminated to and interpreted by the general public, particularly if their ideologies portray a deterministic view of conflict, aggression and killing.

Perhaps a solution to prevent the general public from committing the naturalistic fallacy as a result of their exposure to such genetic information would be to caution or warn people against inferring or interpreting moral judgments based on such reports. However, a study by Friedrich (2005) found that even when participants were warned that making moral inferences from an empirical research is unjustified, it did not fully prevent them from deriving such unwarranted inferences from fictitious empirical research that was given to them to read. Nevertheless, it is important for future research that focuses on the naturalistic fallacy-related effects of genetic explanations to test whether cautioning against making moral judgements from genetic and evolutionary explanations of human behaviour prevents these kinds of judgments.

Although not conclusive, the present study further suggests that experiential explanations may have the opposite effect on people's moral attitudes compared to genetic explanations. In some conditions, we found a non-significant pattern of a lower moral acceptance of killing by the experiential explanations, compared to the control explanations. This pattern became significant among participants in the experiential condition who practised killing a bug, thus lowering their acceptance of bug killing, compared to participants in the control explanation condition who killed a bug for practice. This suggests that experiential explanations might moderate the possible negative effects of genetic explanations. Therefore, one possible way to minimise the negative impacts of genetic explanations could be to emphasise the contribution or role of experiential aspects when discussing genetic explanations and theories. This is especially important since specific instincts, drives or genes do not solely determine, cause or control our behaviours and most modern theorists are inclined towards integrative theories of genes and experience. This suggests the importance of disseminating or presenting such information to the public in a balanced and careful manner.

4.3 Limitations and Strengths of the Study, and Future Directions

Although the present study successfully examined the effects of genetic explanations on the moral acceptability of bug killing, there were some limitations that need to be acknowledged.

The present study predicted and found evidence for the notion that genetic explanations would increase the moral acceptance of bug killing and that an additional practice killing task would exacerbate this effect, because those who kill bugs in two tasks would have more to justify. It was also found that an additional practice killing task, without considering the type of explanation participants received, did not affect the moral acceptance level, suggesting that there was no direct effect of killing one bug for practice. However, it should be noted that the study did not make it clear whether the effect on the moral acceptability of killing was directly due to genetic explanations or to a combination of the killing task and genetic explanations, since the moral acceptance question only came after the main killing task. Therefore, it is important for future research to establish whether genetic explanations have a direct effect on people's moral acceptance of killing, that is by way of analysing its effect among people who have not already killed any bugs in the particular experiment.

This study utilised bugs and a bug-extermination machine similar to the one developed by Martens et al. (2007). This procedure has its strengths and limitations. This procedure enabled us to study killing behaviour in the laboratory in a very direct way, within the ethical and moral limits of experimentation. However it should be noted that bugs and concepts about bug killing to study killing and attitudes on killing are obviously very different from humans and killing among humans, which limits the application of our findings in real world situations involving human aggression and killing. Therefore, it should be noted that generalisations from this study to human killing and attitudes to killing humans or other higher animals should only be made with caution.

Additionally, the objection could be raised that the present study did not really study killing in an aggressive sense as it did not manipulate any intention in participants to hurt the bugs. In other words, it could be that participants were intending to help with the experiment or were complying with the instructions given. Although there may be some truth in this, it should be noted that the experimental passages did portray that bugs are harmful and responsible for certain diseases. Therefore, participants may have acted in an aggressive manner. The present study, however, did not check this as a manipulation. Nevertheless, the mean ratings of the participants' perceived choice in the practice killing task as well as in the self-paced killing task were above the mid line of the 9-point scale, suggesting at the very least, participants' volitional killing behaviour, rather than solely their compliance with the experimenter. Further, even if these results for perceived choice are not very impressive, it should be noted, as discussed in the introduction, that sometimes in warfare, genocides or mass killings, the victims may not directly pose a threat and so the executioner may just be carrying out orders or instructions from a higher or trusted authority.

Certain aspects of the explanation passages may also limit some of our findings with respect to generalising. The manipulation passages used in the present study were quite brief and were on topics of bug killing, because the purpose of the study was to see the effects of such explanations on people's killing behaviour, and this limited the kind of killing topic we could use. For example, since we cannot observe human killing in the laboratory, it is more unrealistic to use explanations about human killing as a manipulation. Future research could further extend and explore this finding using genetic explanations or theories about killing behaviour among humans to see whether there is a general effect on moral acceptability or justification of different types of killing among humans (for example, killing as a punishment, killing during war, or killing for revenge and so on). One thing such a follow up research could also look at is to check whether people in general subscribe more to experiential or genetic explanations regarding the causes of killing and aggression, and whether such existing perspectives in people have different effects on their attitude or behaviour when exposed to exclusively genetic or exclusively experiential explanations.

Furthermore, this study utilised a university student sample instead of a random sample from the general public. Although this might limit the generalisability, perhaps in the sense that the sample represents a population from a specific socioeconomic level and hence not a very "general" population, the fact that it was a student sample gives strength with respect to the implications of the findings. That is, maybe such genetic explanations would elicit more negative effects among lay people, whereas most students would be more aware of the biased explanations and/or the interaction of genes and experience. However, it is important to extend these findings to check and compare the extent to which the general public or other specific groups within the general public may be affected by genetic explanations. Since the public are more exposed to media reports than journal papers or textbooks, the manipulation for such a study could use such news reports.

Despite the limitations discussed above, the present study is the first experimental evidence to suggest that genetic explanations have negative effects on people's moral attitudes about killing and that when combined with additional killing, these effects of genetic explanations may exacerbate the effects on people's attitudes about killing. It suggests that geneticists and evolutionary psychologists cannot ignore the possible negative implications of their theses simply by relying on the naturalistic fallacy arguments. Therefore, given the popularity and influence of genetic explanations in recent times, it is important that scientists and the news media present a balanced analysis and take precautions when disseminating genetic information about aggression and killing to the public.

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APPENDIXES

Appendix A: Genetic Paragraphs

PLEASE READ THESE INSTRUCTIONS:

As a university student, it is ultimately your opinion that determines what text book material is considered appropriate and effective. That is why we are asking you to read and provide us feedback on some excerpts that are being considered for an upcoming psychology textbook about killing. On the next page, you are given a few paragraphs related to the psychology of killing that will present variations on a particular topic. Please read them carefully, with special attention to the content and meaning of each excerpt. After each paragraph and at the end of the text you will see some questions related to the text. Please answer these with your first, honest response by circling the number that best reflects your opinion. Thank you for your participation.

Paragraph 1

According to psychological theories, we often kill bugs and other similar animals because it is part of our genetic programming—it is built in to us. One reason that scientists think that it became part of our genetic programming is that it may have helped our ancestors clean their environment and avoid diseases and other harmful aspects associated with some types of bugs and other lower animals. We are programmed in a way to kill bugs indiscriminately so as to avoid any risks, by preventing them from carrying diseases, poisoning our food, or harming us in any way. Thus, to maximize our chances of survival, our genes have evolved so that we kill bugs and keep our surroundings clean from the varieties of bugs and similar lower animals.

1. **How clearly was this paragraph written?**

Not at all clear 1 2 3 4 5 6 7 Extremely clear

2. **How easy was this paragraph to read?**

Not at all easy 1 2 3 4 5 6 7 Extremely easy

Paragraph 2

That we are genetically programmed to kill bugs may have evolved in humans for various reasons. One may be that killing bugs functions as a strategy to keep our environment clean and safe. But what psychological processes are motivated by these genes? These genes lead us to perceive that bugs are either threatening, for example because we fear that they might spread a disease or may poison our food. And our genes lead us to perceive bugs as simply disgusting. By these psychological means, genes motivate us to take safety measures against the threat of certain bugs and lower animals. Thus, bug-killing behaviour is genetically programmed through inborn and instinctual tendencies that keep us and our environment safe and clean.

1. **How clearly was this paragraph written?**

Not at all clear 1 2 3 4 5 6 7 Extremely clear

2. **How easy was this paragraph to read?**

Not at all easy 1 2 3 4 5 6 7 Extremely easy

Paragraph 3

Bug killing behaviour has evolved in us long ago, and appears to have been reinforced during our evolutionary past. Thus it is a part of our genetic make-up because it helped our ancestors to stay safe from bugs and similar animals that could prove poisonous or harmful. In turn, today, our genes tell us that we should keep our homes and work places free from bugs. Given that exterminating bugs that occupy our habitats have played a survival role since prehistoric times, humans have all inherited a specific genetic code that directs us to engage in bug killing and similar behaviours.

1. **How clearly was this paragraph written?**

Not at all clear 1 2 3 4 5 6 7 Extremely clear

2. **How easy was this paragraph to read?**

Not at all easy 1 2 3 4 5 6 7 Extremely easy

I. According to the three paragraphs above, bug-killing behaviour in humans is caused by:

a. **culture and learning**
b. **genes**
c. **diet**
d. **dreaming**

II. Which paragraph did you find most interesting?

a. **Paragraph 1**
b. **Paragraph 2**
c. **Paragraph 3**

III. How much would you enjoy reading more about the topic presented on the previous page?

a. **Not at all**
b. **Slightly**
c. **Moderately**
d. **Very much**

Appendix B: Experiential Paragraphs

PLEASE READ THESE INSTRUCTIONS:

As a university student, it is ultimately your opinion that determines what text book material is considered appropriate and effective. That is why we are asking you to read and provide us feedback on some excerpts that are being considered for an upcoming psychology textbook about killing. On the next page, you are given a few paragraphs related to the psychology of killing that will present variations on a particular topic. Please read them carefully, with special attention to the content and meaning of each excerpt. After each paragraph and at the end of the text you will see some questions related to the text. Please answer these with your first, honest response by circling the number that best reflects your opinion. Thank you for your participation.

Paragraph 1
According to psychological theories, we kill bugs and other similar animals because it is part of our cultural programming—taught to us by our culture. One reason that scientists think this behaviour became part of our culture is because it helped our ancestors clean the environment and avoid diseases and other harmful aspects associated with some types of bugs and other lower animals. We have learned through our upbringing to kill bugs indiscriminately, so as to avoid any risks, by preventing them from carrying diseases, poisoning our food or harming us in any way. Thus, because it maximized our chances of survival, our culture developed so that we are taught to kill bugs and keep our surroundings clean from the varieties of bugs and similar lower animals.

1. How clearly was this paragraph written?

Not at all clear 1 2 3 4 5 6 7 Extremely clear

2. How easy was this paragraph to read?

Not at all easy 1 2 3 4 5 6 7 Extremely easy

Paragraph 2
That we have learned to kill bugs may have been incorporated into human cultures for various reasons. One may be that killing bugs functions as a strategy to keep our environment clean and safe. But what psychological processes are motivated by these cultural norms? These norms lead us to perceive that bugs are either threatening, for example because we fear that they might spread a disease or may poison our food. And our cultural norms lead us to perceive bugs as simply disgusting. By these psychological means, cultural norms motivate us to take safety measures against the threat of certain bugs and lower animals. Thus, bug-killing behaviour is learned through cultural and social influences that keep us and our environment safe and clean.

1. How clearly was this paragraph written?

Not at all clear 1 2 3 4 5 6 7 Extremely clear

2. How easy was this paragraph to read?

Not at all easy 1 2 3 4 5 6 7 Extremely easy

Paragraph 3
Bug killing behaviour has been present and taught in our cultures for a long time, and appears to have been reinforced by our historical situations. Thus, it is a part of our cultural make-up because it has helped our ancestors to stay safe from bugs and similar animals that could prove poisonous or harmful. In turn, today, our culture and society tells us that we should keep our homes and work places free from bugs. Given that exterminating bugs that occupy our habitats have played a survival role since prehistoric times, for a very long time humans have been taught specific cultural prescriptions and values that direct us to engage in bug killing and similar behaviours.

1. How clearly was this paragraph written?

Not at all clear 1 2 3 4 5 6 7 Extremely clear

2. How easy was this paragraph to read?

Not at all easy 1 2 3 4 5 6 7 Extremely easy

I. According to the three paragraphs above, bug-killing behaviour in humans is caused by:

a. **genes**
b. **culture and learning**
c. **diet**
d. **dreaming**

II. Which paragraph did you find most interesting?

a. **Paragraph 1**
b. **Paragraph 2**
c. **Paragraph 3**

III. How much would you enjoy reading more about the topic presented on the previous page?

a. **Not at all**
b. **Slightly**
c. **Moderately**
d. **Very much**

Appendix C: Control/Neutral Paragraphs

PLEASE READ THESE INSTRUCTIONS:

As a university student, it is ultimately your opinion that determines what text book material is considered appropriate and effective. That is why we are asking you to read and provide us feedback on some excerpts that are being considered for an upcoming psychology textbook about killing. On the next page, you are given a few paragraphs related to the psychology of killing that will present variations on a particular topic. Please read them carefully, with special attention to the content and meaning of each excerpt. After each paragraph and at the end of the text you will see some questions related to the text. Please answer these with your first, honest response by circling the number that best reflects your opinion. Thank you for your participation.

Paragraph 1

Bugs and other small animals are known to exhibit many interesting and odd behaviours. But you may have never thought about this—that bugs kill other bugs during the full moon, but not during other times of the month. Studies indicate that an association exists between the lunar cycles and the behaviour of bugs and other similar animals. Specifically, one recent study has shown that bugs engage in killing other bugs during a full moon and not during other periods of the month. However, further experiments are needed to show causation—that the full moon causes killing among bugs and other lower animals.

1. **How clearly was this paragraph written?**

Not at all clear 1 2 3 4 5 6 7 Extremely clear

2. **How easy was this paragraph to read?**

Not at all easy 1 2 3 4 5 6 7 Extremely easy

Paragraph 2

There is no doubt that the moon continues to influence several aspects of nature and living organisms. Interestingly, some correlational studies suggest that the full moon has an influence on the behaviour of bugs and other small animals. One such study has shown that killing behaviour among bugs occurs only during a full moon. However, scientists have yet to analyze whether such findings definitively show that a full moon causes killing among bugs and other similar animals. Therefore, further studies are needed to explore the effects of the full moon on killing behaviour among bugs and other animals.

1. **How clearly was this paragraph written?**

Not at all clear 1 2 3 4 5 6 7 Extremely clear

2. **How easy was this paragraph to read?**

Not at all easy 1 2 3 4 5 6 7 Extremely easy

Paragraph 3

Since medieval times, people have associated many odd behaviors of humans and animals with the different phases of the moon, particularly the full moon. Until recently, there have been no scientific studies that investigate such claims. However, one recent study showed that killing behaviour among bugs occurs during the time of the full moon, but not during the other periods of the month. However, it is too early to confirm whether such findings prove causation—that a full moon causes killing among bugs. Thus, further studies analyzing the circumstances are needed to establish any causal relationship.

1. **How clearly was this paragraph written?**

Not at all clear 1 2 3 4 5 6 7 Extremely clear

2. **How easy was this paragraph to read?**

Not at all easy 1 2 3 4 5 6 7 Extremely easy

I. According to the three paragraphs above, bugs kill bugs during:

a. **daytime**
b. **full moon**
c. **night**
d. **weekend**

II. Which paragraph did you find most interesting?

a. **Paragraph 1**
b. **Paragraph 2**
c. **Paragraph 3**

III. How much would you enjoy reading more about the topic presented on the previous page?

a. **Not at all**
b. **Slightly**
c. **Moderately**
d. **Very much**

Appendix D: Bug-extermination Machine