The Association Between the Serotonin Transporter Promoter Region Polymorphism and Aggressive Behavior

Daniel S. Linford, Matthew T. Schmolefsky, Barbara C. Trask

Department of Psychology, Department of Zoology, Neuroscience Program, Weber State University, Ogden, UT 84408

Introduction
Recent studies have shown a correlational relationship between the serotonin linked polymorphic region (5-HTTLPR) of the promoter region of the serotonin transporter gene (SLC6A4) and maladaptive behavior (Takahashi & Quadros, 2011). Two functional polymorphisms of this 20-23 base pair repeat have been described: the short form, which has 14 copies and is less transcriptionally efficient, and the long form that contains 16 copies (Whisman, et al., 2011). The short allele is generally considered the maladaptive form in Caucasian populations (Long et al., 2013) and has been linked with anxiety and depression, as well as with some facets of personality such as neuroticism (Gonda et al. 2008). The effect of possessing the short form of the gene is the serotonin transporter protein will be produced at a slower rate, resulting in reduced reuptake of serotonin. An individual has two copies of each gene, so it is possible for a person to have one of three possible combinations of the long and short alleles: Long-Long (LL), Short-Short (SS), and Short-Long (SL). Additional copies of the short allele are expected to increase the severity of neurotic tendencies. We were interested in the effects of this polymorphism on maladaptive behavior and personality.

Methods
Participants
University students (n=109), 33 male and 76 female.

Research Measures
Buss Perry Aggression Questionnaire (BAPQ)
- Shorter Version of the Buss-Durkee Aggression inventory.
- Uses a 5-point scale instead of yes/no format.
- Returns scores on Total Harm Avoidance (HaAot), Physical Aggression (PhysAsg), Verbal Aggression (VerbAgg), Anger, Hostility, and Total Aggression (AggTot).

Harm Avoidance from TCI
- Facet of character
- Made up of four subscales HA1, HA2, HA3, HA4.

5-HTTLPR Polymorphism
- 20-23 base pair repeat in the promoter region of serotonin transporter gene.
- Has two functional forms Long and Short.
- The combination of these two forms may contribute to differences in behavior.

Results
The Buss-Perry and TCI questionnaire data indicated a significant two-tailed correlation between Total Aggression and Total HA. HA1 showed a significant relationship with all of the BAPQ subscales. The weakest of these relationships was with verbal aggression. Hostility showed significant relationships with all of the HA subscales, and had the strongest relationships of all of the aggression variables. HA4 showed the strongest relationships with all of the aggression subscapes, excluding physical aggression. HA2 and HA3 showed a significant relationship only with Hostility.

Sex Differences
Males were lower in total harm avoidance (M=10.62, SD=8.011) than females (M=18.35, SD=7.017); t(109)=5.512, p < .001; (see table 2). Fifty percent of males scored less than 10 on HA, and 50 percent of females scored less than 17, whereas only 17% of males scored more than 20, 68% of females scored more than 20 (see table 2, figure 4). Females also displayed significantly higher scores in all of the subscales of HA. This pattern is in agreement with what was reported by Kose, et al. (2009) on a Turkish population and their findings were congruent with what Cloninger, et al. originally reported (Kose, et al., 2009).

Males were higher in Total Aggression t(109)=1.96, p=.05. This is in line with what is reported in the literature (Buss & Perry, 1992). Although this result was only marginally significant, our sample was predominantly female, had our sample contained a more even distribution of males and females, this relationship might have been stronger (see table 3, and figure 5). 50 percent of males scored less than 65 on total aggression, and 50 percent of females scored less than 50, whereas 20% of females scored 80 or higher and 35% of males scored above 80.

Males scored higher than females in Physical Aggression (M=20.57, SD=9.39) vs. (M=15.41, SD=7.32); t(53.75)=2.874, p = .006, which was to be expected from what Buss & Perry reported (1992). Interestingly, there was no significant difference between males and females on Verbal aggression, Anger, or Hostility.

Genotype Data
In the sample of participants that have been successfully genotyped to date (n=16), no significant relationship with the aggression and TCI variables was found. Genotyping will be completed in the near future and will yield greater statistical power to evaluate the role of the 5-HTTLPR polymorphism in personality traits and aggression.

Conclusions
- Our data showed that total HA could predict Aggression scores. Particularly, high scores in Anticipatory Worry and Pessimism (HA1) and Fatigability (HA4) are directly linked with Anger and Hostility.
- There are significant gender differences in Harm Avoidance and Aggression.
- A aggressive person will be pessimistic, have a negative opinion of what people think of them, have negative expectations for the outcomes of new situations.
- Based on the relationships between these other factors and the interaction of the serotonin system and aggression, we expect to see a relationship between the short form of the 5-HTTLPR Genotype and Aggressive Behavior when the genotyping is completed.

References

Acknowledgements
- Thanks to Dr. Schmolefsky for his mentorship and for use of his research grant funds for this capstone project.
- Dr. Trask for the generous use of her genetics lab and expert instruction on the genotyping process.
- Weber State University’s Office of Undergraduate Research for a travel grant to present this research at NCUR 2014.