THE ROLE OF ANXIETY
IN MENTAL TUMBLING BLOCKS

by

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ABSTRACT
Mental tumbling blocks are a problem in sports such as cheerleading where the athlete has an unexplained fear related to performing a skill that has been previously executed successfully. The current study compared participants with and without a mental tumbling block on self-report measures of anxiety and on vocal analysis data indicating if anxiety or fear is present. Participants were female cheerleaders who ranged in age from 10 to 16 years old. The Sport Anxiety Scale-2 (SAS-2; Smith, Smoll, Cumming & Grossbard, 2006) and the Cheerleading Fear Inventory (CFI; modified from Cartoni, Minganti, and Zelli, 2005) were used in addition to vocal analysis measures assessing pitch and intensity. These vocal analysis measures were taken under two conditions while the cheerleader was interviewed (1) about tumbling and (2) about school. Results indicated that athletes with a mental block reported higher somatic anxiety, concentration disruption, and overall anxiety on the SAS-2 than participants who did not have a mental tumbling block. Similarly, athletes with a mental tumbling block reported higher scores on the CFI than athletes without a mental tumbling block. In addition, athletes with a mental tumbling block showed higher pitch on the vocal analysis measure than athletes without a mental tumbling regardless of interview condition. Finally, several significant correlations emerged between scores on the SAS-2, the CFI, and the vocal analysis measures. These results are discussed in terms of the existing literature, and practical suggestions are offered that may help coaches understand how to effectively handle mental blocks at practice.
ACKNOWLEDGEMENTS

There are several people I would like to thank for their help with this project and their support. This project would not have been possible without the help of all coaches from Legendary Athletics, specifically Paul Tucker and Elizabeth Bernard. Both of you were so helpful in answering severity ratings and always understanding when I needed to use the office for participants. Your support and understanding is greatly appreciated.

Thank you to Dr. Bernard Jensen for his continued support and understanding throughout this study. Not only did you help me in the project formation and the data analysis, you also displayed patience when I needed it most. Also, thank you to Dr. Mark Neider for allowing me to use part of your research lab for my study. Thank you for Dr. Tom Fisher for challenging my ideas and encouraging me to consider many other variables for this project.

I am blessed to have a job that was always willing to work with my thesis schedule. Thank you to Amber Kenney and Julia Nikulina for working with me when we needed to make schedule changes or when I needed to miss meetings in order to complete my thesis. Also, thank you to the rest of the staff for being willing to switch shifts or work extra hours in order to help me finish my thesis.

Lastly, a special thank you to my parents, Dennis and Beverly Thompson. I can never thank you enough for your sacrifices you have made to ensure that I have a great education. I am so blessed to have parents that will always support me and offer help in any way possible. I love you both.
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The Role of Anxiety in Mental Tumbling Blocks

Informed Consent

Principal Investigator(s): Mark Neider, PhD
Sub Investigator: Shannon Thompson
Investigational Site(s): Legendary Athletics

Introduction: Researchers at the University of Central Florida (UCF) study many topics. To do this we need the help of people who agree to take part in a research study. You are being asked to allow your child to take part in a research study, which will include about 50 people at Legendary Athletics. Your child is being invited to take part in this research study because she has a mental tumbling block or because she does not have a mental tumbling block.

The person conducting this research is Shannon Thompson of the UCF Psychology Department. Because the researcher is an undergraduate student, she is being guided by Mark Neider, Ph.D., a UCF faculty supervisor in the Psychology Department.

What you should know about a research study:
- Someone will explain this research study to you.
- A research study is something you volunteer for.
- Whether or not you take part is up to you.
- You should allow your child to take part in this study only because you want to.
- You can choose not to take part in the research study.
- You can agree to take part now and later change your mind.
- Whatever you decide it will not be held against you or your child.
- Feel free to ask all the questions you want before you decide.

Purpose of the research study: The purpose of this study is to investigate the role of anxiety in mental tumbling blocks. Past research has shown that anxiety can interfere with performance in athletic situations. This research study is investigating whether or not anxiety is present while discussing a mental tumbling block and it will be comparing the data with participants that do not have a mental tumbling block.

What your child will be asked to do in the study: She will answer questionnaires about anxiety and fear while tumbling. Following the questionnaires, she will have an informal interview with the researcher, Shannon Thompson, about her tumbling and about school.
Permission to Take Part in a Human Research Study

**Location:** Legendary Athletics' business office

**Time required:** We expect that your child will be in this research study once for a half hour.

**Audio taping:** Your child will be audio taped during this study. If you do not want your child to be audio taped, your child will not be able to participate in the study. There will be no identifiable links to your child in the audiotape. Discuss this with the researcher or a research team member if you have any concerns about confidentiality. If your child is audio taped, the tape will be kept in a locked, safe place. The tape will be erased or destroyed when the data has been analyzed.

**Risks:** There are no expected risks for taking part in this study. There are no reasonably foreseeable risks or discomforts involved in taking part in this study.

**Benefits:** There are no expected direct benefits to your child for taking part in this study, however your child may come to a better understanding of their tumbling as a result of the interview and completing questionnaires.

**Compensation or payment:** There is no compensation or other payment to you or your child for your child’s part in this study.

**Confidentiality:** We will limit your personal data collected in this study. Efforts will be made to limit your child’s personal information to people who have a need to review this information. We cannot promise complete secrecy. Organizations that may inspect and copy your information include the IRB and other representatives of UCF.

**Study contact for questions about the study or to report a problem:** If you have questions, concerns, or complaints, or think the research has hurt your child talk to Dr. Michael Johnson: College of Sciences, (407) 823-1911 or Dr. Mark Neider, Faculty Supervisor, Department of Psychology at (407)-823-4201 or by email at Mark.Neider@ucf.edu

**IRB contact about you and your child’s rights in the study or to report a complaint:**
Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901. You may also talk to them for any of the following:
- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You want to get information or provide input about this research.

UCF IRB Version Date: 01/2010
Permission to Take Part in a Human Research Study

______________________________
Printed Name

______________________________     ______________
Signature                          Date

______________________________
Witness Signature
CHAPTER 1: INTRODUCTION

It has been well established that anxiety can interfere with athletic and artistic performance (Monsma, Mensch, & Farroll, 2009; Mullen, Lane, & Hanton, 2009). This kind of anxiety may stem from a variety of sources, including fear of injury, fear of not performing well, lower levels of self-confidence, or stress in the athlete’s personal life. For example, an athlete may have recently recovered from an injury and as a result, may fear re-injury. Also, an athlete may be experiencing family problems at home and be unable to concentrate in practice.

In cheerleading, one important area of athletic performance involves tumbling. Tumbling is a component of competitive cheerleading where the athlete flips in the air. Many skills that cheerleaders learn in their first few years are back handsprings, back tucks and a combination of the two. The cheerleader may be physically capable of doing a particular skill, but will fail to perform it due to a mental block. A mental tumbling block (MTB) is defined as an inability to perform a skill for any reason other than injury for at least one month. There is no empirical study on this type of mental block for cheerleading. The existing literature focuses on performance anxiety and other types of anxiety that can debilitate performance as well as contribute to fear of failure or fear of injury. The present study investigated the role of anxiety in mental tumbling blocks.
CHAPTER 2: LITERATURE REVIEW

Performance Anxiety

The existing literature on performance anxiety draws a distinction between somatic and cognitive anxiety. Somatic anxiety is known as the physical manifestation of anxiety such as sweaty palms, an accelerated heartbeat or butterflies in the stomach (Gould, Greenleaf, & Krane, 2002; Smith, Smoll, & Passer, 2002). Cognitive anxiety can be defined as the mental component of anxiety such as worry or fear (Morris, Davis, & Hutchings, 1981).

Somatic Anxiety

While a normal amount of somatic anxiety (sweaty hands, faster breathing, etc.) is expected in performance situations, too much of it can negatively impact on performance (Martens, 1977; Sonstroem & Bernardo, 1982; Taylor, 1987; Yerkes & Dodson, 1908). Taylor (1987) found that somatic anxiety has a negative correlation with performance in a variety of sports. Also, Filaire, Alix, Ferrand, & Verger (2009) found that tennis players who lost a match had higher somatic anxiety than winners. Finally, Ommundsen and Pedersen (2007) found that athletes thought they were more competent in their sport when they had higher self-confidence and lower somatic and cognitive anxiety. Competitive cheerleaders may express somatic anxiety through butterflies in their stomach, feeling like their heart is racing, hands shaking, or crying. In the author’s coaching experience, too much somatic anxiety may even be displayed through vomiting or fainting. This study will investigate if cheerleaders with mental tumbling blocks have significantly higher somatic anxiety than cheerleaders without mental tumbling blocks.
Cognitive Anxiety

There are mixed results concerning the impact of cognitive anxiety on performance in athletes. Some studies have found that there is a significant negative linear relationship between cognitive anxiety and performance (Barnes, Sime, Dienstbier, & Plake, 1986; Burton, 1988; Chapman, Lane, Brierley, & Terry, 1997; Taylor, 1987). However, many other studies have found no significant relationship between cognitive anxiety and performance (Hammermeister & Burton, 1995; Maynard & Cotton, 1993; Vadocz, Hall, & Moritz, 1997).

In competitive cheerleading, cognitive anxiety may be expressed in statements such as, “I’m afraid I will get hurt,” or “My tumbling isn’t good enough to do it by myself.” From the author’s experience, many cheerleaders who exhibit a mental tumbling block imagine themselves falling when performing a skill, or they are embarrassed if they do not perform the skill with perfect technique. The present study investigated if there is a significant relationship between both cognitive and somatic anxiety and the presence of mental tumbling blocks.

Performance anxiety is typically measured through various self-report questionnaires (Monsma et al., 2009; Mullen et al., 2009; Ommundsen & Petersen, 2007). For this study, performance anxiety will be measured through the Sport Anxiety Scale (SAS-2; Smith, Smoll, Cumming, and Grossbard, 2006). This questionnaire includes three subscales: somatic anxiety, worry and concentration disruption.

Fear of Injury

Fear may be a driving force in any performance situation. An athlete may fear failure, success, injury, embarrassment, lack of control, etc. In addition, fear of injury or re-injury is a common situation that can lead to a decline in performance (Chase, Magyar, and Drake (2005).
Chase et al. (2005) found that there are six general themes that lead to a fear of injury: difficulty returning from an injury, inability to participate in practice due to injury, fear of serious injury, frustration towards an injury, undescribed fear, and fear of failure. In the author’s experience, athletes have expressed mental tumbling blocks as an undescribed fear or fear of serious injury. Some athletes with a mental tumbling block have already injured themselves performing the skill. Other athletes have never injured themselves while performing the skill, but may have observed others getting injured. Therefore it is important to understand the different types of fear and its relation to mental tumbling blocks.

Monsma, Mensch, and Farroll (2009) found that women experience more worry and concentration disruption than men while injured. Clearly this is an issue because if a woman who has been injured returns to practice to tumble, a lack of concentration could hinder her performance. If she is worried about re-injuring herself, this can lead to a mental tumbling block when she returns to practice. Also, Cartoni, Minganti, and Zelli (2005) found that gymnasts with more experience feared injury more than gymnasts with less experience. If this finding is generalized to competitive cheerleading, then it will show in the specific skills that the competitive cheerleaders are blocking.

In order to measure fear of injury, the participants will completed a questionnaire that asked five questions: 1) “Do you consider yourself to be an apprehensive gymnast?”, 2) Are you afraid of getting hurt?”, 3) “Are you afraid of trying out new exercises?”, 4) “Are you afraid of trying out an exercise that you already know?”, and 5) “Does it ever happen that you imagine (or think) of getting hurt before carrying out an exercise?” (Cartoni et al., 2005). These questions
were answered on a Likert Scale from one to four (one being never to four being always). The above five questions were created as a Gymnastics Fear Inventory (Cartoni et al., 2005), however for the purposes of this study, the word gymnast was be changed to cheerleader.

**Vocal Analysis**

In addition to the use of self-report questionnaires for assessing anxiety, it is important to use objective measures. One objective way to measure anxiety is through vocal analysis. Vocal characteristics can be analyzed using PRAAT (Boersma & Weenink, 2005). PRAAT measures many different vocal characteristics, but this study focused on pitch and intensity. Vocal characteristics are a somatic process because the vocal chords constrict and shorten when there is an unpleasant outcome (Scherer 1986).

There is limited research on vocal characteristics in anxious children. Scharfstein, Beidel, Sims and Finnell (2011) found that children with social phobia spoke more softly and had lower volume variation (pitch) than typically developing children. In addition, several studies have shown that when adults are anxious, there is an increase in the jitter and shimmer of a voice (pitch) and a decrease in spectral noise or loudness (intensity) (Mendoza and Carballo 1998; Scherer 1986). Also, after receiving treatment, anxious adults had a decrease in voice pitch (Laukka, Linnman, Ahs, Pissiota, Frans, Faria, Michelgard, Appel, Fredrikson, & Furmark, 2008). These findings show that there is not enough data to determine the differences between children and adults. According to Scharfstein et al. (2011), anxious children had lower pitch, however research is mixed with adults.

It is hypothesized that competitive cheerleaders with a mental tumbling block will also have anxious vocal characteristics with lower intensity and lower pitch in comparison to their
teammates without a mental tumbling block. According to Kimble and Seidel (1991), when asked trivia questions, the more confident adults were in their answers, the louder they responded. Cheerleaders without a mental tumbling block should be more confident in their tumbling, and this should show in their vocal characteristics when interviewed.

**Mental Tumbling Blocks**

Currently there is no literature on competitive cheerleading in performance situations or on mental tumbling blocks. All of the above mentioned studies investigated different sports or disorders, independent of competitive cheerleading. There is a clear need to address this issue because competitive cheerleading is becoming increasingly popular in the United States and in the world. It is estimated that there are 3 million cheerleaders in the United States (Brady, 2002). This estimate includes all types of cheerleading: sideline, competitive, school, and Pop Warner. The National Center for Catastrophic Sport Injury Research found that over half of catastrophic injuries to female athletes between 1982 and 2007 were related to cheerleading (Mueller, 2009). In some situations, cheerleaders with mental blocks may start to perform the skill, but stop in the middle of it. This can result in serious injuries. Research should focus more on how to prevent these catastrophic injuries. There is a need to not only help the cheerleader suffering from this block, but also to keep her safe so that she can confidently perform the skill.
CHAPTER 3: METHODS

Participants
Forty-nine female children and adolescents participated in this research study. Seventeen participants had a MTB and 32 participants did not have a MTB. A mental tumbling block was defined as not being able to perform a skill for any reason other than an injury for at least one month. This information was obtained from the coach and verified by the participant. The ages of the participants ranged from 10 to 16 years. Every participant was a member of an all-star cheerleading team at Legendary Athletics in Longwood, Florida. The participants were recruited through fliers posted in the gym and through an email that was sent to all the parents. The Institutional Review Board at the University of Central Florida approved the procedure of the experiment.

Apparatus
A digital recording device was used to record the participants’ vocal characteristics. Vocal pitch and intensity are two qualities that were measured in this study. Vocal pitch is associated with the vocal cords tightening while speaking and causing the auditory aspect of the voice to change (Kimble & Seidel, 1991). Intensity refers to the loudness of the voice (Kimble & Seidel, 1991).

PRAAT vocal analysis software program (Boersma & Weenink, 2005) was used to measure these characteristics (pitch and intensity), and PRAAT establishes a mean score for each characteristic.
**Materials**

Participants completed the Sport Anxiety Scale (SAS-2; Smith et al., 2006). This questionnaire has subscales for somatic anxiety, worry and concentration disruption as well as a total score. The SAS-2 has good internal consistency with a Cronbach’s alpha = .91 (95% CI = .90-.92). Participants also completed a modification of the Gymnastics Fear Inventory (GFI; Cartoni et al., 2005). This is a five-question inventory that assesses fear of injury in gymnasts. However, the question domains are also applicable to cheerleading, and for this investigation the only modifications involved changing the words “gymnast” to “cheerleader.” This questionnaire also has good internal consistency (Cronbach’s α = .77). For the purposes of this study, the Gymnastics Fear Inventory was renamed the Cheerleading Fear Inventory (CFI).

**Procedure**

The experiment was conducted at Legendary Athletics in the business office. Prior to the participant coming to the gym, the coach submitted their confirmation that the child has a mental block and gave a severity rating from 1 to 4 (hardly ever, sometimes, every week, and every practice). Participants were informed of the nature of the study and consent from the parents was obtained as well as assent from the child.

The session began with the participant completing all the questionnaires (SAS-2 & CFI). Following the completion of the questionnaires, the experimenter conducted an informal interview with the child to get information about their tumbling. All children disclosed how they feel about their tumbling, what they think about when they attempt to tumble, exactly which skill they have difficulty with, and if they think they will overcome the mental block or if they will
improve their tumbling. A device recorded the interview in order to analyze the child’s vocal characteristics.

The participant also had an informal conversation with the experimenter about school. This conversation topic was selected because the sessions occurred near the time when the new school year started. The children were recorded while they were interviewed about tumbling and during the informal conversation about school. The participant’s vocal characteristics were analyzed during both discussions to comparison measures. The tumbling interview and the school interview were counterbalanced to avoid any possible order effects. Also, the order in which participants answered questionnaires and when they answered interview questions were counterbalanced.

**Design and Analyses**

The vocal analysis portion of the experiment involved a mixed design. The between subjects variable was the presence or absence of a mental block and the within subjects variable was the vocal analysis conducted both during an interview about tumbling and during an interview about school. The questions were consistent across participants and may be found in Appendix A.

Differences in the level of anxiety between the two groups on the self-report questionnaires were determined through between subjects t-tests. In addition, two separate 2 x 2 Analyses of Variance (ANOVAs) were conducted to evaluate the vocal analysis data. Also, a between subjects t-test was conducted to evaluate any differences in experiences with injury for the two groups. Participants were asked if they have witnessed a tumbling injury or if they have received a tumbling injury.
Finally, several correlation matrices were generated. Pearson-product moment correlations were computed between the questionnaire scores (SAS-2 & CFI), and the vocal analysis results (i.e., pitch and intensity). Also, for the subset of participants with a mental tumbling block, correlations were computed between the severity ratings provided by the participants’ coach (this question can be found in Appendix B), the self-report questionnaires scores, and the vocal analysis scores.

**Hypotheses**

It was hypothesized that participants with mental tumbling blocks would show higher levels of self-reported anxiety and fear of injury than participants without mental tumbling blocks as demonstrated through analysis of the SAS-2 and the CFI scores. It was also expected that participants with mental tumbling blocks would have lower intensity and lower pitch scores on their PRAAT analysis than participants without mental tumbling blocks. Lastly, it was hypothesized that the questionnaire results, the vocal analysis results, and (where relevant) the severity ratings from the coaches would all be significantly correlated.
CHAPTER 4: RESULTS

Means and standard deviations for all self-report data can be found below in Table 1. Independent samples t-tests were conducted to compare anxiety levels from self-report data in cheerleaders with and without a MTB. The cheerleaders with a MTB had significantly higher levels of anxiety as reported in the total score for the Sport Anxiety Scale-2 versus cheerleaders without a MTB ($t (43) = 2.00, p < .05$). Cheerleaders with a MTB also had significantly higher reported scores for the somatic and concentration disruption subscales of the SAS-2 compared to those without a MTB; (Somatic: $t (43) = 1.79, p < .05$; Concentration Disruption: $t (43) = 2.40, p < .05$). There was not a significant difference between the two groups for the worry subscale of the SAS-2 ($t (43) = 1.16, p > .05$). In addition, the Cheerleading Fear Inventory (CFI) yielded a significant difference indicating that cheerleaders with a MTB have more fear than those without a MTB ($t (43) = 6.61, p < .05$).

### Table 1: Self-Report Means and Standard Deviations (SD)

<table>
<thead>
<tr>
<th></th>
<th>MTB Mean</th>
<th>MTB SD</th>
<th>No MTB Mean</th>
<th>No MTB SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS-2 Somatic</td>
<td>11.35</td>
<td>2.42</td>
<td>9.64</td>
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</tr>
<tr>
<td>SAS-2 Worry</td>
<td>12.29</td>
<td>3.75</td>
<td>10.89</td>
<td>4.03</td>
</tr>
<tr>
<td>SAS-2 CD</td>
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<td>2.76</td>
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<tr>
<td>SAS-2 Total</td>
<td>31.76</td>
<td>6.92</td>
<td>27.39</td>
<td>7.20</td>
</tr>
<tr>
<td>CFI</td>
<td>11.76</td>
<td>2.70</td>
<td>8.96</td>
<td>2.41</td>
</tr>
</tbody>
</table>

### Table 2: Vocal Analysis Means and Standard Deviations (SD)
Two 2X2 ANOVAs were conducted for the vocal analysis portion of this study evaluating both intensity and pitch. The between subjects variable involved cheerleaders with a MTB versus cheerleaders without a MTB. The within subjects variable was interview type, which involved comparing the cheerleaders’ vocal characteristics from the interview about school with the interview about their tumbling.

Cheerleaders with a MTB had significantly higher pitch during both interview types than cheerleaders without a MTB ($F(1, 43) = 4.21, p < .05$). However, there was not a significant difference in the within subjects variable comparing interview type ($F(1, 43) = 0.65, n.s.$). In addition, no significant interaction was found between the two variables for pitch ($F(1, 43) = 0.65, n.s.$). A graph depicting the results is below in Figure 1.
There was not a significant difference between the two groups with and without a MTB measuring intensity ($F(1, 43) = 0.12$, n.s.). In addition, there was not a significant difference in intensity for the two interview types ($F(1, 43) = 0.42$, n.s.). Finally, there was not a significant interaction between the two variables for intensity ($F(1, 43) = 0.59$, n.s.).

These vocal analysis results do not support the hypotheses that cheerleaders with higher anxiety have lower intensity and pitch. In fact, it was determined that cheerleaders with a MTB had significantly higher pitch than those without a MTB. Table 2 shows the means and standard deviations for both groups.

Pearson product-moment correlation coefficients were conducted to evaluate relationships between the self-report measures, the vocal analysis results, and the severity ratings.
given by the coaches for those cheerleaders who had a mental tumbling block. As seen in Table 3, several significant findings emerged.

As might be expected, significant correlations emerged between the SAS-2 total score and each of the three SAS-2 subscale scores (i.e., Somatic Anxiety, Worry, and Concentration Disruption). In addition, significant correlations were obtained between all three subscale scores of the SAS-2. There was also a significant positive correlation between the CFI and the SAS-2 Total score ($r = 0.65, p < .05$) as well as each of the three SAS-2 subscale scores. Also, mean pitch and mean intensity from the vocal analysis data were significantly positively correlated, but none of the self-report scores were significantly correlated with the vocal analysis results. Finally, no significant correlations emerged between the coaches’ severity ratings and any of the other variables when evaluating data from the subset of participants with a mental tumbling block.

As a final set of analyses, independent samples t-tests were conducted to determine if there were any differences between the two groups on injury experiences and age. The means and standard deviations for these variables can be found in Table 4. Cheerleaders with a MTB witnessed an injury more than those without a MTB ($t (47) = -2.04, p < .05$), but cheerleaders without a MTB injured themselves while tumbling more than cheerleaders with a MTB ($t (47) = 1.78, p < .05$). Also, there was a significant age difference between the two groups ($t (47) = 2.24, p < .05$). Cheerleaders with a MTB were older than those without a MTB.

**Table 3: Correlational Results**
Correlation is significant at the 0.05 level (2-tailed)
**Correlation is significant at the 0.01 level (2-tailed)
***For the MTB group only; n=17 (2-tailed)

<table>
<thead>
<tr>
<th></th>
<th>MTB Mean</th>
<th>MTB SD</th>
<th>No MTB Mean</th>
<th>No MTB SD</th>
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</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td>13.71</td>
<td>2.20</td>
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<tr>
<td>Tumbling Level*</td>
<td>2.88</td>
<td>1.27</td>
<td>2.91</td>
<td>1.17</td>
</tr>
<tr>
<td>Ethnicity**</td>
<td>1.88</td>
<td>1.97</td>
<td>1.63</td>
<td>1.50</td>
</tr>
<tr>
<td>Injured Self While Tumbling***</td>
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<td>0.44</td>
<td>1.53</td>
<td>0.51</td>
</tr>
<tr>
<td>Witnessed Injury While Tumbling***</td>
<td>1.24</td>
<td>0.44</td>
<td>1.06</td>
<td>0.25</td>
</tr>
</tbody>
</table>

*In competitive cheerleading, the divisions are separated by levels 1-5. Participants completed a form that asked what tumbling skills they were able to complete. Their tumbling level was assessed in accordance with the United States All Star Federation, which is the governing body for competitive cheerleading.
** Ethnicity was measured using the following numbers: Caucasian (1), African American (2), Hispanic/Latina (3), Asian (4), Indian (5), and other (6)
*** Self-injury and witnessed injury were measured using yes or no. Yes was labeled as “1” and no was labeled as “2.”
CHAPTER 5: DISCUSSION

This study investigated whether athletes with a MTB have higher levels of anxiety and fear than those without a MTB. The scores on the SAS-2 and the CFI supported the hypotheses that there would be a higher level of overall anxiety and fear in the MTB group. Only on the worry subscale of the SAS-2 did athletes with a MTB not report higher levels of anxiety than athletes without a MTB. Taken together, these self-report findings suggest that cheerleaders with a MTB experience greater somatic symptoms of anxiety, have more difficulty concentrating, and have a higher fear of injury associated with tumbling.

Previous research has consistently demonstrated that somatic anxiety can interfere with athletic performance in a variety of contexts (Filaire, Alix, Ferrand, & Verger, 2009; Martens, 1977; Sonstroem & Bernardo, 1982; Taylor, 1987), and the present findings are the first to report this possible link in cheerleading. In addition, associations between stress/anxiety, concentration disruption, and athletic injury have also been reported in the literature (Williams, Tonyman, & Anderson, 1991), and the results of the current investigation are consistent with such findings.

The vocal analysis results revealed a significant difference in pitch between the two groups, but this difference was in the opposite direction of that advanced in the initial hypothesis (i.e., higher rather than lower pitch for the participants with a mental tumbling block). No difference in intensity was found between the two groups. Thus, the vocal analysis data provided mixed support for the existence of objective physical symptoms of anxiety.

The initial vocal analysis hypotheses were based on the results of one study that found that anxious children had lower volume variation (pitch) than non-anxious children (Scharfstein
et. al, 2011). However, further review of the vocal analysis literature on adults shows that anxious adults, or adults put into an anxiety-provoking situation have higher pitch levels than non-anxious adults (Barrett & Paus, 2002; Laukka et al., 2008; Scherer, 1986). Thus, the findings of the current study are consistent with vocal analysis research with anxious adults that reveals higher pitch than that seen in non-anxious individuals. It may be that there are very real differences in the vocal patterns seen in anxious children vs. anxious adults, and further research is required to replicate these findings. However, significant differences in pitch were detected between the two groups in the current investigation indicating differences in real physical symptoms of anxiety.

The two different interview types were used in an effort to demonstrate that heightened anxiety in the participants with a mental tumbling block was specific to tumbling. However, there was no significant difference between the two groups in pitch or intensity during the two types of interviews (i.e., when talking about school versus talking about tumbling). In addition, there was no significant group by type of interview interaction for either pitch or intensity. Thus, one alternate hypothesis that cannot be eliminated based on the findings of the current investigation is that the participants with a mental tumbling block simply possess higher levels of trait anxiety. In retrospect, it might have been interesting and valuable to include such a measure in this investigation (e.g., the Trait version of the State-Trait Anxiety Inventory; STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1970). As it stands, future research is required to evaluate this possibility.
Although the significant positive correlations among the subscales on the SAS-2 were to be expected, it was more noteworthy to find that the CFI scores were also significantly positively correlated with the total and subscale scores from the SAS-2. The highest correlations were obtained between CFI scores and the somatic and concentration disruption subscales on the SAS-2. Although it is not possible to make any causal conclusions from these correlational findings, these findings do support an association between fear of injury and both somatic anxiety symptoms and disruptions in concentration. Future research is required to further evaluate the relationships between these constructs, and common method variance may unfortunately account for these findings. This possibility is further bolstered by the fact that neither CFI nor SAS-2 scores were significantly correlated with the pitch and intensity scores from the vocal analysis results.

One additional important result involved finding a significant difference in age between the two groups. Those with a MTB were somewhat older than those without a MTB. Although no highly plausible age-related reason (based on less than two years in mean age difference) can be advanced to explain the other between-group differences, it certainly would have been ideal to have the groups equal in age. Thus, the age difference cannot be ruled out as a possible confound in the interpretation of the results.

In addition to all of the quantitative data reported, cheerleaders were also simply asked to recall if they witnessed or experienced any injuries while tumbling. Results showed that those with a MTB witnessed more injuries than those without a MTB. However, more cheerleaders without a MTB were injured while tumbling than those with a MTB. This could be explained by
the fact that cheerleaders with a MTB might not get injured as often because they are not tumbling as often. When a cheerleader has a MTB, they are often taken out of the routine in all tumbling sections, and they may even quit tumbling classes and private lessons. This would not give them the chance to be injured while tumbling. Also, the MTB group was slightly older than the non MTB group, giving them the opportunity to witness more injuries because they have been involved in the sport longer.

There are a few other limitations to this study. The interviews were conducted in a cheerleading gym during its normal business hours (i.e., between 3 p.m. and 9 p.m.). Even though the interviews were conducted in a private office, the athletes’ water fountain was right outside the office door. In many participants’ interviews, athletes were heard in the background of the recordings. Even though these sections were cut out of the recording before analyzing vocal characteristics, it was impossible to accurately analyze all of the participant’s answers using the vocal analysis software because some data was eliminated. Future research needs to record participants in a room that is soundproof or at least further removed from high traffic areas.

Also, the author was the experimenter in this investigation. Although every effort was made to be objective and to treat all participants identically, it remains possible that subtle experimenter bias may have been operating. A final limitation is that the results would be more powerful if this study included cheerleaders from many different gyms in the Orlando area. Some gyms teach very differently and put more pressure on their athletes than other gyms. Data from multiple gyms would be more representable of the competitive cheerleading population.
These results suggest that there are important relationships between anxiety, fear, and a MTB, but there are inconsistencies. More research needs to be conducted in this and related sports (e.g., gymnastics) to be able to accurately determine factors associated with “mental blocks.” It would be beneficial to athletes and coaches to determine if anxiety differences are sport specific or simply due to differences in trait anxiety. This would help coaches know how to treat athletes with a MTB. Also, there needs to be more research on children measuring their vocal characteristics. Future research is necessary to determine the reliability of these results. It would be interesting and revealing to obtain similar measures while an athlete is in a private tumbling lesson or in a tumbling class, rather than slightly removed from the setting. Also, it would be interesting to conduct similar research in gymnastics and other sports like diving to determine reliability and validity of the current data.

Taken together, the findings of the current research suggest that coaches need to find techniques to ease the cheerleader’s fear in order to allow her to focus on executing skills correctly and safely. In addition, coaches need to develop and use methods to help cheerleaders to focus more narrowly and concentrate on their tumbling.
APPENDIX A: INTERVIEW QUESTIONS
Interview Questions

School Task:

1. How do you like school?

2. What is your favorite subject and why?

3. Do you like your teacher? Why or why not?

4. Do you play any sports or participate in any clubs at school?

5. Who’s your best friend at school? Tell me about her/him.

Tumbling Task:

1. What skill are you blocking?

2. What do you think about before you try to do it?

3. How do you feel before you try to do it?

4. Do you visualize anything before you try to do it? If so, what do you see?

5. Do you think you will ever get past your mental block?

*These tasks will be counterbalanced. All questions will be asked conversationally and will be recorded for vocal analysis.
APPENDIX B: SEVERITY RATING
Dear Coach,

You are being asked to give a severity rating for [Insert Cheerleader’s Name]. This is because she will be participating in a research study that is investigating the effects of anxiety on mental tumbling blocks. Your answer will be confidential.

Please read the following definition of a mental tumbling block: not being able to do a skill for any reason other than an injury for at least one month.

Please check one of the following:

____ This cheerleader meets the criteria for a mental tumbling block

____ This cheerleader does not meet the criteria for a mental tumbling block

If you checked that she does have a mental tumbling block, please give a severity rating for her block:

____ 1) Not severe: will perform the skill 75% of the time in practice

____ 2) Moderately severe: will perform the skill 50% of the time in practice

____ 3) Severe: will perform the skills 25% of the time in practice

____ 4) Very severe: will never perform the skill in practice
APPENDIX C: CHEERLEADING FEAR INVENTORY
Cheerleading Fear Inventory

Many athletes get scared while competing in sports. This even happens to pro athletes. Please read each question. Then, circle the number that says how you USUALLY feel while you are tumbling. There are no right or wrong answers. Please be as truthful as you can.

<table>
<thead>
<tr>
<th>While I am tumbling:</th>
<th>Not At All</th>
<th>Sometimes</th>
<th>Often</th>
<th>All The Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Do you consider yourself to be a fearful cheerleader?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2) Are you afraid of getting hurt?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3) Are you afraid of trying out new exercises?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4) Are you afraid of trying out an exercise that you already know?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5) Does it ever happen that you imagine (or think) of getting hurt before doing an exercise?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
APPENDIX D: SPORT ANXIETY SCALE-2
REATIONS TO PLATING SPORTS

Many athletes get tense or nervous before or during games, meets or matches. This even happens to pro athletes. Please read each question. Then, circle the number that says how you USULLY feel before or while you compete in sports. There are no right or wrong answers. Please be as truthful as you can.

<table>
<thead>
<tr>
<th>Before or while I compete in sports:</th>
<th>Not At All</th>
<th>A Little Bit</th>
<th>Pretty Much</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. It is hard to concentrate on the game.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. My body feels tense.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. I worry that I will not play well.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. It is hard for me to focus on what I am supposed to do.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. I worry that I will let others down.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Before or while I compete in sports:</th>
<th>Not At All</th>
<th>A Little Bit</th>
<th>Pretty Much</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>6. I feel tense in my stomach.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. I lose focus on the game.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. I worry that I will not play my best.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. I worry that I will play badly.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. My muscles feel shaky.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Before or while I compete in sports:</th>
<th>Not At All</th>
<th>A Little Bit</th>
<th>Pretty Much</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. I worry that I will mess up during the game.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. My stomach feels upset.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. I cannot think clearly during the game.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14. My muscles feel tight because I am nervous.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15. I have a hard time focusing on what my coach tells me to do.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
APPENDIX E: INFORMED CONSENT
The Role of Anxiety in Mental Tumbling Blocks

Informed Consent

Principal Investigator(s): Mark Neider, PhD
Sub Investigator: Shannon Thompson
Investigational Site(s): Legendary Athletics

Introduction: Researchers at the University of Central Florida (UCF) study many topics. To do this we need the help of people who agree to take part in a research study. You are being asked to allow your child to take part in a research study, which will include about 50 people at Legendary Athletics. Your child is being invited to take part in this research study because she has a mental tumbling block or because she does not have a mental tumbling block.

The person conducting this research is Shannon Thompson of the UCF Psychology Department. Because the researcher is an undergraduate student, she is being guided by Mark Neider, Ph.D., a UCF faculty supervisor in the Psychology Department.

What you should know about a research study:
- Someone will explain this research study to you.
- A research study is something you volunteer for.
- Whether or not you take part is up to you.
- You should allow your child to take part in this study only because you want to.
- You can choose not to take part in the research study.
- You can agree to take part now and later change your mind.
- Whatever you decide it will not be held against you or your child.
- Feel free to ask all the questions you want before you decide.

Purpose of the research study: The purpose of this study is to investigate the role of anxiety in mental tumbling blocks. Past research has shown that anxiety can interfere with performance in athletic situations. This research study is investigating whether or not anxiety is present while discussing a mental tumbling block and it will be comparing the data with participants that do not have a mental tumbling block.

What your child will be asked to do in the study: She will answer questionnaires about anxiety and fear while tumbling. Following the questionnaires, she will have an informal interview with the researcher, Shannon Thompson, about her tumbling and about school.
Permission to Take Part in a Human Research Study

Location: Legendary Athletics' business office

Time required: We expect that your child will be in this research study once for a half hour.

Audio taping: Your child will be audio taped during this study. If you do not want your child to be audio taped, your child will not be able to participate in the study. There will be no identifiable links to your child in the audiotape. Discuss this with the researcher or a research team member if you have any concerns about confidentiality. If your child is audio taped, the tape will be kept in a locked, safe place. The tape will be erased or destroyed when the data has been analyzed.

Risks: There are no expected risks for taking part in this study. There are no reasonably foreseeable risks or discomforts involved in taking part in this study.

Benefits: There are no expected direct benefits to your child for taking part in this study, however your child may come to a better understanding of their tumbling as a result of the interview and completing questionnaires.

Compensation or payment: There is no compensation or other payment to you or your child for your child’s part in this study.

Confidentiality: We will limit your personal data collected in this study. Efforts will be made to limit your child's personal information to people who have a need to review this information. We cannot promise complete secrecy. Organizations that may inspect and copy your information include the IRB and other representatives of UCF.

Study contact for questions about the study or to report a problem: If you have questions, concerns, or complaints, or think the research has hurt your child talk to Dr. Michael Johnson: College of Sciences, (407) 823-1911 or Dr. Mark Neider, Faculty Supervisor, Department of Psychology at (407) 823-4201 or by email at Mark.Neider@ucf.edu

IRB contact about you and your child’s rights in the study or to report a complaint: Research at the University of Central Florida involving human participants is carried out under the oversight of the Institutional Review Board (UCF IRB). This research has been reviewed and approved by the IRB. For information about the rights of people who take part in research, please contact: Institutional Review Board, University of Central Florida, Office of Research & Commercialization, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901. You may also talk to them for any of the following:
• Your questions, concerns, or complaints are not being answered by the research team.
• You cannot reach the research team.
• You want to talk to someone besides the research team.
• You want to get information or provide input about this research.

UCF IRB Version Date: 01/2010
Permission to Take Part in a Human Research Study

______________________________
Printed Name

______________________________
Signature

______________________________
Witness Signature

______________________________
Date
APPENDIX F: LIST OF TABLES AND FIGURES
### Table 1: Self-Report Means and Standard Deviations (SD)

<table>
<thead>
<tr>
<th>Group</th>
<th>MTB Mean</th>
<th>MTB SD</th>
<th>No MTB Mean</th>
<th>No MTB SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS-2 Somatic</td>
<td>11.35</td>
<td>2.42</td>
<td>9.64</td>
<td>3.44</td>
</tr>
<tr>
<td>SAS-2 Worry</td>
<td>12.29</td>
<td>3.75</td>
<td>10.89</td>
<td>4.03</td>
</tr>
<tr>
<td>SAS-2 CD</td>
<td>8.71</td>
<td>2.76</td>
<td>7.21</td>
<td>1.42</td>
</tr>
<tr>
<td>SAS-2 Total</td>
<td>31.76</td>
<td>6.92</td>
<td>27.39</td>
<td>7.20</td>
</tr>
<tr>
<td>CFI</td>
<td>11.76</td>
<td>2.70</td>
<td>8.96</td>
<td>2.41</td>
</tr>
</tbody>
</table>

### Table 2: Vocal Analysis Means and Standard Deviations (SD)

<table>
<thead>
<tr>
<th>Group</th>
<th>Tumbling Mean</th>
<th>Tumbling SD</th>
<th>School Mean</th>
<th>School SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTB (Pitch)</td>
<td>259.28</td>
<td>31.25</td>
<td>261.72</td>
<td>33.49</td>
</tr>
<tr>
<td>No MTB (Pitch)</td>
<td>246.80</td>
<td>12.77</td>
<td>246.80</td>
<td>13.15</td>
</tr>
<tr>
<td>Total (Pitch)</td>
<td>251.51</td>
<td>22.17</td>
<td>252.44</td>
<td>23.82</td>
</tr>
<tr>
<td>MTB (Intensity)</td>
<td>61.62</td>
<td>3.25</td>
<td>61.19</td>
<td>3.40</td>
</tr>
<tr>
<td>No MTB (Intensity)</td>
<td>61.79</td>
<td>4.24</td>
<td>61.83</td>
<td>4.06</td>
</tr>
<tr>
<td>Total (Intensity)</td>
<td>61.72</td>
<td>3.86</td>
<td>61.59</td>
<td>3.79</td>
</tr>
</tbody>
</table>
Table 3: Correlational Results

<table>
<thead>
<tr>
<th></th>
<th>SAS-2 Somatic</th>
<th>SAS-2 Worry</th>
<th>SAS-2 Concentration Disruption</th>
<th>SAS-2 Total</th>
<th>CFI</th>
<th>Total Mean Pitch</th>
<th>Total Mean Intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAS-2 Somatic</td>
<td>.503**</td>
<td>.392**</td>
<td>.782**</td>
<td>.648**</td>
<td>.270</td>
<td>.256</td>
<td></td>
</tr>
<tr>
<td>SAS-2 Worry</td>
<td>.503**</td>
<td>.364*</td>
<td>.823**</td>
<td>.357*</td>
<td>.085</td>
<td>.055</td>
<td></td>
</tr>
<tr>
<td>SAS-2 Total</td>
<td>.392**</td>
<td>.364*</td>
<td>.635**</td>
<td>.530**</td>
<td>.244</td>
<td>.109</td>
<td></td>
</tr>
<tr>
<td>CFI</td>
<td>.648**</td>
<td>.357*</td>
<td>.530**</td>
<td>.645**</td>
<td>.093</td>
<td>.133</td>
<td></td>
</tr>
<tr>
<td>Total Mean Pitch</td>
<td>.270</td>
<td>.085</td>
<td>.244</td>
<td>.093</td>
<td>.198</td>
<td>.142</td>
<td></td>
</tr>
<tr>
<td>Total Mean Intensity</td>
<td>.256</td>
<td>.055</td>
<td>.109</td>
<td>.133</td>
<td>.142</td>
<td>.299*</td>
<td></td>
</tr>
<tr>
<td>Coach’s Rating***</td>
<td>.296</td>
<td>-.161</td>
<td>.069</td>
<td>.014</td>
<td>.122</td>
<td>.042</td>
<td>.005</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level (2-tailed)
**Correlation is significant at the 0.01 level (2-tailed)
***For the MTB group only; n=17 (2-tailed)

Table 4: Demographic Means and Standard Deviations (SD)

<table>
<thead>
<tr>
<th></th>
<th>MTB Mean</th>
<th>MTB SD</th>
<th>No MTB Mean</th>
<th>No MTB SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>13.71</td>
<td>2.20</td>
<td>12.28</td>
<td>2.08</td>
</tr>
<tr>
<td>Tumbling Level*</td>
<td>2.88</td>
<td>1.27</td>
<td>2.91</td>
<td>1.17</td>
</tr>
<tr>
<td>Ethnicity**</td>
<td>1.88</td>
<td>1.97</td>
<td>1.63</td>
<td>1.50</td>
</tr>
<tr>
<td>Injured Self While Tumbling***</td>
<td>1.24</td>
<td>0.44</td>
<td>1.53</td>
<td>0.51</td>
</tr>
<tr>
<td>Witnessed Injury While Tumbling ***</td>
<td>1.24</td>
<td>0.44</td>
<td>1.06</td>
<td>0.25</td>
</tr>
</tbody>
</table>
*In competitive cheerleading, the divisions are separated by levels 1-5. Participants completed a form that asked what tumbling skills they were able to complete. Their tumbling level was assessed in accordance with the United States All Star Federation, which is the governing body for competitive cheerleading.

** Ethnicity was measured using the following numbers: Caucasian (1), African American (2), Hispanic/Latina (3), Asian (4), Indian (5), and other (6)

*** Self-injury and witnessed injury were measured using yes or no. Yes was labeled as “1” and no was labeled as “2.”

**Figure 1: Mean Pitch**
REFERENCES


