Spring 2016

The Relationship Between The Buss-Perry Aggression Scale And Evoked Heart Rate While Attending Aggression And Friendly Dyadic Interactions

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THE RELATIONSHIP BETWEEN THE BUSS-PERRY AGGRESSION SCALE AND EVOKED HEART RATE WHILE ATTENDING AGGRESSION AND FRIENDLY DYADIC INTERACTIONS

A Masters Thesis

Presented to

The Graduate College of

Missouri State University

In Partial Fulfillment

Of the Requirements for the Degree

Master of Science, Psychology

By

Sarhand Awla Hasan

May 2016

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Psychology

Missouri State University, May 2016

Master of Science, Psychology

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ABSTRACT

The relationship between an individual's propensity of displaying aggressive behavior, as assessed via the Buss-Perry Aggression Questionnaire, and physiological responses (evoked heart rate (HR)) while viewing 5-sec video clips of aggressive and friendly dyadic interactions was examined. No significant differences between aggressive and friendly groups' Evoked HR were found. However, there were significant individual differences in aggression identified within the aggressive and friendly video groups. Individuals who scored low on Buss-Perry Verbal Aggression subscale displayed HR deceleration, whereas individuals who scored high on Buss-Perry Verbal Aggression subscale displayed HR acceleration when viewing verbal but not physically aggressive video clips. This trend was also evident for the relationship between the Buss-Perry Anger subscale when viewing friendly helping video clips. How individuals with different propensity of aggressive behavior react to friendly interactions are interpreted via an empathy-emotion model of aggression. The findings support the use of implicit measures such as HR that could be employed in a therapeutic setting to assist aggressive individuals in recognizing the connection between stimulus events that elicit an emotional response and subsequent inappropriate behavior(s).

KEYWORDS: heart rate, Buss-Perry Aggression Scale, acceleration, deceleration, Aggressive behavior, anger, hostile, empathy, verbal aggression, physical aggression

This abstract is approved as to form and content

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ACKNOWLEDGEMENTS

I would like to express my appreciation to all those who contributed to the preparation of this project. Special thanks to the staff in the Infant Perception and Research Lab: particularly D. Wayne Mitchell, Stephanie Aholt, George Spencer, and Benjamin Graves.

I am also grateful to my family and friends that have been supportive throughout times I have spent on thesis. Lastly, I wish to express my gratitude to all who taught me throughout my graduate student life.

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INTRODUCTION

"Are humans innately friendly or aggressive?" is a question that has been asked throughout humanity. Hobbes (1651), one of our earliest philosophers, viewed humankind as innately aggressive, and by seeking power and enforcing laws humans reduce their innate aggressive instinct. The innate aggression viewpoint was further promoted by Freud (1915). Freud believed that humankind and all other beings are inherently aggressive as a function of self-preservation instincts. Those instincts create an inconvenient tension that can be released through performing acts of aggression.

However, Hamlin, Wynn, and Bloom (2007; 2010) provided evidence that infants, as early as 3 to 6 months of age, show preference for individuals who display prosocial behavior as opposed to individuals who display antisocial behavior. One of Hamlin's et al. (2007) primary research questions was whether infants can form impressions of individuals based upon how those individuals treat others. For example, during a habituation phase, infants were presented a series of events (via a video clip) where a 'Climber' attempts to reach top of a hill, but fails two times. Then, there is a 'Helper' that helps the 'Climber' to reach the top of the hill (pro-social) and a 'Hinder' that prevents 'Climber' from reaching the top of the hill (antisocial). The 'Climber', 'Helper', and 'Hinderer' were inanimate objects (wooden blocks with 'googly eyes'). The wooden objects (Climber, Helper, and Hinderer) differed only in shape and color. After viewing the video events, the infants were presented simultaneously the 'Helper' and 'Hinderer' to the left and right of the infant (counterbalanced for lateral position) for 30 sec. Based upon preferential looking, infants preferred the 'Helpful' object

significantly more than the 'Hindering' object. Hamlin et al. (2007) argue that their findings "indicate that humans engage in social evaluation far earlier in development than previously thought, and support the view that the capacity to evaluate individuals on the basis of their social interactions is universal and unlearned" (p. 559).

The development of aggression and the environmental factors that promote aggressive behavior are yet to be understood. In that regard, an understanding of how one learns to internalize and regulate emotional experiences with stimulus events would be an important avenue of study. It is the contention of the author that the relationship between empathy and aggression is one area that has shown promise. Although environmental factors most likely play an important role in the development and maintenance of aggressive behavior, the genetic component cannot be ignored, as evidenced by the consistent finding that resting HR is correlated negatively with subsequent aggressive behavior. Hence, the nature-nurture debate appears to be alive with regard to explanation for aggressive behavior(s). In the following 3 sections a brief review of relevant studies on (1) the relation between empathy and aggression, (2) the heritability of aggression with regard to resting HR, and (3) the relationship between aggressive behavior and resting HR will be examined.

Aggression and Empathy

Although humans internalize and react to the same stimuli and events in various ways, the reasons behind the reaction differences are poorly understood. Eisenberg and Fabes (1992) propose that emotional intensity and regulation capacities are associated with the way an individual reacts to an event. That is, perceiving distress situations

results in an observer's emotional arousal. However, how an observer evaluates and regulates this arousal leads to different behaviors. If the observer regulates the emotional arousal *optimally*, the observer would resonate with the position of another person and thus behave pro-socially. In contrast, if the observer *over-regulates* the emotional arousal, there would be proactive withdrawal and thus the observer avoids being a part of the event. And individuals who *under-regulate* emotional arousal consequently become self-focused and are more likely to engage in aggressive behavior. This supports the notion that empathy plays a significant role in an individual's aggressive or pro-social reaction to an event.

Davis (1980) divided empathy into fantasy, perspective-taking, empathic concern, and personal distress components. Fantasy refers to the observer's tendency to identify with fictional characters; perspective-taking refers to the observer's ability to see the event from other people's perspectives; empathic concern refers to the observer's compassion to those facing painful situations; and personal distress refers to the observer's distress to those suffering.

Batson, Fultz, and Schoenrade (1987) distinguish between two forms of congruent emotional responses (emotional empathy and personal distress) that an observer experiences while viewing another individual in need. Emotional empathy refers to the situation during which the observer focuses on another individual in need to reduce the other's need. In emotional empathy, the observer is motivated to help the other in need because the observer feels moved, compassionate, soft-hearted, tender, and so on. Personal distress, on the other hand, refers to feelings such as being: *upset*, *distressed*,

alarmed, *worried*, *disturbed*, and so forth. In personal distress, one appears to evoke egoistic motivation to diminish one's own aversive arousal.

To assess the association of affective and cognitive empathy with verbal, physical, and indirect aggression, 241 elementary school boys completed the Basic Empathy Scale and three questions that were believed to assess three types of aggression. It was found that affective and cognitive empathy were related differently to physical, verbal, and indirect aggression. That is, affective empathy was related to physical aggression when controlling for cognitive empathy. While controlling for affective empathy, an association between cognitive empathy and indirect aggression was found. However, there was no relationship between verbal aggression and affective or cognitive empathy (Yeo et al., 2011).

Lockwood, Seara-Cardoso, and Viding (2014) examined the hypothesis that different types of emotional regulation strategies moderate the empathy-pro-social behavior relationships. One hundred ten female and male adults were recruited to complete the Questionnaire of Cognitive and Affective Empathy, the Emotional Regulation Questionnaire, and the Pro-social Tendencies Measure. They found that pro-social tendencies were predicted by cognitive empathy (r = .36) and affective empathy (r = .43). The Pro-social behavior-affective empathy relationship was also moderated by cognitive reappraisal. A significant relationship between pro-social behavior and empathy was found for individuals with average and low cognitive appraisal. In contrast, for people with higher cognitive reappraisal tendencies, the relationship was not significant. This indicates that there are individual differences in the use of empathy regulation strategies between when behaving antisocially compared to behaving pro-socially. In

another study to examine the relationship between empathy and psychopathy, 80 adult males completed the Reactive and Proactive Aggression Questionnaire (RPQ), the Hare Psychopathy Checklist-Revised: SV (PCL-R; SV), and the Interpersonal Reactivity Index (IRI). The participants were divided into three groups as follows: Control group: healthy men from the general population; Violent group 1: violent men from the general population; and Violent group 2: criminal offender inmates. They found that criminal offenders had the highest psychopathy scores whereas criminal offenders had the highest personal distress. These data supports the association between lack of empathy and aggressive behavior (Díaz-Galván et al., 2015).

Jolliffe and Farrington (2006) examined the association of cognitive and affective empathy with bullying. Seven hundred twenty male and female adolescents were recruited to complete a bullying questionnaire and the Basic Empathy Scale (BES). A significant association between bullying and low affective empathy was found for females but not for males. Low affective empathy, still, was associated with *occasional* versus *frequent* bullying for both genders. Cognitive empathy was not significantly related to bullying among any genders. Overall, indirect bullying by females and direct violent bullying by males was found to be associated with low total empathy. Although there were no significant differences between those who reported bullying and those reporting no bullying, the effect sizes ranged from $d = .14$ to .18 for males and $d = .15$ to .32 for cognitive empathy, affective empathy and total empathy respectively.

A longitudinal study by Batanova and Loukas (2014) examined the association of aggression with different components of empathy, and how family and school factors moderate the relationship over one year in a middle school. Four hundred eighty-one

female and male adolescents completed the Davis's Empathic Concern Subscale, the Davis's Perspective Taking Subscale, the Family Environment Scale, five items from National Longitudinal Study of Adolescent Health, and the Crick's Aggression Questionnaire in two study waves. For girls, a decrease in overt aggression was predicted by empathic concern. For boys, a negative impact of low empathic concern on aggression was reduced by positive family relations after one-year. Overt aggression was also decreased by school connectedness one-year later. This indicates that school and family play a significant role in boys' aggressive behavior as affective empathy does in girls' aggression.

In sum, the previous studies show there is a negative relationship between empathy and aggressive behavior. That is, a lack of empathy is an indicator of antisocial behavior. It should be also noted that different components of empathy are dissimilarly related to aggressive and pro-social behavior. For example, if an individual's reaction for a painful event is emotional empathy, the individual tries to reduce the other's distress. Whereas, if the reaction of the observer is personal distress, the observer tries to reduce his own distress. Accordingly, empathy plays a significant role in the way individuals react to an event.

Heritability: Aggression and Resting HR

Although how individuals learn to control aggression is of practical importance in order to improve human interactions in society, there is evidence for the genetic contribution to aggressive behavior. Experiments examining the resting HR-aggression association have confirmed repeatedly that low resting HR is relatively indicative of

aggressive behavior (Farrington, 1997), and offspring of violent individuals tend to have low resting HR (Farrington, 1987). HR variability is a result of changes in autonomic processes of respiration and blood pressure regulation. This phenomenon is mediated through the sympathetic and parasympathetic autonomic nervous system (Mezzacappa et al., 1997); the sympathetic system increases HR (associated with a fight or flight response) whereas the parasympathetic system decreases HR (associated with lower emotional arousal).

Raine (2002) states that low resting HR is the easiest and best replicated 'biological' measure of aggressive and antisocial behavior. Physiological explanations of low resting HR-aggression association are low arousal, fearlessness, stimulation seeking, reduced noradrenergic functioning, and reduced right-hemisphere functioning. However, Raine (2002) argues primarily that individuals are predisposed to be aggressive as function of a low physiological arousal as evident by a low resting HR. That is, people with low resting HR have low arousal and people with low arousal seek stimulation, such as beating, assault, and robbery which results in an increase their arousal to more normal or elevated autonomic level. Thus, if low resting HR is inherited, then HR could be one genetic mechanisms through which aggressive behavior is transmitted.

By using biometric genetic-model fitting, Ditto (1993) assessed familial influences on HR. The participants were 100 healthy twin pairs of various ages, consisting of 20 homosexual dizygotic female pairs, 20 homosexual dizygotic male pairs, 20 monozygotic female pairs, 20 monozygotic male pairs, and 20 heterosexual dizygotic pairs. A significant genetic influence was found on resting HR. The heritability estimate (variance accounted for) was .65 for resting HR.

To examine resemblances of twins and their parents in relation to sport participation, the heart rates of 46 dizygotic and 44 monozygotic adolescent twin pairs and their parents were assessed. They were also asked about sport participation. It was found that there was a positive relationship between environmental influences and HR changes for all twins; indicating that HR is influenced by both genetic and environmental factors (Boomsma, Van-den-Bree, Orlebeke, & Molenaar, 1989). Likewise, Raine, Venables, and Mednick (1997) stated that HR is an early biological marker and partially heritable while describing the low HR-aggressive behavior association.

Moffitt and Caspi (2001) compared various childhood risk factors related to lifelong antisocial behavior. Low resting HR at ages 7, 9, and 11 was found to be related to life-course aggressive behavior for both females and males.

In a longitudinal study in Montreal, Canada, the association between anxiety and antisocial behavior and autonomic HR regulation was examined. One hundred seventy-five (175) male adolescents completed self-report assessments of anxiety and antisocial behavior at ages 10, 11, 12, 13, 14, and 15. Participants' HR was measured in the laboratory settings familiar to them. A negative relationship between level of antisocial behavior and changes in HR was found. That is, decreasing HR was associated with increasing levels of aggressive behavior (Mezzacappa et al., 1997).

The evidence from numerous cross cultural studies have provided further support of the low resting HR-Aggressive behavior association, such as the U.S (Raine et al., 1997), Canada (Mezzacappa et al., 1997), England (Farrington, 1987), and New Zealand (Moffitt & Caspi, 2001). This indicates that the relationship between HR and aggression is independent from culture and ecological context.

Aggressive Behavior and Resting HR

The Nobel Prize winner, Konrad Lorenz (1966), examined coral fish in the aquarium and then he observed them in the sea. He found that coral fish are more aggressive toward fish that have similar colors as them compared to the fishes of differential color. Lorenz also found that fish are less aggressive toward other species than their own species. He found that Coral fish do not attack the other species unless the other species come into their territory. He concluded that animals are more aggressive toward their own species (intra-specific aggression) than others. He refutes, however, that aggression is a destructive instinct. He stated that aggression is an innate instinct to protect an individual from destruction. Thus, Lorenz believes that animals behave aggressively to survive.

In a longitudinal study, Raine, Venables, and Mednick (1997) hypothesized that low resting heart rate at an age of 3 years would be predictive of aggressive behavior at age 11. The resting HR for over 1,700 children was recorded at age 3 years. Eight years later, the participants were rated again by parents using the Child Behavior Checklist. The results were that children who had lower resting heart rates at age 3 years were rated significantly more aggressive by age 11 (d = .33). It was concluded that antisocial and aggressive behavior in adolescents is associated with low resting HR in childhood.

Cambridge University conducted a longitudinal study to investigate Delinquent Development and antisocial behavior. The study sample consisted of 411 males from London. The participants were examined and interviewed at age of 8, 10, 14, 16, 18, 21, 25, and 32. In the study, various types of tests and interviews were used and the conviction record of each participant was examined until the age of 40. The participants'

resting HR was recorded at age 18. Significantly low resting HR was found for the participants who were classified as chronic offenders and for those participants who were convicted of violence before age of 25. Moreover, out of 48 predictors used for the study, only two predictors (low resting HR and poor concentration) were associated independently with violence, with low resting HR being the strongest predictor (Farrington, 2003). Raine et al. (1997) argues that HR is the most significant indicator of aggressive and violent behavior. A meta-analysis by Portnoy and Farrington (2015) of United Kingdom and USA longitudinal studies, the average effect size was $d = .35$; indicating again a reliable relationship between resting HR and subsequent antisocial behavior.

Ortiz and Raine (2014) conducted a meta-analysis assessing the relationship between resting HR and children's subsequent antisocial behavior. Independent effect sizes from 45 studies were obtained. Overall, resting HR was found to be related to children's antisocial behavior (average $d = .44$), again indicating that individuals with low resting HR have a tendency to display aggressive and antisocial behaviors.

Furthermore, to further investigate HR and electrodermal activity (EDA) association with aggression, a meta-analysis of 95 studies was conducted. All the studies included had to be in relation to either HR or EDA or both with the aggression measurement. The range of publication years for all studies was from 1957 to 2001. The studies used also had to have sufficient data to calculate effect sizes. Additionally, the studies included in the meta-analysis had undergone scientific review. Of the 95 studies, 16 were specific to the resting HR-aggression relationship. The mean aggregate effect

size (d = .38) was found by Lorber (2004); again supporting that aggressive behavior is related to low resting HR.

To assess the generalizability of this well-replicated association between low resting HR and aggression, Raine, Fung, Portnoy, Choy, and Spring (2014) recorded resting HR of 334 Hong Kong adolescents aged 11-17 years from both genders. One of the hypotheses of the study was that psychopathic traits and aggression are correlated with low resting heart rate. To assess aggression in adolescents, their parents were assigned to fill out the Antisocial Personality Screening Device and the Reactive-Proactive Aggression Questionnaire on their children. They found that the psychopathic traits and proactive aggression were correlated significantly with low-resting HR (r = -.18).

However, Wilson and Scarpa (2013) examined the correlation between aggression and baseline HR in women. Two hundred and three young adult women were assigned to complete measures of aggression and then subsequently their baseline HR was then measured. The relationship was in the predicted direction (r = -.15); however, no statistically significant relationship between aggression and baseline HR in this sample of women was found.

In a different study, Wilson and Scarpa (2014) examined how sensation-seeking behavior mediates a relationship between low-resting HR and aggressive behavior. One hundred twenty-eight college students from both genders completed the Zuckerman Sensation Seeking Scale, the Buss-Perry Aggression Questionnaire, and the Impulsive/Premeditated Aggression Scale. Resting HR was measured for all of the participants. The main effect of sensation-seeking was found to be significant in

relationship to premeditated aggression. The interaction of sensation seeking and resting HR was also found to be statistically significant in relationship to premeditated aggression. A significant inverse association of low sensation-seeking and premeditated aggression was found, particularly when anticipating physical aggression. They argued that the result of the study indicates that aggressive behavior is resulted from an interaction between both psychophysiology and psychosocial factors.

As mentioned at the beginning of this manuscript, Hamlin, Wynn, Bloom, and Mahajan (2011) found that 5-month-old infants' prefer individuals (hand puppets) who have been seen acting positively toward another (a Puppet seen displaying Giving behavior) versus individuals (a Puppet seen displaying Taking behavior). This supports that humans, before being influenced by environmental factors, are able to make complex and sophisticated social evaluations of others and events. Additionally, this suggests that humankind has a preference for helpful and peaceful behavior as opposed to antisocial and aggressive behavior. Hence, one could argue that aggressive behaviors are acquired. But, given the findings that resting HR is correlated with subsequent aggression, one can view resting HR as an important biological marker for the propensity for aggression. Here, Cohen's *d* effect size appears to average .44: a value often interpreted as a moderate effect size. However, the magnitude of .44, transposed to a percent of variance, is approximately 4% (see Baker, Tuvbad, Reynolds, Zheng, Lozano, and Raine 2009, for comprehensive summary). Therefore, 4% of the variance in aggression can be attributed to resting HR. This leaves much work to be done to understand the development of aggression.

The Purpose of this Study

The purpose of the current study was two-fold: (1) to assess if the magnitude and direction of an individual's Evoked HR was different when viewing Verbal versus Physical Aggressive dyadic interactions as opposed to when viewing Verbal versus Physical Friendly dyadic interactions; and (2) whether there is a significant relationship between the propensity for aggression, as measured by the Buss-Perry Aggression Questionnaire and subsequent Evoked HR.

Primary Hypotheses

Hypothesis 1. Differences in Evoked HR between Aggression and Friendly Video Clips: It was hypothesized that there would be differences between Evoked HR when viewing aggression versus friendly video clips; and that there would be greater Evoked HR acceleration when viewing the aggression video clips compared to that of the friendly video clips.

Hypothesis 2. Differences in Evoked HR between Verbal versus Physical Dyadic Interactions: Although Evoked HR acceleration is expected for both the Verbal and Physical interaction video clips, it was hypothesized that there would be greater HR acceleration for the Physical Aggression videos versus the Verbal Aggression videos. For Friendly video clips, significantly greater Evoked HR acceleration is expected for Physical Friendly video clips compared to the Verbal Friendly videos.

Hypothesis 3. Correlation between Buss-Perry Aggression Subscales and the magnitude of Evoked HR change: It was hypothesized that the Buss-Perry Aggression subscales would correlate with the magnitude of Evoked HR change while attending to

the Aggression and Friendly videos. It was hypothesized that the Buss-Perry Aggression Subscales would correlate positively with the magnitude of HR change when viewing Friendly-helping interaction videos; particularly the Verbal Aggression subscale when viewing the verbal aggression videos; and the Physical Aggression subscale when viewing the Physical Aggression videos. That is, it is expected that there would be greater HR acceleration for individuals with high aggression scores whereas those individuals with low aggression scores would display little or no HR acceleration. While viewing friendly dyadic interactions it was expected that the Verbal and Physical Aggression subscales would predictive positively the magnitude of Evoked HR.

METHODS

Participants

Missouri State University IRB approval was obtained before conducting this experiment (September 04, 2015; approval #16-0045). Sixty-nine adults (PSY 121 students) were recruited as participants. Participants were recruited via the Missouri State University Psychology Department SONA online Experiment Management system, which allows PSY 121 students to review on-going research projects and to then choose those in which they wish to participate. Out of 69 participants recruited, 3 were excluded because of equipment failure, and 3 participants were identified as outliers because of extreme resting HR (> 100 bpm) and thus excluded. The final sample after omitting these individuals was (n = 63), consisting of 32 females (*M* age of 20) and 31 males (*M* age of 21).

Equipment and Materials

To record HR, three disposable adhesive electrodes were used; one placed on each ankle and the right wrist of each participant. HR was measured using a BIOPAC Systems, Inc. MP30 amplifier, a Dell OPTIPLEX GX-820 desktop computer, and the BIOPAC Systems, Inc. physiological monitoring software. The stimuli were 18 5-second Video Clips were presented on a QuickTime media player with a Dell OPTIPLEX 755 Desktop computer on a 43 cm diagonal computer monitor. There were 4 Verbal video clips (2 displaying verbal aggression interactions and 2 that displayed verbal friendly interactions) and 4 Physical video clips (2 displaying physical aggression interactions and

2 displaying physical friendly interactions) all of which were taken from real life footage and news reports. Participants were also completed the 29 item of Buss-Perry Aggression Questionnaire. The video clip Verbal Aggression interactions are (1) two young skateboarders engaging in name-calling and (2) a man verbally assaulting a woman; the Physical Aggression interactions are (1) two drivers whereby a street fight evolves and (2) a man hitting a reporter; the Verbal Friendly interactions are (1) a pregnancy surprise interaction and (2) a marriage proposal; and the Physical Friendly interactions are (1) a man assisting a blind man cross a street and (2) a man assisting an elderly woman with a food cart.

Procedure

Participants were assessed twice during this experiment: a *Laboratory Assessment* and a *Self-Report Assessment*. The total time to complete the assessments was approximately 30 minutes (10 minutes for orientation, obtain consent, and to collect demographic information), and 20 minutes to conduct the *Laboratory Assessment* and the *Self-Report Assessment*. The procedures for each assessment will be discussed in turn.

Upon arrival at the testing location (Infant Perception and Learning Lab, PCOB, Room 226) each participant was given an oral presentation explaining the basic testing procedures (an orientation to and a rationale for the types of tasks that were going to be used in this study). Each participant was then given the Consent Form (see Appendix A) and the Demographic Information Sheet (see Appendix B). The demographic information was used to document the characteristics of the recruited sample and to provide basic data that might have a direct effect upon heart rate (e.g., exercise and caffeine information).

Once consent for participation was obtained, the *Laboratory* and *Self-Report Assessments* were conducted. The order of these assessments was counterbalanced, meaning that half of the participants completed the *Self-Report* before they received the *Laboratory Assessment,* while the other half received the *Laboratory Assessment* first followed by the *Self-Report.* The afore-mentioned assessments were conducted as follows:

The Self-Report Assessment

The participants were asked to complete one paper and pencil self-report, the Buss-Perry Aggression Questionnaire (see Buss and Perry 1992). The Buss-Perry Aggression Scale consists of 4 subscales that assesses 4 types of aggression (verbal, anger, hostile, and physical). According to Buss (1961), physical aggression is defined as overcoming an organism or removing a barrier by using body parts or weapons to deliver noxious stimuli. Verbal aggression is defined as delivering noxious stimuli to another organism through vocal response, such as rejection and threat. Anger is defined as emotional response with facial-skeletal and autonomic factors that intensifies aggression. Hostility is negative implicit interpretation and evaluation of events and people. This scale has been found to be a reliable and valid measure of an individual's risk of displaying aggressive and hostile behaviors. The Buss-Perry Aggression Questionnaire consists of 29 items where items 1-9 measure Physical Aggression (α = .85; test-retest reliability, r = .80), items 10-14 Verbal Aggression (α = .72; test-retest reliability, r = .76), items 15-21 Anger (α = .83; test-retest reliability, r = .72), and items 22-29 Hostility (α = .77; test-retest reliability, r = .72). Each question on the Buss-Perry Questionnaire employs a five-point rating scale, where 1 = extremely uncharacteristic of me, 2 =

somewhat uncharacteristic of me, 3 = neither uncharacteristic nor characteristic of me, 4 = somewhat characteristic of me, and 5 = extremely characteristic of me. Individual Subscale scores were derived by summing the ratings for the questions that define each of the subscales. A Total Aggression score was also derived by summing each individual's ratings across all 29 items (α = .89; test-retest reliability, r = .80).

The Laboratory Assessment

This assessment was an evaluation of the participant's physiological responses (HR) to a series of 5-sec video clips displaying a nature scene, aggressive or friendly-helping interactions. Participants were sitting approximately 61 cm in front of the 43 cm computer monitor where video-clip presentations were displayed via a QuickTime Computer Program. HR was recorded and monitored by way of three unobtrusive adhesive electrodes placed on the participants' ankles and right wrist via the BioPac MP30 software and hardware. The laboratory session began by recording and establishing a resting HR. Once the three electrodes had been attached to the participant, the participant was asked to sit quietly for 2 minutes while HR was recorded. Once a resting HR was established, the QuickTime video was subsequently cued. There were two variations of the QuickTime Videos: an *Aggressive* condition and a *Friendly* condition. In the *Aggression* condition, a series of 14 neutral video clips, each displaying the same natural Mountain/Lake scene, and 4 video clips displaying *Aggressive* interactions between two individuals were played. Two of the aggression video clips represented verbal-aggression interactions and two of the video clips represented physical-aggression interactions. The *Friendly* condition was identical to the *Aggression*

condition except 4 video clips displaying *Friendly* interactions between two individuals were shown in place of the *Aggression* video clips. Two of the video clips displayed friendly verbal interactions and two video clips displayed friendly physical helping interactions. The video clips were selected from YouTube and news websites. None of the aggression video clips displayed blood, death, body dismemberment, gun violence, or war scenes. Each video clip was displayed for 5 sec followed by a 5 sec inter-clip-interval (a blank computer screen). The aggression and friendly video clips were presented randomly between the neutral video clips with one stipulation, that is, at least two neutral stimuli preceded the presentation of a friendly or aggression video clip. HR was recorded and monitored throughout the video clip presentations.

Participants were assigned randomly to one of two groups, *Aggression* (n = 30) or *Friendly* (n =33). Within each of the *Aggression* and *Friendly* groups, participants were assigned randomly to one of two video clip presentation orders: *forward* and *backward* and to a testing order (Laboratory assessment then Self-Report or Self-Report then Laboratory assessment). The resulting design used a 2 (Group; Friendly vs Aggression) X 2 (Gender) X 2 (Video Clip Order; Forward vs Backward) X 2 (Assessment Order) X 2 (Video Type; Verbal vs Physical) X 2 (Evoked HR) ANOVA with repeated measures on the last two factors.

RESULTS

Data Reduction

To establish resting HR, three BPM were taken at the 60 second and 90 second time points out of 120 seconds of the resting HR. The average of those six BPM was then calculated and represented the resting HR measure. The 14 *neutral video clip presentation*s were excluded.

For the each of the aggression and friendly video presentation trials, the first three BPM were taken at the stimulus onset, except one of the physical aggression video clip trials in which the physical act started in the middle of the video. For that video clip the first three last BPM were taken beginning a half second prior to the physical act.

The average of the three BPM for each of the verbal and physical video presentation trials was calculate, and then HR change scores were converted to difference scores in the form of (*A – B);* where *A* was the average Evoked HR will attending the video clip and *B* was the average resting HR. A negative difference indicates an Evoked HR deceleration below resting HR and a positive difference score indicates Evoked HR acceleration above resting HR. These Evoked HR difference scores were further reduced to 2-video presentation averages. The Evoked HR difference scores for the two verbal interactions were averaged as were the Evoked HR difference scores for the two physical interactions within each of the *Friendly* and *Aggression* groups. Therefore, the Evoked HR was reduced to two aggregate HRs; one verbal and one physical within each of the *Friendly* and *Aggression* groups.

On the Buss-Perry questionnaire 4 participants failed to rate one questionnaire item and 1 participant failed to rate two questionnaire items. These missing data points were replaced by deriving an average of the participant's ratings on the subscale which contained the missing response.

Preliminary Analyses

Buss-Perry Norm Comparisons: In order to assess whether this sample of participants represents the Buss-Perry (1992) aggression norms, a series of one-sample *t*-tests were calculated comparing the sample mean to each of the subscale normed means by Gender. The sample means and *SD*s with the corresponding Buss-Perry norms are presented in (T 1). It was found that males in the current study scored lower on all subscales in the current study, *physical aggression* $t(30) = -2.10$, $p = .04$; *verbal aggression*, $t(30) = -1.93$, $p = .06$; *anger*, $t(30) = -1.97$, $p = .11$; and *hostility*, $t(30) = -1.74$, $p = .09$. However, the differences were significant only for *physical aggression*. On the other hand, females scored higher on *physical* and *verbal aggression* and lower on *anger* and *hostility* in the current study while compared to the Buss and Perry (1992) study. However, the differences were minimal and only significant for *verbal*: *physical aggression*, $t(31) = .84$, $p = .41$; *verbal*, $t(31) = 2.11$, $p = .04$; *anger*, $t(31) = -1.37$, $p = .18$; and *hostility*, $t(31) = -1.05$. Overall, the men in this study have lower Total aggressive scores, $t(30) = -2.51$, $p = .02$; and the women's Total aggression scores in the current study are representative of the Buss-Perry norms ($t(31) = .05$, $p = .96$).

Gender Differences on the Buss-Perry Aggression Questionnaire: As noted in the above analyses, this sample is well within the norms established by Buss and Perry

(1992). However, to test for Gender differences across the various Buss-Perry subscales, a series of independent *t*-tests were calculated. It was found that males significantly scored higher on *physical aggression* compared to females, $t(30) = 5.66$, $p < .01$. Males also scored higher on *hostility* and *anger*. However, the differences were not significant, $t(30) = .13$, $p = .90$ for *hostility*, and $t(30) = .28$, $p = .78$ for *anger*. Females scored higher on *verbal aggression*, but the difference was not significant, $t(30) = -.914$, $p = .37$. For the Total aggression score, males scored higher than females in aggression questionnaire. However, the difference was marginal and not significant, $t(30) = 1.78$, $p = .09$.

In sum, this sample is a reasonable representation of the Male and Female norms established by Buss and Perry (1992).

Primary Analyses

There are two primary data analyses: (1) Examine the differences between Aggression and Friendly groups' Evoked HR while attending physical and verbal interaction videos, and (2) correlation analyses between the Buss-Perry Aggression subscales and Evoked HR while attending verbal and physical dyadic interactions. The results of these analyses are presented and discussed in turn.

Evoked HR Analysis: Preliminary analyses to assess Gender differences, Video Clip test order (forward vs backward) and Assessment order (Lab vs Self-Report) resulted in no significant main effects or interactions. The primary Evoked HR data was collapsed into a 2 (Group; Friendly vs. Aggression) X 2 (Video Type; Physical vs. Verbal) X 2 (Evoked HR) ANOVA with repeated measures on the last two factors. No significant main effects or interactions resulted. The Evoked HR means are displayed in

(F 1) and correspondingly the means and *SD*s are presented in (T 2). Although no significant differences in Evoked HR resulted, the changes in Evoked HR were not in the hypothesized direction. In fact, the observed results are in the opposite direction. That is, HR deceleration was found within all video clips. Although not statistically significant, the magnitude of HR deceleration for the Aggression video clips were greater than those of the Friendly video clips.

Correlation between the Buss-Perry Aggression Questionnaire and Resting HR: Although not a primary hypothesis of this study, the correlation between the Buss-Perry Total Aggression score and resting HR was calculated in order to test whether the data from this sample would replicate that of previous research. The results of a Pearson correlation between the average resting HR and the Total Aggression score was found to be negative and statistically significant ($r(61) = -.294$, $p = .019$). The scatterplot is displayed in (F 2). The direction and magnitude of this relationship is in concordance with other studies as cited in the introduction of this manuscript; hence those individuals with low resting HR tend to score higher on the Buss-Perry Aggression Scale.

In the following subsections the results of a series of zero-order correlations (Pearson Correlations) between the Buss-Perry subscale scores are presented and discussed separately for the Aggression and Friendly groups.

Aggression Group – Correlations between the Buss-Perry Subscale scores and Evoked HR by Video: As mentioned previously there were 4 aggression videos; two representing verbal aggression interactions and two representing physical aggression interactions. The two verbal aggression interactions were (1) two skateboarders engaging

in name-calling and (2) a man assaulting verbally a woman. The two physical aggression interactions were (1) two drivers in a street fight and (2) a man hitting a reporter.

It was predicted that individuals who score high in Aggression would have higher Evoked HR while viewing Aggressive videos. For the Aggression correlation analyses only the Verbal Aggression subscale was found to be related to the magnitude of Evoked HR change. As hypothesized, a significant correlation was found between Buss-Perry Verbal Aggression subscale and Evoked HR for the two skateboarders engaging in name-calling video ($r(28) = .41$, $p = .024$; the scatterplot is displayed in (F 3); and Verbal Aggression and Evoked HR for the man assaulting verbally a woman ($r(28) = 36$, $p = .048$; the scatterplot is displayed in (F 4). However, the correlation between the Verbal Aggression subscale and Evoked HR for the Physical Aggression two driver's street fight video and Physical Aggression and Evoked HR for the man hitting a reporter was not significant; $r(28) = 32$, $p = .086$; scatterplot is displayed in (F 5); and $r(28) = 15$, $p = .434$; scatterplot is displayed in (F 6); respectively.

As can be observed in the scatterplots, Evoked HR acceleration is associated with a greater propensity for aggression whereas, Evoked HR deceleration is associated with a lower propensity for aggression.

Friendly Group - Correlations between the Buss-Perry Subscale scores and Evoked HR by Video: Four Friendly interaction videos were employed; two representing friendly verbal interactions and two representing friendly physical interactions. The two friendly verbal interactions were (1) a couple interacting during a marriage proposal and (2) a couple interacting with a pregnancy surprise. The two friendly physical interactions

were (1) a man helping an elderly woman pushing a food cart and (2) a man assisting a blind man.

It was expected that the Buss-Perry Aggression Subscales would correlate positively with the magnitude of Evoked HR change when attending the Friendly dyadic interaction videos. This hypothesis was partially supported. Only the Anger subscale was found to be correlated significantly with Evoked HR; and moreover, the Anger subscale was the only aggression subscale that resulted even in a possible relationship trend. To summarize, the correlation of Anger Subscale with Evoked HR was not significant for the verbal video of a pregnancy surprise ($r(31) = .24$, $p = .18$; the scatterplot is displayed in (F 7), nor with the physical helping video of a man helping an elderly woman pushing a food cart ($r(31) = .26$, $p = .145$; the scatterplot is displayed in (F 8), nor for the physical video of a man assisting a blind man ($r(31) = .21$, $p = .24$; the scatterplot is displayed in (F 9). Although the expected trend between the aggression subscale and Evoked HR was evident, as can be observed from the above correlations, only the correlation between Anger Subscale and Evoked HR was found to be significant for the verbal marriage proposal video ($r(31) = .37$, $p = .034$; the scatterplot is displayed in (Figure 10).

When examining the scatterplots, individuals who scored low in Anger tended to display HR deceleration, whereas, those individuals who had high Anger scores tended to display HR acceleration. It is theorized that individuals who are less angry show Evoked HR deceleration as a function of being more empathic and other-person oriented; whereas those individuals who are more angry are less empathic and are more self-concerned. These findings are in concordance with other studies which have found that individuals who are less empathic engage in higher rates of physical aggression. And moreover, these

finding lend support to that psychophysiological measures, such as evoked HR, may provide additional evidence, more objectivity, when employed with self-report measures.

DISCUSSION

To recap, the purpose of this study was to test for differences in Evoked HR while viewing Aggression (verbal and physical) versus Friendly (verbal and physical) dyadic interactions. Unexpectedly, no significant differences resulted, and moreover, the observed direction of Evoked HR appears to be primarily HR deceleration as opposed to the predicted acceleration, at least based upon group averages. But given the direction of Evoked HR as predicted by the two aggression subscales, an explanation for the null between group and video findings is apparent. When viewing the scatterplots, it is evident that some participants displayed HR deceleration whereas others displayed HR acceleration, and this direction was related to one's propensity for aggression. This finding was hypothesized, in that a significant positive relationship between an individual's risk of displaying aggressive behavior, as assessed via the Buss-Perry Aggression Questionnaire, and Evoked HR was expected.

Specifically, it was hypothesized that the Buss-Perry Verbal Aggression Subscale would correlate positively with the magnitude of Evoked HR when viewing Verbal Aggression and/or Verbal Friendly dyadic interaction videos. And that, the Physical Aggression subscale would be correlated positively with the magnitude of Evoked HR when viewing Physical Aggression and/or Physical Friendly dyadic interaction videos. These hypothesized finding were supported partially. The Verbal Aggression subscale did correlate positively with the Evoked HR for the Verbal Aggression video. And no significant relationship was found between the Physical Aggression subscale and subsequent Evoked HR. Although not presented in the result section, there was no

evidence of a relationship between Evoked HR and any of the other aggression subscales. All correlations were virtually zero. This does fit with Buss and Perry (1992) interpretations of the scales. The Anger subscale is associated with a psychological activation-preparation for aggression in the form of an emotional-affective component, whereas the hostility subscale represents a cognitive component. The Verbal and Physical subscales represent a motor response component. Given this, one would expect these subscales to be correlated more so with observed verbal and physical aggression behaviors, hence activating a motor responsiveness.

Although it was predicted that the Verbal and Physical subscales would be correlated positively with the Evoked HR when attending to the Verbal and Physical Friendly videos, this finding was not observed. An unexpected relationship between the Anger subscale and Evoked HR was observed. Individuals low in Anger tended to display HR deceleration whereas individuals who scored high in Anger tended to display HR acceleration. *Post hoc,* this finding is interesting and makes sense given some afterthought. An empathy-emotional interpretation of why individuals with different propensity of aggressive behavior react to video clips of friendly-helping dyadic interactions is proposed. Borrowing from Eisenberg (2010), empathy is defined as an affective response that is identical, or very similar to what the other person is feeling or might be expected to feel in an observed context; therefore empathy is being able to understand what another person is feeling. Given that the Anger subscale is theorized to reflect a measure of emotion, it may be that the Evoked HR is representing this emotional state of empathy when viewing others being helpful and kind. Therefore the interpretation of HR deceleration versus HR acceleration could be a function of empathy

or the lack of empathy. It is suggested here that the observed HR deceleration is associated with increased empathy (less anger), whereas HR acceleration is associated with egoistic personal distress (more anger). Batson et al. (1983) viewed this distinction as individual differences in the manner in which one internalizes empathetic emotion. Therefore, HR acceleration is associated with self-concern and being less empathic in a helping situation; and HR deceleration may be associated with genuine altruistic feelings of empathy and being other-person oriented in a helping situation. In sum, those individuals who are less empathic may be more likely to engage in higher rates of aggressive and antisocial acts. This notion is supported by Jolliffe's and Farrington's (2006) work examining the relationship between bullying and low empathy.

Furthermore, the results of this study are in accordance with other studies that have found individuals who have low arousal are more likely to engage in aggressive acts. In this study, it was found that individuals who scored higher in Buss-Perry Aggression Questionnaire had higher Evoked HR while viewing aggression or friendly stimuli. Therefore, not only do aggressive acts, but also friendly acts appear to elicit emotion arousal and could be argued that by increasing arousal results in tension build up. Given the magnitude of tension build up and an environmental stimulus provocation, the reduction of tension release would be a function of an aggressive act, verbal and/or physical for those individuals with a high propensity for aggression. This interruption is in concordance with the early work of Buss (1961) and Hokanson (1974). Based upon the findings in this study, an individual's arousal can be increased through not only conducting aggressive behavior, but also when observing a friendly or aggressive stimulus event. It is the contention of the author that these findings lend support for

physiological measures as an indicator of aggression that could be incorporated into therapy. According to Eysenck (1997), antisocial individuals have low arousal, which creates an unpleasant physiological state. To release the unpleasant physiological state, antisocial people seek stimulation to surge their arousal to more normal level. Given the result of this study, friendly and aggressive stimulus events can increase Evoked HR and consequently could increase the probability of conducting aggressive behavior of those individuals how score high in aggression. Therefore, the use of physiological measures as an indicator of aggression that could be incorporated into therapy. Given that emotional arousal can be elicited by merely watching a 5 sec aggressive or friendly act, and processing of such acts involves cognition, this arousal could be a discriminative stimulus that sets the stage for aggressive behavior. Hence, a promising therapeutic approach could be to: (1) incorporate a physiological measure(s) like HR whereby individuals are taught to recognize this emotional arousal and its relationship to subsequent aggressive behavior solutions; (2) assess the cognitive attributions and perceptions of the stimulus-problem-aggression event; and (3) then train new non-aggressive problem solutions. Teaching friendly forms of behaviors and empathic understandings could be effective treatment for antisocial individuals.

In summary, low resting HR has been shown as a reliable biomarker for the propensity for aggression; however, only 1 to 4 percent can be attributed to a genetic covariation (Baker et al., 2009). Therefore, much more research is needed to understand the complexities of the various environmental factors that contribute to the development and maintenance of aggressive behavior. The genetic contribution to a low resting HR to subsequent aggression is small, however, one cannot ignore that low resting HR is a

biological marker that may set the stage for later aggressive behavior. A low arousal state, as stated previously could be aversive for an individual. Therefore, most any stimulus event could elicit an emotional response which in turn could evoke an overt behavioral response. And if the consequences of the overt response was a reduction in tension and positive reinforcement, this could begin the development of inappropriate behavior(s).

Of course further research is needed regarding the behaviors and stimulus events that elicit emotional arousal and evoke subsequent aggressive behavior. In this study brief 5 sec video clips can elicit an emotion response. Greater Evoked HR acceleration by individuals who score high in aggression while either viewing friendly or aggression stimuli demonstrates that aggressive people are sensitive to stimulus events as well as low aggressive individuals. The correlational findings in this study lend support that the propensity for aggression can be measured and is related to the implicit measure of HR, which could provide additional evidence and objectivity when employed with self-report measures.

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APPENDICES

Appendix A. Consent Form

Missouri State University Consent of Participation – Sarhand Hasan 2015
Infant Perception and Learning Laboratory

This study is part of the Missouri State University Psychology Graduate Program designed to give us more information and to fulfill a thesis requirement for Sarhand Hasan. The following information is provided so that you can decide whether you wish to participate in this study. If you agree to participate, you will (not necessarily in this order) complete paper-and-pencil questionnaire and view a series of 5-second video clips via a PowerPoint slide show. Some of the video clips may be unpleasant. During the viewing you will have 3 electrodes attached to you (one on each of your ankles and one on your right wrist) so to record and monitor your heart rate. One of the members of the research lab should have explained the purposes and procedures of the study to you, and will answer any questions you might have. Please be assured that if you agree to participate, you are free to withdraw from the study even after you have signed this consent form. If you wish to withdraw, simply stop any on-going task and tell the research staff you wish not to continue. Should you decide to terminate the research session; all data pertaining to you that have been collected will be destroyed.

Since it is our policy to protect the confidentiality of all our participants, your name will not be included in any data analyses, subsequent publication or presentations related to this research study. All raw data collected during this study will be identified only by code-number to insure confidentiality of the information collected.

If questions arise after you have left the research laboratory, feel free to give D. Wayne Mitchell, Ph.D. a call at 417-836-6941 or at waynemitchell@missouristate.edu.We do not anticipate any risk to you as a result of participating in this study, but it is unlikely that this study will provide you with any direct benefits. Your participation will, however, make an important contribution to our scientific knowledge, and we very much appreciate your cooperation.

In addition, we would appreciate your filling out the attached demographic sheet so we can document the characteristics of our participants. Any of the questions you feel uncomfortable about answering, please feel free to leave blank. As with the raw data collected, this information will be entered into our computer system and only identified by code-number to insure confidentiality.

I have read the above description of the study and I agree to participate.

Participant's Name (please print) _____.

Participant's Signature _____.

Witness's Signature _____.

Date _____.

Appendix B. Demographic Information Sheet

Participant's Name: _____.

1. Date of Birth _____. 2. Gender _____.

3. Time you last ate today _____.

Briefly, describe what and how much you ate. _____

_____.

4. Have you had caffeine in the past 3 hours? Yes ____. No ____.

Approximately, how much? _____.

5. Are you currently taking any cold medicine, allergy medicine, or prescribed medication?

Yes ____. No ____.

If yes, please explain _____

_____.

6. Do you exercise regularly? Yes ____.No _____.

If yes, how often and how long? _____

Type(s) of Exercise:_____

_____

_____.

7. Do you smoke? Yes ____.No ____.

On average how much do you smoke? _____

8. What mode of transportation did you use to get to the study? _____

_____

Table 1. The Buss-Perry norms (Means and *SDs*) are provided adjacent each of the Subscale sample Mean and *SD* for Gender by Aggression Subscales.

	Male				Female			
Scale	*M/Norm*	*SD/Norm*	*N*	*M* Age	*M/Norm*	*SD/Norm*	*N*	M Age
Physical	22.76/24.3	4.09/7.7	31	21.45	18.60/17.9	4.66/6.6	32	20.15
Verbal	14.10/15.2	3.19/3.9	31		14.62/13.5	3.01/3.9	32	
Anger	16.04/17.0	3.17/5.6	31		15.89/16.7	3.35/5.8	32	
Hostility	19.34/21.3	6.27/5.5	31		19.19/20.2	5.44/6.3	32	
Total	72.24/77.8	12.32/16.5	31		68.30/68.2	11.81/17.0	32	

Table 1. Evoked HR Means and *SD*s by Video

Group	Mean	*SD*	*N*
Physical Aggression: Driver's street fight	-2.13	8.68	30
Physical Aggression: a man hits a reporter	-1.11	10.26	30
Verbal Aggression: Skateboarders name calling	-1.32	8.77	30
Verbal Aggression: a Man assaults a Woman	-1.84	9.76	30
Physically Helping: A man assisting an elderly woman	-1.47	7.88	33
Verbally Friendly: pregnancy surprise	-1.01	6.67	33
Physically Friendly: a man helps blind man	-.14	7.94	33
Verbally Friendly: marriage proposal	-.95	9.62	33

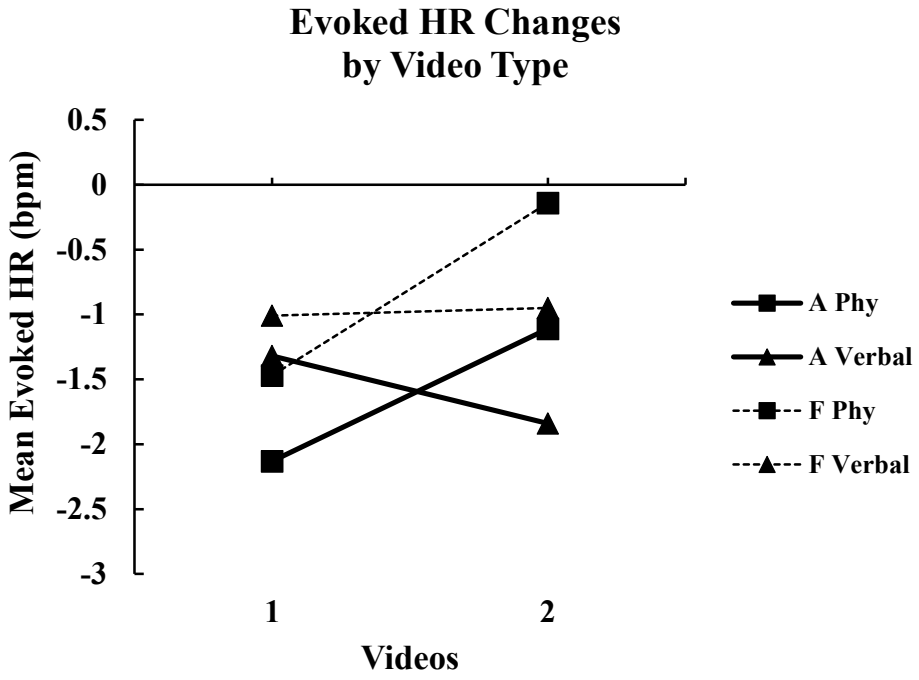

Figure 1. Mean of Evoked HR: Aggression and Friendly Group by Verbal and Physical Videos.

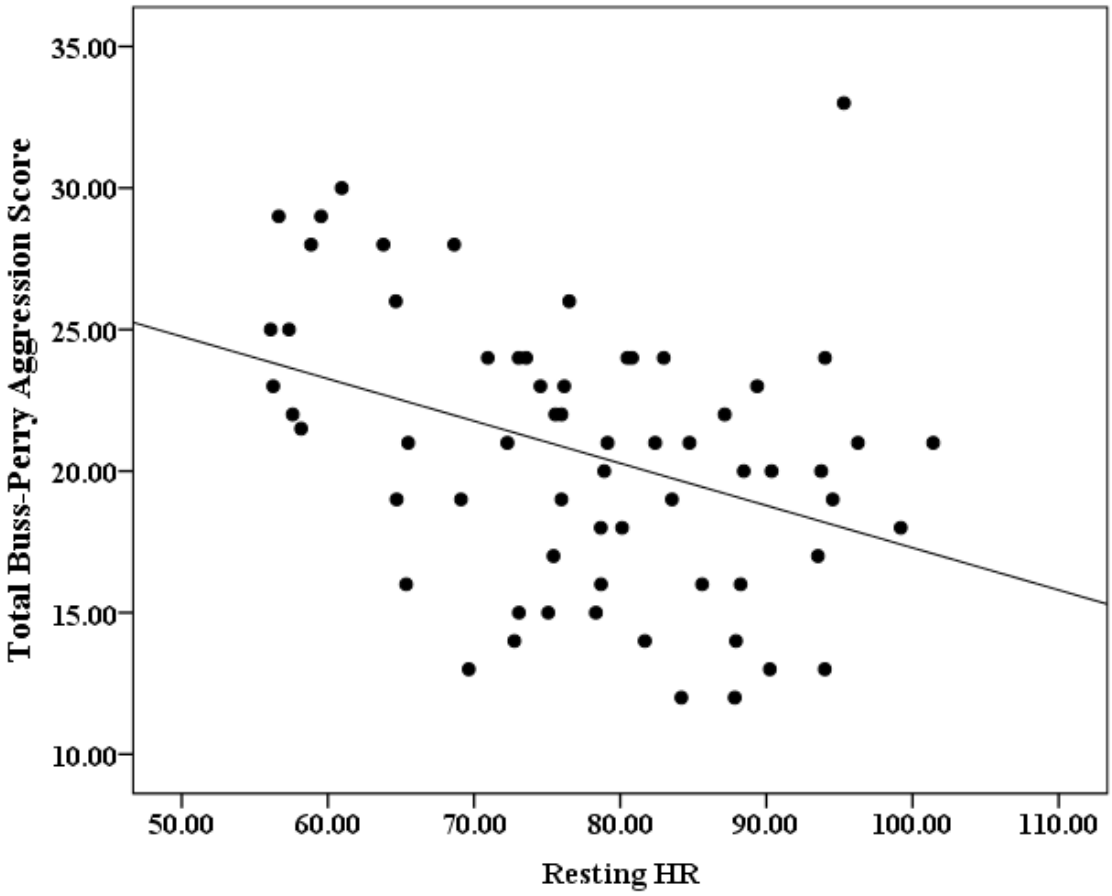

Figure 2. Scatterplot between Resting HR and Buss-Perry Aggression Questionnaire.

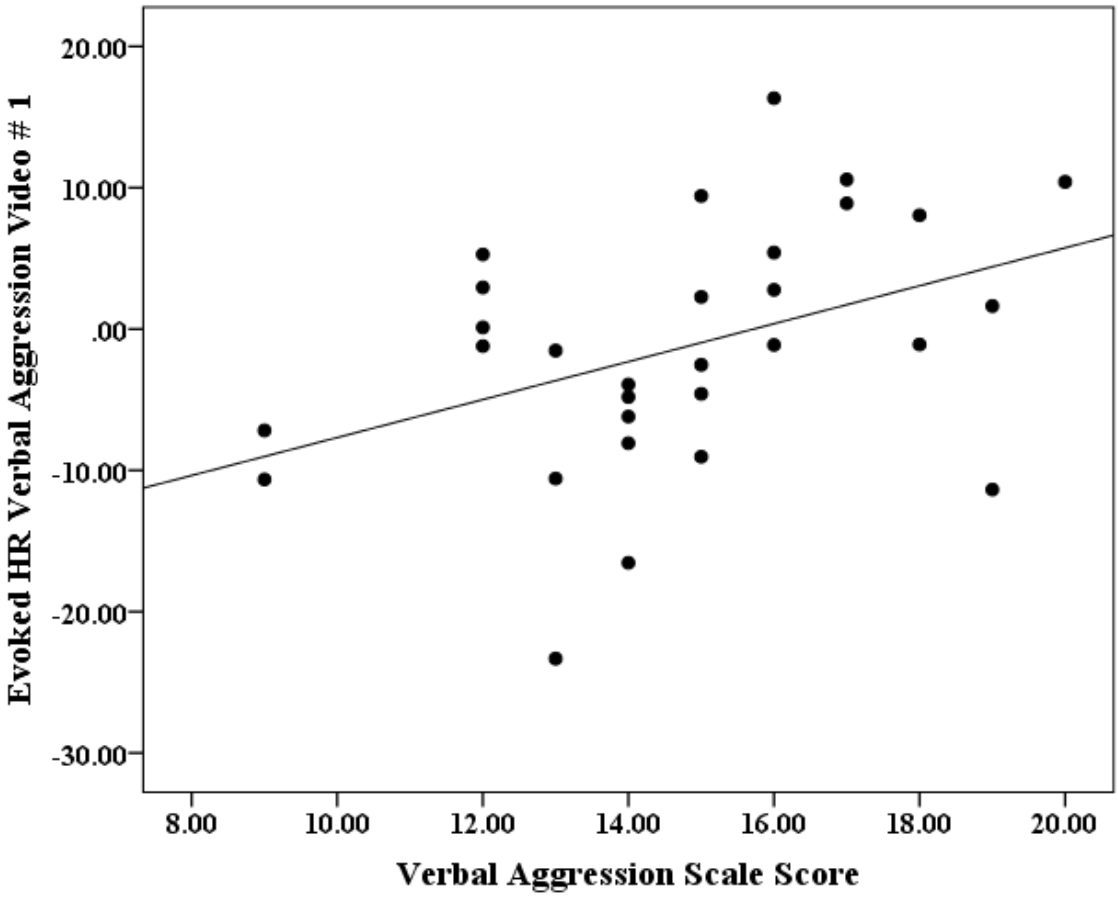

Figure 3. Scatterplot between Verbal Subscale and Evoked HR changes while viewing Verbal Aggression of Skateboarder's Name-Calling.

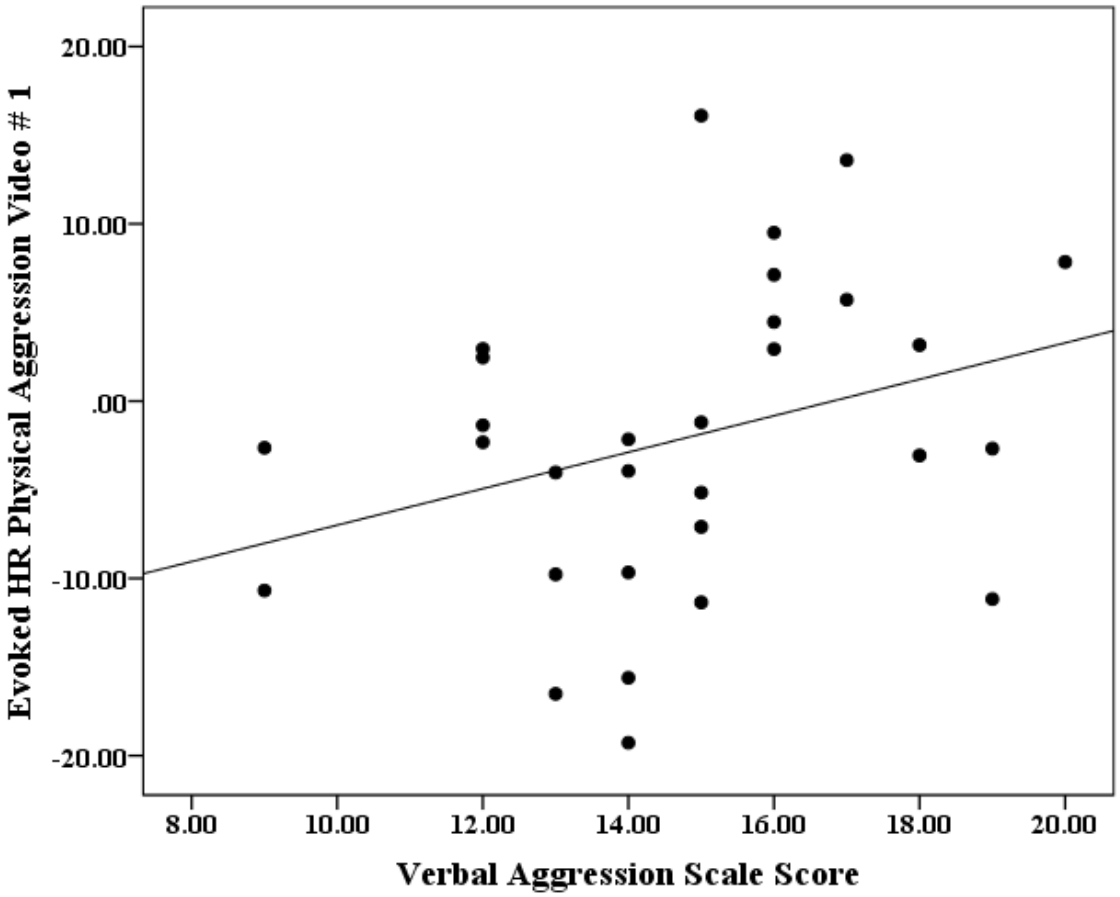

Figure 4. Scatterplot between Verbal Subscale and Evoked HR changes while viewing Physical Aggression of Driver's Street Fight.

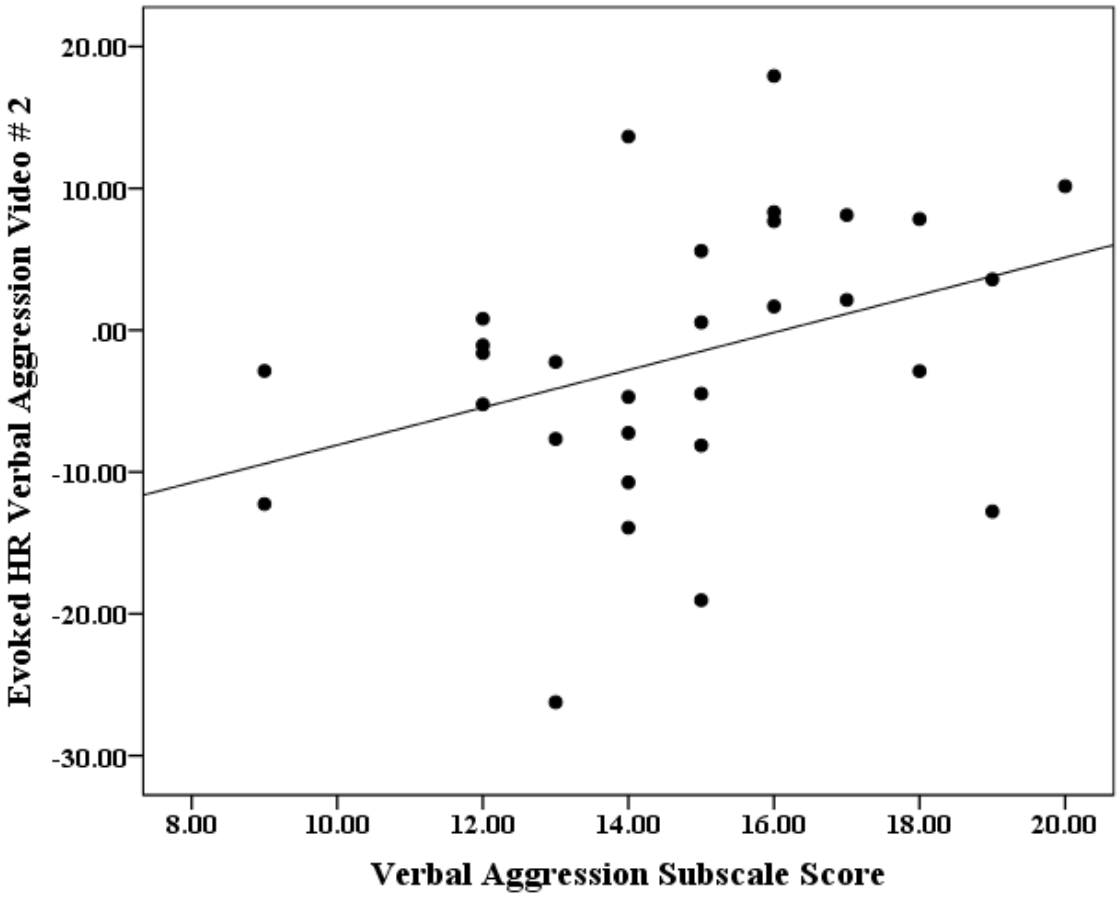

Figure 5. Scatterplot between Verbal Subscale and Evoked HR changes while viewing Verbal Aggression of a Man Assaulting a Woman.

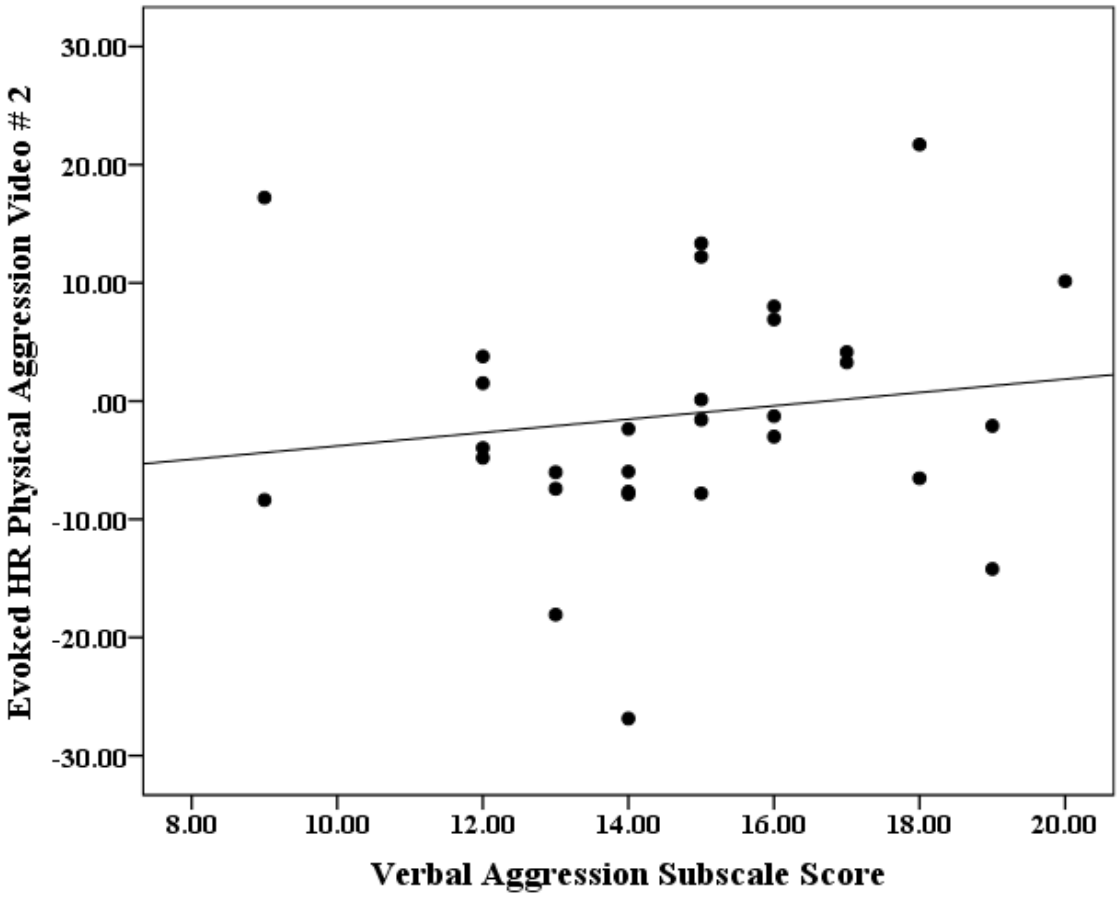

Figure 6. Scatterplot between Verbal Subscale and Evoked HR changes while viewing Physical Aggression of a Man Hitting a Reporter.

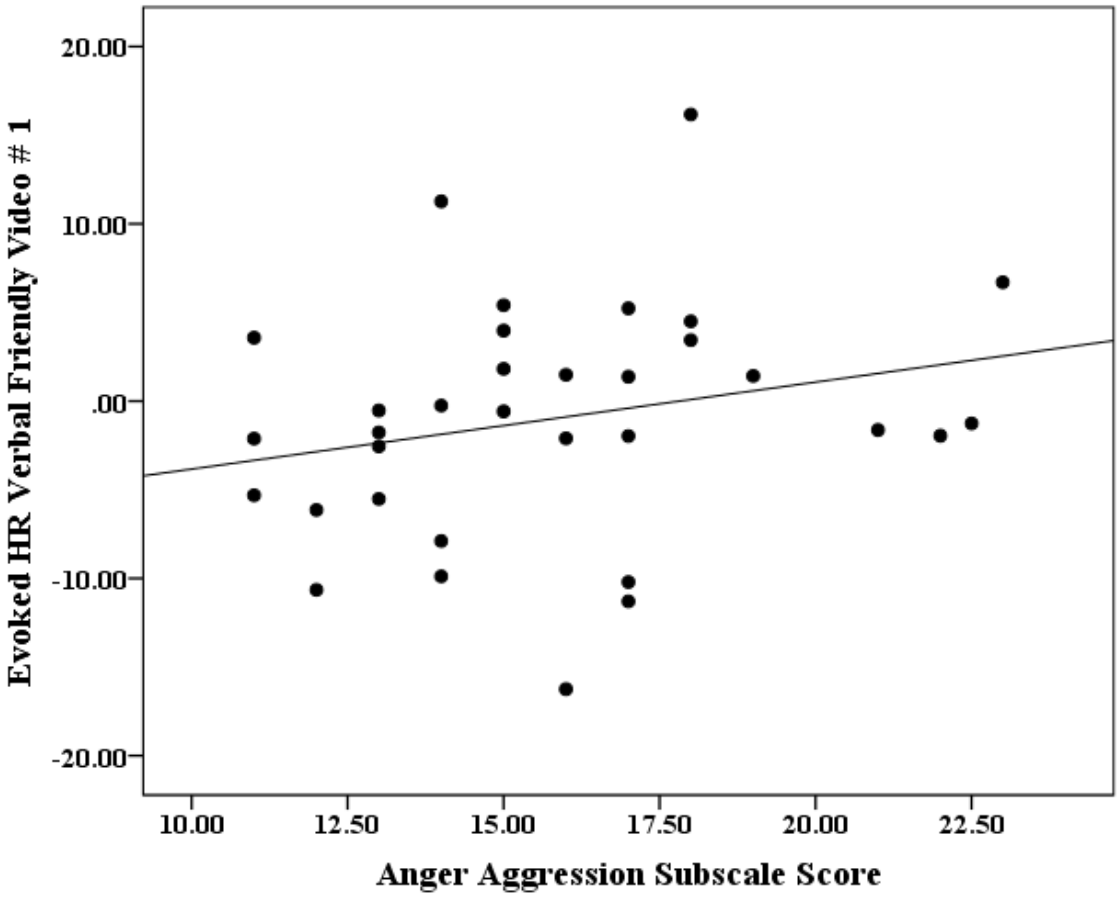

Figure 7. Scatterpolot between Anger Subscale and Evoked HR changes while viewing Verbal Friendly Pregnency Surprise.

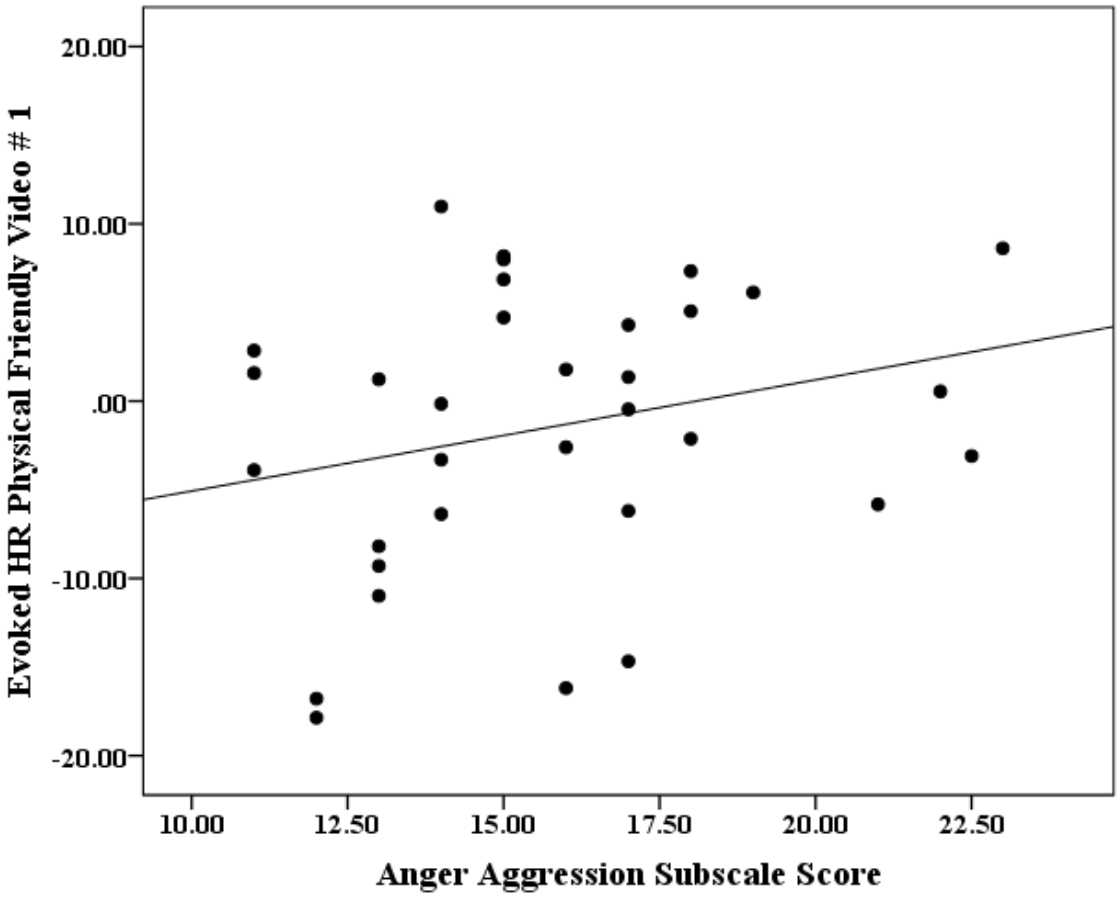

Figure 8. Scatterplot between Anger Subscale and Evoked HR changes while viewing Physical Friendly of a Man Assisting a Elderly Woman.

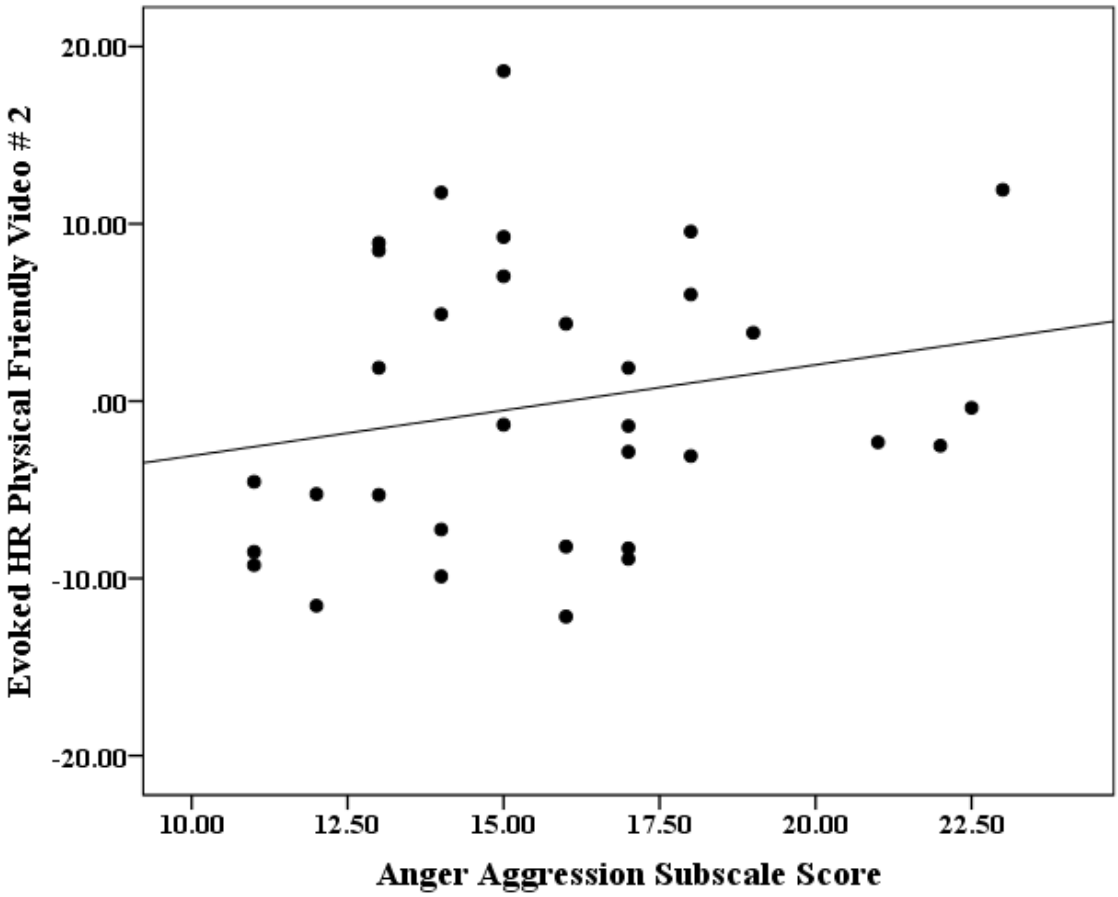

Figure 9. Scatterplot between Anger Subscale and Evoked HR changes while viewing Physical Friendly of a Man Assisting a Blind Man.

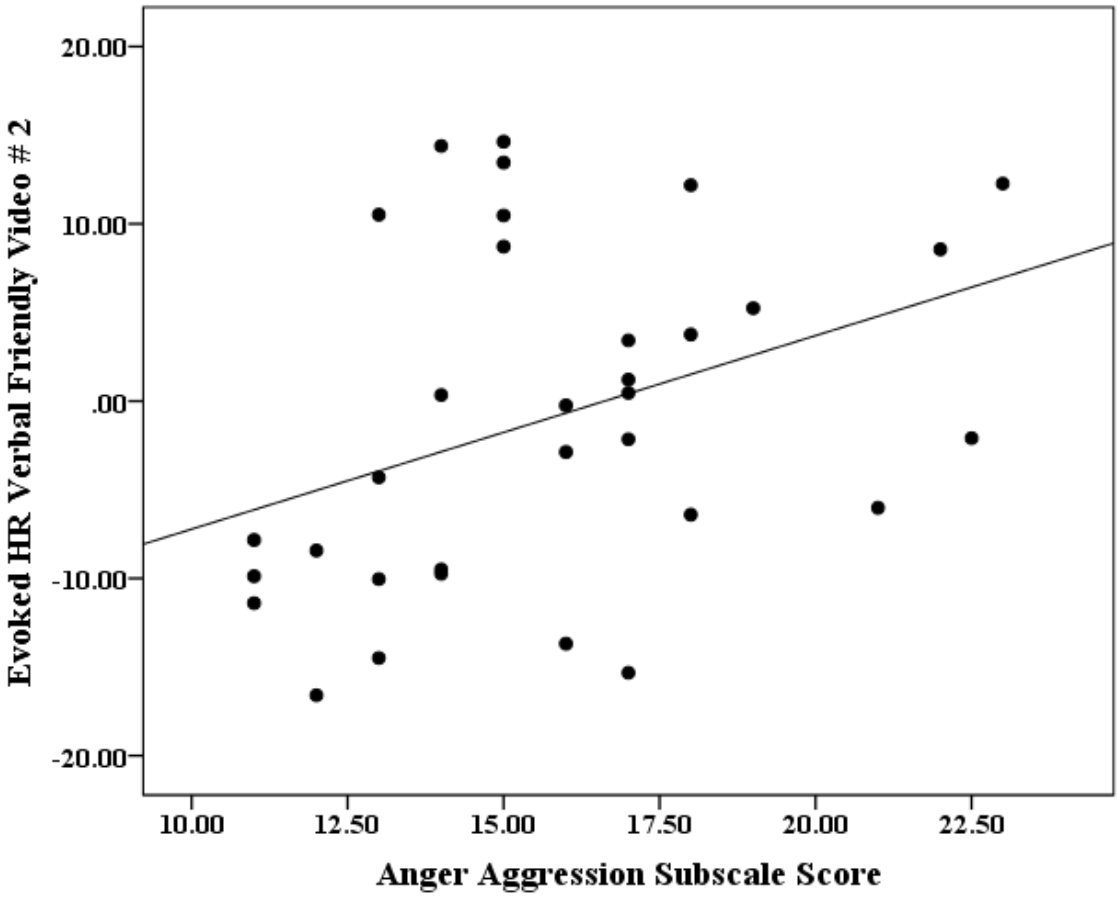

Figure 10. Scatterplot between Anger Subscale and Evoked HR changes while viewing Verbal Friendly of Marriage Proposal.