Indivdual differences in pain tolerance psychology essay

It is generally agreed that the perception of pain does not only depend on the noxious input, but also on a variety of psychological variables including an individual's emotional state. The amygdala is one area of the brain linked with the regulation of both emotion and pain (Lapate, Lee, Salomons, van Reekum, Grieschar & Davidson, 2012). This region has also been implicated in trait aggression and the act of cursing. The current study aimed to expand on previous work looking into the hypoalgesic effect of swearing on pain (Stephens, Atkins and Kingston, 2009; Stephens & Umland 2011) whilst also examining the role of trait aggression and gender. Participants consisted of 50 students from the University of Central Lancashire. They took part in two cold pressor task trials whilst either cursing or repeating the word " chair". They also completed the Trait Aggression Questionnaire (Buss & Perry, 1992). Physiological readings of heart rate and systolic/diastolic blood pressure were taken along with cold pressor latency. It was found that swearing had no impact on pain tolerance and there were no differences in physiological reading between any of the conditions. However, the results showed that both males and females who scored high on the trait aggression questionnaire could withstand the cold pressor task for longer than those low in trait aggression. Males also lasted longer on the cold pressor task than females across both the swearing and non-swearing conditions. The lack of findings with regards to swearing could be due to the manner in which participants were asked to curse. Despite this, the findings do support the idea that individual differences need to be taken into account when studying pain and when dealing with pain in the clinical population.

Physical pain has been subject to vast amounts of research across various disciplines. From an evolutionary point of view, pain serves an important purpose. For example, it motivates action to escape or avoid noxious stimuli (Ploghaus, Tracey, Gati, Clare, Menon, Matthews, Nicholas & Rawlins, 1999). The more that is discovered about the physiological and psychological processes involved in the perception of pain, the more complex it has become (Ogden, 2007). Traditionally, the main body of research into pain has been on the pharmacological control of pain and has been focused on the spinal cord processes of pain relief. As more is being learnt about the different types of pain modality systems it is becoming clearer that pharmacology is not the only way to manipulate these mechanisms (Villemure & Bushnell, 2002). More recent evidence has been provided using neuroimaging as a means to further explore these mechanisms.

Functional neuroimaging has shown that certain areas of the brain are activated when pain is experienced. These include the thalamus, somatosensory and prefrontal cortices and the anterior cingulate cortex (Ploghaus et al, 1999). However, recent research on pain has focussed more on the role that emotions play in pain regulation. The current view is of pain is much more multidimensional. This means the perception of pain does not necessarily depend on the level of noxious input; rather it is heavily influenced by many psychological variables (Wiech & Tracey, 2009). The emotional dimension of pain is further supported by findings that show a large percentage of neurons in the medial thalamus that respond to noxious stimuli applied directly to the skin are changeable depending on the motivational and affective state of the animal (Price, 2002 cited in Wickens, 2009). Therefore it is necessary to study other areas of the brain in relation to pain.

More and more research is showing that the amygdala may play an important role in the integration of affective regulation and pain perception (Lapate, Lee, Salomons, van Reekum, Grieschar & Davidson, 2012). Using a combination of behavioural, physiological and neuroimaging methods (Lapate et al. (2012) demonstrated that both pain and emotion regulation are reflected in amygdala function. Other recent studies have also focused on the influence emotions have on pain. For example, Godinho, Magnin, Frot, Perche & Garcia-Larrea (2006) demonstrated that empathy with other people's suffering increased a participant's own reported pain intensity. In addition, De Wied and Verbaten (2001) conducted a study looking at the effect positive and negative pictures would have on participant's pain tolerance. They found that participants viewing the positive pictures prior to the task could withstand pain for longer than participants viewing the negative pictures before the task. With regards to negative emotions it has been found that inducing anger or sadness (Rainville, Bao & Chrétien, 2005) or a depressed mood (Berna, Leknes, Holmes, Edwards, Goodwin & Tracey, 2010) in healthy participants increases pain intensity and leads to individuals rating pain as more unpleasant than if these negative emotions had not been induced. Given that emotions are linked to the effects of pain, research has also explored the role they play in its regulation. For example recent research has looked at the effects of swearing on pain tolerance.

The use of taboo words, or swearing, is a prominent yet understudied part of human language (Van Lancker & Cummings, 1999) which is used across all cultures (Pinker, 2007). Swearing can be used as a means to express emotion, particularly negative. The primary meanings of offensive words are connotative (Jay & Janschewitz, 2008) rather than denotative meaning they have an emotional feeling distinct from the actual meaning of the word. As soon as a child learns to speak, they learn to curse. Children learn that cursing is a form of coping with stress and it has been hypothesised that being punished for cursing as a child can lead to the words holding a negative emotional connotation for the user (Jay, King & Duncan, 2006). Therefore it is important to explore how swear words effect emotions compared to normal language.

It has been suggested that the connotations and denotations of words are actually processed and stored in different parts of the brain, with denotation being primarily dealt with in the neocortex of the left hemisphere and connotation being processed across connections between the neocortex and the limbic system in the right hemisphere (Pinker, 2007). Interestingly it appears that the neuropathology of swearing is distinct from the main language areas of the brain. This can be seen in cases of severely aphasic patients where cursing is done with almost perfect articulation in comparison to the patient’s disabilities in other areas of language and speech (Van Lancker & Cummings, 1999). It has also been found that for patients suffering from coprolalia (the obscene linguistic outbursts of Gilles de la Tourette’s syndrome) the symptoms are the same (although culturally specific taboos) in different languages which is evidence to support the act of cursing as having a neurobiological basis (Pinker, 2007). The amygdala has also been implicated in swearing with neuroimaging studies showing increased activation in this area of the brain on hearing/saying taboo words (Jay, 2000). However, despite swearing being common in both clinical and non-clinical populations, it is a relatively neglected area of study. This may be due partly to a universal negative reaction to profanity (Van Lancker & Cummings, 1999). In particular it is surprising that swearing as a response to pain has received such little attention in the scientific community.

To date there appears to be only two studies in the area of swearing as a response to pain, both of which were conducted by Dr Richard Stephens (Stephens, Atkins and Kingston, 2009Stephens, et al. 2009; Stephens & Umland 2011). In the first of these studies Stephens et al. (2009) looked at swearing as a response to pain by asking participants to submerge their hand in freezing cold ice water (the cold pressor task). They hypothesised that swearing would be a maladaptive response to pain. In total 67 participants took part in a swearing and non-swearing trial. In the swearing trial they were asked to repeat a swear word they would use if in pain and in the non-swearing trial they were asked what word they could use for a table. Stephens took heart rate readings as well as using a perceived pain scale. In this study he found that swearing increased cold pressor latency (i. e. the time that they could keep their hand in the ice water), lowered pain perception and was accompanied by an increased heart rate. The increased heart rate is indicative of sympathetic nervous system activation, or the ‘ fight or flight’ response. As this study included both male and female participants the element of gender based differences in pain tolerance had to be considered. While this is a physical difference, the emotional effect of swearing for males compared to females could affect pain tolerance.

The main gender difference with regard to pain tolerance found in Stephens et al.'s (2009) study was that males could withstand the cold pressor task for longer than females. Women have been found to show greater sensitivity to experimentally induceds pain than men (Riley, Robinson, Wise, Myers & Fillingim, 1998) although a review of studies conducted over the past ten years looking at pain and gender suggests that pain tolerance is the only measure in which there is significant difference between males and females during the cold pressor task (Racinea, Tousignant-La¬, ammec, Kloda, Dione, Dupuis & Choinière, 2012). Other gender differences in the study by Stephens et al. (2009) were observed with females having a greater reduction in perceived pain and a greater increase in heart rate during the swearing condition. This could be due to gender differences in swearing. For example, it has been found that females perceive more power in swear words than males (Dewaele, 2004). It has also been found that although swearing frequency is similar across both genders, males tend to be more offensive than females (Jay & Janschewitz, 2008). There have also been inconsistent results in studies looking at physiological responses to pain in men and women. Maixner and Humphrey (1993) found that women responded to pain with an increased heart rate, as shown in Stephens et al. (2009), and men responded to pain with an increase in blood pressure. However a more recent study conducted by al'Absi, Peterson and Wittmers (2002) found a relationship between blood pressure and pain perception only amongst their female participants whilst other studies have found no evidence of gender differences when looking at the blood pressure/pain relationship (Helfer & McCubbin, 2001; Poudevigne, O'Conner & Pasley, 2002). These gender differences could go some way to explain why swearing has the different effects on pain perception and physiological responses. In a second study conducted by Stephens & Umland (2011) replicated earlier findings in a second study on 71 participants. , most of the results from the first study were replicated. Participants were able to keep their hand in the cold water for longer if they were swearing, and heart rate was also increased. With regards toHowever, when they looked at gender differences they found males lasted longer during the cold pressor task than females as before but this time there was no dramatic change in heart rate for the female participants.

One possible reason for swearing being an effective response to pain is that it could activate part of the brain known as the ‘ Rage Circuit'. This is an evolutionary response in mammals which goes from part of the amygdala, through the hypothalamus then into the midbrain. It is like a sudden reflex response to pain or frustration. When this happens the ‘ rage circuit' triggers the parts of the brain connected with negative emotion – including words with a strong emotional connotation such as swearing (Pinker, 2007). Indeed, Stephens et al. (2009) suggested that swearing may be effective due to it inducing a negative emotion despite previous research suggesting that negative emotion actually decreases pain tolerance and increases pain perception (Berna et al., 2010; De Wied & Verbaten, 2001; Rainville et al., 2005). It should be noted however that such research tends to consider the emotional state prior to the experience of pain rather than the emotional response to noxious stimuli (Rainville, Bao & Chrétien, 2005).

Another explanation for the hypoalgesic effect of swearing could be the role of the amygdala in the “ fight or flight” response. The central nucleus of the pathway projects to the hypothalamus which then triggers the sympathetic nervous system resulting in the “ fight or flight” response of raised heart rate and blood pressure (Wickens, 2009). This response can be activated by a number of different stimuli; including pain and can increase pain tolerance and decrease the perception of pain. Further activation of the amygdala, such as through swearing, may increase physiological reactions further resulting in this mechanism being even more effective against pain.

Negative emotions such as anxiety and depression have received a lot of attention in the field of pain research. It is becoming apparent that other negative emotions, such as anger, fear and aggression may also be involved in the perception of pain (Quartana, Bounds, Yoon, Goodin & Burns, 2010). Aggression is one of the negative emotions that have been suggested to be linked to swearing (Stephens & Umland, 2011). Many studies have been conducted in the past on whether pain elicits aggression, but there has been little research into whether aggression as a trait has an effect on pain tolerance and pain perception. In a study conducted by Seguin, Pihl, Boulerice, Tremblay & Harden (1996) adolescent boys were asked to take part in a pain tolerance task assessed via finger pressure pain. Trait aggression was recorded as “ stable”, “ unstable” or no history. The results suggested that boys classed as unstable aggressors displayed the lowest pain tolerance, whereas boys classed as stable aggressors displayed the highest pain tolerance. Another study found that male participants who displayed higher levels and frequency of aggression could endure longer periods of pain compared to males with lower levels of aggression (Niel, Hunnicut-Ferguson, Reidy, Martines & Zeichner, 2007). This seems to suggest that aggression does, in some way, play a role in pain tolerance. The main issue arising from these studies is that they only included male participants. A more recent study looking at a sample of both males and females found no significant relationship between pain tolerance and trait aggression once the men's conformity to a masculine gender role had been controlled for (Reidy, Dimmick, MacDonald, & Zeichner, 2009). These conflicting results highlight the need for further research into the role of trait aggression in the experience of pain alongside the effects of swearing and including both male and female participants.

The amygdala has already been mentioned in connection with pain modulation, swearing and emotion however it has also been linked with trait aggression. In a recent study 20 volunteers underwent brain scans which revealed a significant negative correlation between trait aggression and amygdala volume (Matthies, Rusch, Weber, Lieb, Phillipsen, Tuescher et al., 2012). Due to this and the previous inconclusive research into the role of trait aggression and pain, a high/low trait aggression condition will be included in the current study to see if there is any interaction between trait aggression and swearing during the cold pressor task.

The main aim of the current study is to try and replicate the results found by Stephens et al. (2009; 2011). A cold pressor task will be used as the noxious stimuli with swearing, gender and trait aggression being compared with regards to cold pressor latency. Heart rate will be recorded as in Stephens et al. (2009; 2011) but the current study will also record systolic and diastolic blood pressure. These physiological responses were not measured in the original studies on swearing and pain and would provide more evidence that the sympathetic nervous system is activated to a greater degree whilst swearing as well as giving more insight into the blood pressure and pain relationship (Helfer & McCubbin, 2001; Poudevigne, O'Conner & Pasley, 2002).

Based on previous research several hypotheses were generated. In line with the findings of Stephens et al. (2009; 2011) it is hypothesised that cold pressor latency will be longer in the swearing condition compared to the non-swearing condition for males and females. It is also expected that physiological responses (systolic/diastolic blood pressure and heart rate) will be higher in the swearing condition compared to the non-swearing condition. Additionally, males are expected to withstand the noxious stimulus (cold pressor task) for longer than females across the swearing and non-swearing conditions. In line with Stephens et al. (2009), but not Stephens & Umland (2011) it is hypothesised that females will display a greater increase in heart rate (and therefore systolic and diastolic blood pressure) in the swearing condition in comparison to the males.

HypothesisIn line with Stephens et al., (2009; 2011): Cold pressor latency will be longer in the swearing condition compared to the non-swearing condition for males and females. Systolic blood pressure will be higher in the swearing condition compared to the non-swearing condition for males and females. Diastolic blood pressure will be higher in the swearing condition compared to the non-swearing condition for males and females. Heart rate will be higher in the swearing condition compared to the non-swearing condition for males and females. Overall males will withstand the noxious stimulus (cold pressor task) for longer than females across the swearing and the non-swearing conditions. In line with Stephens et al., (2009), but not Stephens & Umland (2011): Females will display a greater increase in heart rate (and therefore systolic and diastolic blood pressure) in the swearing condition in comparison to the males. Due to the inconclusive research into the role of trait aggression and pain tolerance no specific hypothesis will be generated for this variable. Instead it will be examined whether trait aggression will have any effect on systolic blood pressure, diastolic blood pressure, heart rate and cold pressor latency across the swearing and non-swearing conditions and also whether there are any gender differences.

METHOD

DESIGN

A 2 x 2 x 2 mixed subjects design was employed for this study. The between subjects factors were gender (male/female) and trait aggression (high/low). The within factor was ‘ swearing’ with all participants taking part in both the swearing and the non-swearing condition. The order of conditions (swearing/non-swearing) was counterbalanced for each participant. The dependent variables measured were systolic blood pressure (mmHg), diastolic blood pressure (mmHg), heart rate (BPM) and cold pressor latency (length of time participants kept their hand in the cold water in seconds). The cold pressor task was employed as the painful stimulus. To avoid demand effects participants were not informed of the true nature of the task until they were debriefed.

PARTICIPANTS

The participants consisted of 50 students attending various courses at the University of Central Lancashire. They were recruited using both opportunity sampling and through the research participation pool where students receive credit for taking part in research. Participation was entirely voluntary. There were 25 females and 25 males with ages ranging from 18 to 44 years. Mean age was 23. 4 years (SD = 5. 71). Participants were screened for existing heart conditions, high/low blood pressure and circulatory problems. No participants were excluded from the study on the basis of this screening.

MATERIALS

Prior to taking part in the study, participants were given a brief sheet (see Appendix 1 for brief) and screened using a health screening questionnaire provided by the University of Central Lancashire (see Appendix 2 for Health Screening Questionnaire). For the Cold Pressor Task a bucket filled with a mixture of cold water and ice was used. Prior to each task a thermometer was used to check the temperature was 0°C. For baseline readings and between tasks a bucket containing room temperature water (25 °C) was used. Physiological readings were obtained using a LifeSource® UA-767 Plus machine which measures both blood pressure (systolic and diastolic) and heart rate.

Trait aggression was measured using a trait aggression questionnaire (Buss & Perry, 1992). This questionnaire consists of 29 items which participants rank on a likert scale of one to five with one being ‘ not at all like you’ and five being ‘ completely like you’. Examples of statements are; “ Once in a while I can’t control the urge to strike another person” and “ I tell my friends openly when I disagree with them.” Within the questionnaire are four subscales which measure ‘ verbal aggression’, ‘ physical aggression’, ‘ hostility’ and ‘ anger’. For the purposes of this study the overall trait aggression score was used where a higher score on the questionnaire equals a higher level of trait aggression. The questionnaire has been shown to have good internal consistency (Î± = . 89) as well as test-retest reliability (r = . 80; Buss & Perry, 1992). (See Appendix 3 for Trait Aggression Questionnaire). After completing the aggression questionnaire participants were made fully aware of the nature of the study through the debrief (see Appendix 4 for debrief).

PROCEDURE

For the task students individually attended a research laboratory on campus at the University of Central Lancashire. They were informed that the study would be looking into physiological responses to the cold pressor task and asked to complete a health screening questionnaire. Following this participants were asked to make themselves comfortable whilst the blood pressure/heart rate cuff was placed around their non-dominant arm before submerging their dominant hand up to the wrist in a bucket of room temperature water for three minutes. At the end of the three minutes a baseline blood pressure and heart rate reading were recorded. Participants were then asked for what swear word they would use if they were to bang their thumb with a hammer and also what word they would use to describe a chair. Whilst repeating their chosen word for either cursing or chair, participants submerged their dominant hand in the cold water. They were given the instruction to keep their hand in the water until it became too uncomfortable or painful. A time limit of three minutes was imposed due to safety reasons and 11 participants reached the limit in one or both conditions. During the task, heart rate and blood pressure were recorded every 30 seconds. Once they removed their hand they were asked to submerge it back in the bucket of room temperature water for three minutes. Following this participants were asked to repeat the initial cold pressor task, this time repeating the chosen word not used in the first condition. Order of conditions was counter-balanced for all participants.

Following both cold pressor tasks participants were asked to complete the aggression questionnaire before being fully debriefed. The trait aggression questionnaires were scored and then a median split performed. Possible trait aggression scores range from 29 – 145. Participants in this study scored from 49 – 113 with a median of 69. 5. Trait aggression was then split into high or low, with high being equal to, or more than 69. 5, (n25) and low being less than 69. 5 (n25). The research was conducted with the approval of the ethics committee at the University of Central Lancashire

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For the purpose of analysis, averages were taken of the systolic, diastolic and heart rate readings for male and female participants with high and low trait aggression in each condition (swearing/non-swearing). Cold pressor latency was recorded in seconds. the trait aggression questionnaires were scored and then a median split performed. Possible trait aggression scores range from 29 – 145. Participants in this study scored from 49 – 113 with a median of 69. 5. Trait aggression was then split into high or low, with high being equal to, or more than 69. 5, (n25) and low being less than 69. 5 (n25). (For raw data refer to Appendix 5)

The effects of swearing/aggression on systolic blood pressure during the cold pressor task

Systolic blood pressure (mmHg) was recorded during the cold pressor task. Table 1 shows the means and standard deviations of systolic blood pressure during the swearing and non-swearing conditions for high/low trait aggressive males and females.

Table 1: Means (and standard deviations) of Systolic Blood Pressure (mmHg) across swearing/non-swearing conditions for high/low trait aggressive males/females.

HIGH AGGRESSION

LOW AGGRESSION

TOTAL

SWEARING

MALE

125. 24

(20. 95)

129. 21

(16. 05)

127. 15

(18. 48)

FEMALE

123. 31

(12. 45)

119. 81

(11. 65)

121. 49

(11. 92)

TOTAL

124. 31

(17. 07)

124. 32

(14. 45)

124. 32

(11. 92)

NON SWEARING

MALE

121. 45

(16. 46)

129. 48

(19. 54)

125. 30

(18. 09)

FEMALE

119. 33

(13. 77)

116. 44

(11. 28)

117. 82

(12. 36)

TOTAL

120. 43

(14. 95)

122. 70

(16. 82)

121. 56

(15. 79)

A 2 (trait aggression: high/low) x 2 (gender: male/female) x 2 (swearing/non-swearing) mixed subjects factorial ANOVA revealed no significant main effect of swearing condition on systolic blood pressure ($F(1, 46) = 1.57$, $p = 0.217$, $Eta^2 = 0.033$). There was a non-significant main effect of gender ($F(1, 46) = 2.95$, $p = 0.093$, $Eta^2 = 0.060$) and a non-significant main effect of trait aggression ($F(1, 46) = 0.13$, $p = 0.718$, $Eta^2 = 0.003$). In addition, the interaction between swearing and trait aggression showed no significance ($F(1, 46) = 0.29$, $p = 0.593$, $Eta^2 = 0.006$). The interaction between swearing and gender was non-significant ($F(1, 46) = 0.19$, $p = 0.662$, $Eta^2 = 0.004$) as was the interaction between gender and trait aggression ($F(1, 46) = 1.42$, $p = 0.240$, $Eta^2 = 0.030$). Overall there was no significant 3-way interaction between swearing, gender and trait aggression ($F(1, 46) = 0.16$, $p = 0.691$, $Eta^2 = 0.003$). (For analysis output on systolic blood pressure see Appendix 6).

The Effect of swearing/aggression on diastolic blood pressure during the cold pressor task

Diastolic blood pressure (mmHg) was recorded during the cold pressor task.

Table 2 shows the means and standard deviations of diastolic blood pressure during the swearing and non-swearing conditions for high/low trait aggressive males and females.

Table 2: Means (and standard deviations) of Diastolic Blood Pressure (mmHg) across swearing/non-swearing conditions for high/low trait aggressive males/females.

HIGH AGGRESSION

LOW AGGRESSION

TOTAL

SWEARING

MALE

78. 73

(17. 66)

87. 37

(12. 75)

82. 88

(15. 81)

FEMALE

85. 63

(9. 85)

79. 50

(16. 37)

82. 44

(13. 72)

TOTAL

82. 04

(14. 58)

83. 28

(14. 99)

82. 66

(14. 65)

NON SWEARING

MALE

80. 56

(13. 05)

86. 24

(13. 05)

82. 88

(15. 81)

FEMALE

85. 21

(8. 81)

85. 74

(10. 06)

85. 49

(9. 29)

TOTAL

82. 79

(11. 24)

85. 98

(11. 78)

84. 39

(11. 51)

A 2 (trait aggression: high/low) x 2 (gender: male/female) x 2 (swearing/non-swearing) mixed subjects factorial ANOVA revealed no significant main effect of swearing condition on diastolic blood pressure ($F(1, 46) = 0.65$, $p = 0.425$, $Eta^2 = 0.014$). There was a non-significant main effect of gender ($F(1, 46) = 0.07$, $p = 0.801$, $Eta^2 = 0.001$) and a non-significant main effect of trait aggression ($F(1, 46) = 0.48$, $p = 0.491$, $Eta^2 = 0.010$). In addition the interaction between swearing and trait aggression showed no significance ($F(1, 46) = 0.21$, $p = 0.651$, $Eta^2 = 0.004$). The interaction between swearing and gender was non-significant ($F(1, 46) = 0.40$, $p = 0.531$, $Eta^2 = 0.009$) as was the interaction between gender and trait aggression ($F(1, 46) = 2.51$, $p = 0.120$, $Eta^2 = 0.030$). Overall there was no significant 3-way interaction between swearing, gender and trait aggression ($F(1, 46) = 1.41$, $p = 0.241$, $Eta^2 = 0.030$). (For analysis output on diastolic blood pressure see Appendix 7).

The Effect of swearing/aggression on heart rate during the cold pressor task

Heart rate (BPM) was recorded during the cold pressor task. Table 3 shows the means and standard deviations of heart rate during the swearing and non-swearing conditions for high/low trait aggressive males and females.

Table 3: Means (and standard deviations) of heart rate (bpm) across swearing/non-swearing conditions for high/low trait aggressive males/females.

HIGH AGGRESSION

LOW AGGRESSION

TOTAL

SWEARING

MALE

83. 79

(11. 45)

81. 93

(15. 86)

82. 90

(13. 48)

FEMALE

92. 10

(16. 79)

87. 34

(16. 14)

86. 92

(16. 29)

TOTAL

87. 78

(14. 59)

84. 74

(15. 91)

86. 26

(15. 19)

NON SWEARING

MALE

84. 57

(20. 16)

84. 91

(16. 13)

84. 73

(17. 96)

FEMALE

89. 88

(12. 40)

85. 17

(16. 42)

87. 43

(14. 53)

TOTAL

87. 12

(16. 76)

85. 04

(15. 94)

86. 08

(16. 22)

A 2 (trait aggression: high/low) x 2 (gender: male/female) x 2 (swearing/non-swearing) mixed subjects factorial ANOVA revealed no significant main effect of swearing condition on heart rate (F(1, 46) = 0. 01, p = 0. 934, Eta^2 = . 000). There was a non-significant main effect of gender (F(1, 46) = 1. 40, p = 0. 243, Eta^2 = 0. 030) and a non-significant main effect of trait aggression (F(1, 46) = 0. 46, p = 0. 503, Eta^2 = 0. 010). In addition the interaction between swearing and trait aggression showed no significance (F(1, 46) = 0. 09, p = 0. 770, Eta^2 = 0. 002). The interaction between swearing and gender was non-significant (F(1, 46) = 1. 14, p = 0. 292, Eta^2 = 0. 024) as was the interaction between gender and trait aggression (F(1, 46) = 0. 24, p = 0. 628, Eta^2 = 0. 005). Overall there was no significant 3-way interaction between swearing, gender and trait aggression (F(1, 46) = 0. 08, p = 0. 780, Eta^2 = 0. 002). (For analysis output on heart rate see Appendix 8).

The Effect of swearing/aggression on cold pressor latency during the cold pressor task

Cold pressor latency (the length of time participants kept their hand in the ice water) was recorded in seconds. Table 4 shows the means and standard deviations of cold pressor