IMPACT OF GRIT ON PERFORMANCE AFTER MASTERY- OR PERFORMANCE-ORIENTED FEEDBACK

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Grit and achievement motivation have been predictors of behavior in academia and military settings (Duckworth, Matthews, Peterson, & Kelly, 2007), but to date, research on their effects on sport performance has been limited. Given grit’s predictive role in other performance domains, grit may be influential in athletes’ long-term goal attainment, interacting with their achievement motives and leading to better performances. Athletes’ trait levels of grit may influence how they understand and respond to messages received within motivational climates from key personnel such as from coaches and teammates. We examined potential moderating effects of grit on the relationship between motivational feedback and high school soccer players ($N = 71; M_{age} = 15.81$) performance on a soccer task, their desire to persist in the task, and their choice of task difficulty. We used hierarchical multiple regression to test the main effects of feedback and grit and to determine if grit moderated the effects of feedback on performance. Grit was a significant moderator of the feedback-shooting performance relationship, accounting for 3.9% of variance, but not task difficulty or persitence. Simple slopes analysis revealed a significant effect for low ($B = 13.32, SE_b = 4.44, p = .004, t = 2.99$), but not high, ($B = 2.11, SE_b = 4.31, p = .63, t = .49$), grit on task success. These results suggest that for those high in grit, feedback about natural ability or hard work is not particularly influential on performance. However, for low grit athletes, type of feedback matters.
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Achievement motivation theory has been used to explain and predict individuals’ behaviors in different performance domains such as academics and athletics. Initially, the achievement motive was viewed as a general internal need for achievement that resulted in behaviors designed to improve performance and achieve desired outcomes (Atkinson, 1957; Elliot & Dweck, 1988; McClelland, 1961). As this theoretical perspective was refined, researchers came to focus on two main achievement motives – mastery and performance (Dweck & Leggett, 1988; Grant & Dweck, 2003; Nicholls, 1984) – that are represented through achievement goals (approaches to achievement tasks) and mindsets (integrated meaning systems based on task difficulty, effort, and ability that determine achievement goals). These motives are determined through exposure to the psychological climates created by significant social agents in achievement domains. These socialization agents (e.g., teachers, peers, coaches) create the motivational climates through their communication/feedback about ability, effort, the difficulty of tasks, and what defines success. Ames (1992) identified two types of motivational climates – mastery or performance – that parallel the goal orientations and mindsets individuals may develop. In a mastery climate, success is defined in terms of self-improvement, mastery, effort, and dedication to the task being learned or performed (Ames, 1992). Performance climates, on the other hand, value competence and “natural” ability, and development is placed within a context of winning rather than personal improvement (McArdle & Duda, 2002). Thus, to understand athletes’ achievement behaviors and performances, researchers have focused on identifying and measuring motivational climates, mindsets, and goal orientations.
For academic tasks, certain motivational climates have been associated with improved performance (Dweck, 2006). In a mastery-oriented climate, which emphasizes hard work and effort as determinants of success, students tend to persist longer in learning tasks, increase their effort when faced with adversity, and attribute failure to internal, controllable characteristics (i.e., “I could have worked harder;” Dweck & Leggett, 1988; Mueller & Dweck, 1998). In contrast, in performance-oriented climates, which promote superiority over others, students tend to give up easily when faced with adversity and attribute failure to external circumstances or internal, uncontrollable characteristics (i.e., “I just don’t have enough ability;” Dweck & Reppucci, 1973). Students in mastery-oriented climates also tend to enjoy challenging academic tasks more than students who are being exposed to performance-oriented climates, and generally perform better over time (Dweck & Leggett, 1988; Mueller & Dweck, 1998; Utman, 1997).

In sport, researchers also have examined motivational climates with respect to a number of outcomes, including well-being (i.e., self-esteem, positive affect), need satisfaction, performance success, and intrinsic motivation, to name a few (e.g., Atkins, Johnson, Force, & Petrie, 2013; Le Bars, Gernigon, Ninot, 2009; Reinboth & Duda, 2006). For example, Atkins et al. (2015) found that, in two independent samples of 8th grade male athletes, a mastery motivational climate created by peers and parents, but not coaches, predicted a mastery goal orientation, which subsequently predicted sport competence ($R^2$’s = .34 to .37), self-esteem ($R^2$’s = .63 to .64), and sport enjoyment ($R^2$’s= .22 to .41). Similarly, in a study of female athletes (mean age = 12.7 years), Atkins, Johnson, Force, and Petrie (2013) found that a perceived mastery-oriented climate created by parents, but not peers, was related directly to the athletes’ self-esteem ($R^2 = .40$), sport competence ($R^2 = .22$), and enjoyment ($R^2 = .18$). Extending previous research on motivational climates in sport, Gershgoren, Tenenbaum, Gershgoren, and
Eklund (2011) used an experimental design to manipulate soccer players’ goal orientations through the feedback offered by their parents—either a performance (i.e., aim is to increase skill level and beat others) or a mastery (i.e., aim is to develop competence) goal perspective. Although both mastery and performance feedback resulted in significant increases in the athletes’ perceptions of the respective motivational climates and goal orientations, neither type of feedback had a direct effect on the soccer players’ actual performance in penalty kicks. These studies of athletes and sport environments suggest that, consistent with previous research in academic environments (Ames, 1992; Nicholls, 1989), (a) athletes’ goal orientations generally are consistent with the perceived motivational climate as created by parents, coaches and teammates, and (b) motivational climates and goal orientations are related directly to a range of positive psychosocial outcomes (e.g., fun, self-esteem) and indirectly to behavioral intentions, such as remaining involved in sport (Atkins et al., 2013; Atkins et al., 2015). However, there has been insufficient research done in the sport domain to determine the direct effects of motivational feedback on actual performance, though studies on student learning strongly support the idea that mastery-oriented feedback had a direct and positive effect on students’ persistence in the face of adversity, intrinsic motivation, and challenge seeking, to name a few (Mueller & Dweck, 1998; Grant & Dweck, 2003; Elliott & Dweck, 1988).

Individuals’ grit, or their passion and perseverance for long-term goals (Duckworth, Peterson, Mathews, & Kelly, 2007), may influence their goal choice and pursuit in conjunction with their achievement motives (Duckworth, 2013). Thus, athletes’ grit may interact with the perceived motivational climate to increase sustained and focused application of resources toward achieving goals. “Grittier” (Duckworth et al., 2007) people tend to persist longer in the face of adversity because of their commitment to their goals; they are also aware of how certain
achievement tasks -- such as deliberate practice and pursuing challenging tasks -- contribute to skill development and goal attainment. For example, Duckworth et al. (2007) examined grit as a predictor of success in completing intensive summer training at an elite military academy. They assessed the cadets’ grit upon arriving to West Point, and used that in addition to Whole Candidate Score (WCS), the measure used to admit candidates, a separate measure of self-control, SAT score, Leadership Potential Score, Physical Aptitude Exam, and the cadets’ rank in high school. About 1 in 20 cadets drop out of summer training (known as Beast Barracks) because of its intensive nature. Grit predicted completion of the intensive training program better than any other predictor ($\beta = .48$), including WCS ($\beta = .09$). As the authors noted, this type of training requires a different sort of fortitude and the ability to sustain effort in the face of adversity to overcome the physical and mental challenges presented. In a related study, Duckworth et al. (2007) surveyed national spelling bee participants about the amount of time they studied for the competition, how far they advanced in the competition, their grit, and number of prior competitions, and then tested them to determine their verbal IQ. Grit predicted advancement to higher rounds in competition ($\beta = .34$); grittier participants also engaged in more weekend study time for the competition, which partially mediated the relationship between grit and final round reached in the competition. The authors concluded that gritty participants outperformed their less gritty peers, at least in part, because they worked longer and harder in their preparation. Although grit has been used to predict success in academia and the military, it has yet to be examined extensively within sporting contexts, though this domain would seem a natural laboratory for studying grit given that success in sport often results from extensive effort and preparation and may take a long-time before success is realized.
Given grit’s role in predicting deliberate practice and performance, it is plausible that grit may be influential in athletes’ long-term goal attainment, interacting with their achievement motives and leading to better performances. That is, athletes’ trait levels of grit may influence how they understand and respond to the feedback and messages they receive within the motivational climate, such as from coaches and teammates. For example, when grittier athletes receive feedback that emphasizes the importance of effort, they may want to persist longer, perform better, and choose more challenging tasks than their less gritty peers receiving the same feedback. If gritty athletes receive feedback emphasizing ability, grit may act as a sort of buffer to this performance-oriented message, reducing the negative impact of that feedback on their desire to persist, choose difficulty tasks, and perform to the best of their abilities.

Thus, the purpose of this study was to examine the potential moderating effects of grit on the relation between motivational feedback and athletes’ performance on a soccer task, their desire to persist in the task and their choice of task difficulty. First, I hypothesized that grit would moderate the effect of feedback on trial two performance in both feedback conditions. Specifically, athletes receiving mastery-oriented feedback will perform better than athletes receiving performance-oriented feedback, and I expect that higher levels of grit will raise performance in both feedback conditions. Second, I hypothesized that grit would moderate the effect of feedback on trial two task difficulty in both feedback conditions. Specifically, athletes receiving mastery-oriented feedback will select more difficult shots on their second trial than athletes receiving performance-oriented feedback, and I expect that higher levels of grit will increase task difficulty across both feedback conditions. Third, I hypothesized that grit would moderate the effect of feedback on desire to persist in the task after the second trial. Specifically, athletes in the mastery-oriented feedback condition will choose to persist more so than athletes in
the performance-oriented feedback group, and I expect that higher levels of grit will increase the athletes desire to persist in the task across both feedback conditions.
CHAPTER 2 METHOD

Participants

Participants were 71 male varsity or junior varsity soccer players drawn from high schools and select soccer club teams located in a large metropolitan area in the south central U.S. In terms of race/ethnicity, the players were Hispanic/Latino/Mexican American, \( n = 31, 43.7\% \), Caucasian/White \( n = 31, 43.7\% \), Other \( n = 4, 5.6\% \), African-American/Black, \( n = 3, 4.2\% \), and Asian American/Pacific Islander players \( n = 2, 2.8\% \). Mean age was 15.81 years \( (SD = .82) \); mean years playing organized soccer was 9.38 years \( (SD = 3.57) \). Current cumulative mean GPA reported by the players was 3.73 on a 5-point scale. Two \( (2.8\%) \) players identified as seniors, 31 \( (43.7\%) \) as juniors, 29 \( (40.8\%) \) as sophomores, and 9 \( (12.7\%) \) as freshmen. The mean time spent in practice and competition each week was 8.07 hours \( (SD = 3.77) \) in high school soccer and 3.27 hours \( (SD = 3.61) \) on club teams. The boys reported playing the following positions on their high school teams: 15 \( (21.1\%) \) offense/forward/striker, 32 \( (45.1\%) \) midfield, 18 \( (25.4\%) \) defense, and 3 \( (4.2\%) \) goalie; three \( (4.2\%) \) players did not play high school soccer. Playing status on their high school teams was: 44 \( (62.0\%) \) starter; 10 \( (14.1\%) \) reserve, but play more than half a game; 12 \( (16.9\%) \) reserve, but play less than half a game; and 5 \( (7.0\%) \) did not play. For those who played on a club soccer team, their primary playing status broke down as follows: 30 \( (42.3\%) \) starter; 6 \( (8.5\%) \) reserve, but play more than half a game; 1 \( (1.4\%) \) reserve, but play less than half a game; and 34 \( (47.9\%) \) did not play. Positions played on club teams included: 3 \( (4.2\%) \) offense/forward/striker; 20 \( (28.2\%) \) midfield; 9 \( (12.7\%) \) defense; 5 \( (7.0\%) \) goalie; and 34 \( (47.9\%) \) did not play.

Measures

Demographics


Participants provided information regarding their gender, age, race/ethnicity, total number of years participating in organized soccer, primary position on their high school team (offense/forward/striker, midfield, defense, or goalie), playing frequency on their high school team (starter, reserve/but play more than half a game, reserve/but play less than half a game, or does not play), weekly hours of practice, participation in club soccer, primary position in club soccer, playing frequency in club soccer, current academic status, and current GPA.

Grit

The 8-item Grit-Short (GRIT-S) scale (Duckworth & Quinn, 2009) measures individuals’ ability and willingness to overcome adversity, work hard, finish projects, achieve goals, be diligent, and stay focused, encouraged, and committed over a long period of time. On items such as “I have achieved a goal that took years of work,” athletes responded using a scale that ranged from 1 (Very much like me) to 5 (Not like me at all). The scale demonstrated adequate internal consistency (Cronbach’s $\alpha = .83$) in a sample of 139 male and female undergraduates (Duckworth et al., 2007). For the current study’s alpha, two items were dropped (item 3 and 5) because of their negative effect on the full scale reliability. These two items were more complex in nature, worded indirectly (i.e., included “not”), and measured the broad concept of consistency of goals, which athletes may have not interpreted as directly related to their sport or may have been low due to their developmental stage. After reverse scoring the appropriate items, the total score was the mean of the six items; higher scores indicated higher grit. The alpha of the remaining six items was .61. The total score has been related to Big Five Conscientiousness ($r = .77, p < .001$) and self-control ($r = .63, p < .001$), but grit differs in that its emphasis is on persistent effort and focus over time rather than a general tendency to be orderly and self-controlled (Duckworth et al., 2007). In addition, the total score has predicted military
retention, school retention, and workplace retention beyond intelligence, physical aptitude, Big Five personality traits, and job tenure over timeframes ranging from 24 days to 18 months (Eskreis-Winkler, Duckworth, Shulma, & Beal, 2014).

Task Success

Task success was represented by the athletes’ total performance scores on Trial 1 and Trial 2; a task success score was calculated for each round. The formula for computing total points was: Total Goals Made Points + Time Bonus (maximum 20 points). Total goals made points was calculated by multiplying the goal value (10, 15, or 20) by the number of successfully made kicks to that goal. This initial value could range from 0 to 240 points. The time bonus was calculated by subtracting the time it took the participant to perform the task from the total two-minute time limit, dividing that score by 10, and multiplying the entire value by 5. For example, if a person were to make 4 shots on the 10 point goal, 2 shots on the 15 point goal, and 1 shot on the 20 point goal in 58 seconds, their score would be: $(4 \times 10) + (2 \times 15) + (1 \times 20) + (120-58/5) = 110$.

Task Difficulty

Task difficulty was represented by the percentage of shots taken each round toward each goal regardless of whether or not the shots were made. This percentage was multiplied by a weighted value that represented the difficulty of each goal; the nearest goal was the easiest and was weighted by 10, the middle goal by 15, and the farthest goal by 20. After multiplying the percentage of shots taken at each goal by the appropriate weight, these values were added together to form a composite task difficulty score, which ranged from 10, low level of difficulty, to 20, high level of difficulty. For example, if a player attempted 4 shots at the nearest goal, 4 shots at the middle goal, and 4 shots at the farthest goal, the task difficulty score would be
represented by the following formula: \((.33 \times 10) + (.33 \times 15) + (.33 \times 20)\) and would equal 15.

Task Persistence

Based on the work of Mueller and Dweck (1998), though modified to fit the specific soccer task of the study, athletes responded to the question “If I had the time, I would attempt the task a 3rd time to try and improve my score” on a scale from 1 (Not at all) to 6 (Very Much). This question provided information on how much each athlete wanted to continue pursuing the specific soccer task in the experiment. Dweck and Mueller (1998) found that children who believed their ability was fixed tended to persist less when given feedback that suggested their success or failure was based on talent rather than hard work.

Procedure

First, the researchers obtained approval from the University of North Texas Institutional Review Board (IRB) for human subjects research. Following approval, high school and select team boys’ soccer coaches were contacted via email to solicit permission to have their players participate in the study during regularly scheduled soccer practices. Through email and follow-up phone calls, the researchers explained the purpose of the study, which was to examine the influence of different types of verbal feedback on subsequent soccer performance, and answer any questions they had. After obtaining permission from the coaches, the researchers visited the team during a scheduled practice and distributed consent forms for the players to take home to their parents. The following week, all consented (and assented) players completed the demographics questionnaire, the Short Grit Scale (Grit-S) and the other measures that were part of the larger study from which these data were obtained. The consent forms and packets were coded by number so data could be matched across all parts of the study. No names (or other
explicitly identifying information) were recorded on the questionnaire packets. The packets took approximately 10 minutes to complete.

Depending on the soccer program’s practice schedule, either immediately upon completion of the questionnaire packets or at a predetermined time the following week, the research team implemented a soccer shooting task at the athletes’ practice facilities; three to five researchers were present at any data collection time to handle all necessary tasks associated with implementing the soccer shooting task. A 2-foot by 2-foot area was outlined on the field and designated as the “kicking box.” From the kicking box, three small soccer goals were set at distances of 10 yards, 15 yards, and 20 yards, and at angles of 45-, 135-, and 90-degree, respectively, from the center of the box.

Soccer players participated in the task one at a time; no teammates or coaches were present when a player completed the task and received feedback. Players were introduced to the task (which was described as a drill designed to improve shooting and passing skills in high school soccer players) and then given an opportunity to ask questions. Following this introduction, players completed several brief measures related to confidence and anxiety that were part of the larger study but are not reported here (these measures took less than one minute to complete). Upon completing these measures, athletes took four practice shots at each goal to determine a baseline for the task and to ensure that each player had an equal chance to warm-up and practice prior to being tested; their success (out of four shots) was recorded for each goal. Next, participants performed the task, which required kicking 12 soccer balls (one at a time) toward the three goals with the objective of scoring as many points as possible; that is, players were allowed to determine at which goals they wanted to kick the balls and in what order they would do so. Again, their only instruction was to score as many points as possible. Each goal
was worth a different number of points – 10 points for the 10 yard goal, 15 points for the 15 yard goal, and 20 points for the 20 yard goal. The players were given two minutes to kick all 12 of the balls at any of the three goals. Players received bonus points for finishing the task under 120 seconds based on the previously described formula. The researcher who was responsible for providing the feedback to the players positioned him- or herself slightly behind the participant and the kicking box. The remaining researchers were positioned behind the soccer goals to collect the soccer balls as the participant kicked them. The researcher who was standing behind the participant was responsible for scoring his performance and providing the feedback (see Appendix C).

Once players had completed the task and a total score was computed, the researcher provided feedback to participants on their performance. Players were randomly assigned to a feedback condition – task/growth or ego/fixed – prior to beginning the task and were given feedback consistent with that assignment. The feedback in the mastery condition was, “Good job, you scored really well. You must be a really hard-working soccer player.” Feedback in the performance condition was, “Good job, you scored really well. You must be a naturally talented soccer player.” Players received only one type of feedback – mastery or performance.

Following the feedback, players were told that they had one more opportunity to complete the task. Prior to doing so, while the soccer balls were being retrieved and the kicking task re-set, they completed another set of the same brief anxiety and confidence measures that were part of the larger study (these measures took less than one minute). The players were again given instructions for the task (“to score as many points as possible within the two minute time limit.”). Administration of the task was exactly the same as in the first round. Following the completion of the task in the second round, players were asked to respond to the task persistence
question as well as three others. One of these questions asked participants to select from two options regarding the type of feedback they received during the drill; this question served as the manipulation check for the study. Participants then completed a final series of questions asking them to provide their own responses regarding why they believe they performed as they did. All participants, regardless of experimental condition, and just prior to departing, were given the task- or growth mindset feedback prior to departing the study (“Thank you for your participation. You did really well today on the task, you must be a hard working soccer player;” see Appendix B, Script, Part 3). This feedback was given to mitigate any negative effects associated with the performance-based feedback and because this type of post-experiment feedback was found to be beneficial (Mueller & Dweck, 1998). Within each team, once all players had completed the shooting task, they were entered into a drawing to win $5 gift cards from local restaurants.
CHAPTER 3 RESULTS

Data Analysis

I used SPSS Version 20.0 to conduct all aspects of the data analyses for this study. Missing data were examined first; only 1.08% of data were missing across all the questionnaires used in this study. Thus, I imputed missing values using mean substitution (Dodeen, 2003).

Total performance and task difficulty scores on Trial 1 and Trial 2 were computed for each participant based on the formulae previously described. Task persistence was measured by the scale previously described. I examined the Grit total score as well as the task success, task difficulty, and task persistence scores to check for violations of normality (e.g., skewness, kurtosis, outliers); none were noted.

I used hierarchical multiple regression (HMR), the preferred statistical procedure for identifying moderator effects (Frazier et al., 2004), to test the main effects of feedback and grit on the different outcomes and to determine the extent to which grit moderated the effects of the feedback on task performance. Task success, task persistence, and task difficulty represented the three different performance outcomes that were tested independently via separate HMRs.

Feedback was effect-coded, with the group receiving performance-oriented feedback coded (-1) and the group receiving mastery-oriented feedback coded (+1). Grit score was standardized to reduce challenges associated with mutlicollinearity between the main effects and interaction term (Frazier et al., 2004). Grit by mastery feedback interaction scores were calculated by multiplying the two scores together. For the HMR conducted on Trial 2 performance and task difficulty selection, I entered Trial 1 performance or Trial 1 task difficulty selection at step 1 to control for those effects. At step 2, I entered the effect-coded feedback variable. At step 3, I entered the standardized grit score. At step 4, I entered the grit by feedback
interaction term. For the analysis predicting task persistence, at Step 1 of the HRM, I entered the
effect-coded task feedback, at Step 2 the standardized grit score, and at Step 3 the Grit by task
feedback interaction term. Although past research has suggested that using changes in $R^2$ greater
than or equal to .01 to determine the significance of moderator effects (Brannan & Petrie, 2011;
McClelland and Judd, 1993), I took a more conservative approach and set $R^2 > .02$ as the cut-off.
For any significant interaction effect that emerged, regression slopes were plotted using
predicted values for task success, task persistence, and task difficulty derived from representative
groups at one standard deviation above the mean and one standard deviation below the mean on
the moderator term and whether or not they received mastery or performance feedback. For each
line, I determined if the slope differed significantly from zero (Aiken & West, 1991). I used the
PROCESS macro (Hayes, 2012) to complete this analysis. Last, I compared the slopes of the two
regression lines to determine if they differed significantly from one another.

Task Success

At Step 1, performance on Trial 1 explained 5.2% of the variance in Trail 2 performance,
$F (1, 69) = 4.23, p = .044$. Entering the effects coded feedback explained an additional 7.6% of
the variance, $F (2, 68) = 5.99, p = .017$. Step 3, in which the standardized grit score was added,
was not significant, $F (3, 67) = .155, p = .695, \Delta R^2 = .002$. At step four, the inclusion of the
standardized grit and feedback interaction, explained an additional 3.9% of variance $F (4, 66) =
3.14, p = .081$, which exceeded the established .02 cutoff. Together, these four predictors
explained 17.5% of the variance in Trial 2 performance, $F (4, 66) = 3.504, p = .012$. See Table 1.

The slopes analysis examining the interaction between feedback and grit on Trial 2
success revealed that, at low levels of grit (grit score of 3.15), the slope of the line between
feedback and Trial 2 performance was significantly different from zero ($B = 13.32, SE_b = 4.44,$
However, for individuals with high levels of grit (grit score of 4.05), the slope of the line was not significant, \((B = 2.11, SE_b = 4.31, \ p = .63, t = .49)\). The slopes of the high and low grit conditions did not differ significantly from each other \((B = -5.66, t = -1.77, p = .08)\). Although not significantly different \((B = 7.30, t = 1.59, p = .12)\), when examining just the athletes in the performance feedback condition, those high in grit scored 20% (14 point difference; \(SD_{pooled} = 20.22;\) Cohen’s \(d = .69\)) higher on the task in the second round than the athletes who were low in gritty. In the mastery condition, those low in grit scored 7% higher than athletes high in grit (7 point difference, \(SD_{pooled} = 20.22;\) Cohen’s \(d = .32\)) See Table 2, Figure 1, and Figure 2.

**Task Difficulty Selection**

At step one, the main effect for feedback was not significant on task persistence, \(F (1, 69) = .172, p = .690, \Delta R^2 = .002\). At Step 2, the inclusion of grit also was not significant, \(F(2, 68) = .003, p = .960, \Delta R^2 = .002\). At Step 3, the grit x feedback interaction term was entered into the model and explained a nonsignificant, additional .6% of the variance, \(F (3, 67) = .382, p = .539\). The overall model was not significant, \(F (3, 67) = .184, p = .907\). See Table 1.

**Task Persistence**

At step one, the main effect for feedback was not significant on task persistence, \(F (1, 69) = .172, p = .690, \Delta R^2 = .002\). At Step 2, the inclusion of grit also was not significant, \(F(2, 68) = .003, p = .960, \Delta R^2 = .002\). At Step 3, the grit x feedback interaction term was entered into the model and explained a nonsignificant, additional .6% of the variance, \(F (3, 67) = .382, p = .539\). The overall model was not significant, \(F (3, 67) = .184, p = .907\). See Table 1.
CHAPTER 4 DISCUSSION

The purpose of the current study was to examine the relationship of grit and feedback to task persistence, task difficulty, and actual performance on a soccer shooting task. The feedback athletes received emphasized either hard work (mastery-orientation) or natural ability (performance-orientation). Grit was represented by a trait measure of this construct.

Although grit did not moderate the effects of feedback on either the athletes’ intention to persist or the difficulty of their shot selection, grit did significantly moderate the effect of feedback on the soccer shooting task, even after controlling for the athletes’ performance on Trial 1. For low grit athletes there was a 37% difference in their performances, which was significant, between the mastery-, and performance-, oriented feedback conditions. Specifically, within this low grit group, the athletes who received mastery-oriented feedback improved their shooting performance on Trial 2, whereas those in the performance-oriented condition fared worse than their Trial 1 attempt. Only one other experimental study has examined directly the potential influence of mastery- or performance-oriented motivational feedback on athletes’ subsequent performance in their sport. In a sample of male adolescent soccer players, Gershgoren et al. (2011) found that when parents delivered mastery-oriented feedback during a penalty shooting task there were increases in their children’s mastery goal-orientation and perceptions of the motivational climate as mastery-focused. The parents’ feedback, however, was unrelated to the athletes’ actual performance on the goal kick task.

Our results indicate that the type of feedback athletes receive is particularly important when their grit is low. In such instances, mastery-oriented feedback that emphasizes the importance of hard work and effort facilitated improved performance, whereas performance-oriented feedback, which focused on natural ability, led to lower scores. For low grit athletes,
feedback about hard work communicates that they are in control of the determinants of a successful performance and they can improve by increasing their effort, something that is plausible and not particularly ego-threatening. In contrast, because low grit athletes do not hold the general belief that they can succeed by sustaining effort over time, receiving feedback that their performance was based on natural ability may be particularly threatening. For these athletes, there is no additional strategy, such as putting forth more effort, to help them perform better because they are being told, through the performance-oriented feedback, that their outcomes are based on innate ability. As a result, their responses to the challenge (the second shooting task) may be attenuated, putting forth less effort and seemingly not caring about the task so as to preserve their sense of competence and belief that they are talented. In research on achievement patterns in education, mastery-oriented feedback has resulted in performance improvements on subsequent academic challenges, whereas performance-oriented feedback has led to the withdrawal of effort and underperformance (Hong, Chiu, Dweck, Lin, & Wan, 1999; Mueller & Dweck, 1998; Nicholls, 1984). The mastery-oriented feedback in these academic tasks, which focused on hard work, resulted in increased effort in tasks directly related to performance improvement (e.g., increased studying, tutoring, or choosing more effective cognitive strategies) and ultimately led to a greater performance. In contrast, the performance-oriented feedback on these academic tasks, which emphasized natural ability, resulted in the students engaging in behaviors that were unlikely to help performances and that allowed them to maintain the appearance of competence, like withdrawing effort or selecting easier tasks.

We expected that high grit athletes who received mastery-oriented feedback would perform significantly better than their high grit peers in the performance-oriented condition, yet these high grit athletes performed equally well regardless of the feedback they received. Grit,
however, did moderate how the athletes responded to the performance-oriented feedback, such that high grit athletes scored 20% higher than those who reported low levels of grit. The difference was mostly due to the performance decrements that occurred for low grit athletes. Although this relation did not reach the .05 level of statistical significance, which likely was due to the small sample and lower power, the size of the percent difference in performance was practically meaningful. High grit athletes are less vulnerable to the pernicious effects of performance-oriented feedback because their passion for their goals and belief in their ability to effectively perform in a challenging circumstance remains unaltered by feedback, whether mastery- or performance-oriented. Duckworth and colleagues (Duckworth et al., 2007; Robertson-Kraft & Duckworth, 2014) have found that individuals high in grit were less likely to be deterred by unfavorable circumstances or increasing challenges, such as grueling military workouts or poor working conditions. Instead of being influenced by extraneous variables, including motivational feedback, high grit individuals are likely to remain steadfast in their goals and approach to achievement. Low grit individuals, however, are less resilient to external factors. Their general belief in their ability to succeed through hard work and perseverance fluctuates as they receive feedback that suggests success depends on either talent or effort. For those low grit athletes who come to believe that innate ability is a critical factor, their performance suffers as they withdraw from tasks because they do not believe they can alter or control important determinants of success.

Contrary to expectation and previous research (e.g., Dweck, 1986; Elliott & Dweck, 1988; Mueller & Dweck, 1998), grit did not moderate the effects of the feedback received on the difficulty of the athletes’ shot selection nor on their intention to persist in the task. The lack of significant effects on the task difficulty variable may have been due to the athletes becoming
anchored to their initial strategy. Anchoring is the tendency to rely too heavily on initial information, behaviors, or strategies when making decisions (Tversky & Kahneman, 1974). In our study, the anchoring may have resulted from the athletes choosing to replicate their approach from Trial 1 in an effort to perform more efficiently at the same shots before incorporating a more difficult shot selection. In support of this explanation, post-hoc examination of the data revealed significant correlations between the percentage of shots taken at each goal between Trials 1 and 2, and with overall task difficulty scores between the two trials. For task persistence, the lack of a significance may have been due to the fact that the majority of athletes indicated they would do the task again if offered ($M = 4.99; SD = 1.46$ on a 6-point scale). Given the strong intention to persist, there simply may have been insufficient variance in the scores to be significant. More research is needed on task difficulty and persistence in the sport domain given the strong relation of motivational feedback to these outcomes in academic performance settings (Grant & Dweck, 2003; Dweck & Leggett, 1988).

There are several limitations in the current study that warrant further discussion. First, all participants were male high school soccer players drawn from only one metropolitan area, which may limit generalizability of the findings in terms of gender and sport. Previous research has demonstrated differences between male and female students in their achievement behavior (Dweck & Reppucci, 1973), thus this study might be extended to female soccer players and male and female athletes from different sports. Second, even after dropping the two complexly worded items, the internal consistency of the grit scale was below .70. This may have downwardly biased results, such that the moderating effect of grit was underestimated due to less accurate measurement. Third, although consistent with previous research in which an experimenter provided feedback to school children (e.g., Mueller & Dweck, 1998), the fact that the athletes did
not receive information from a known socializing agent (e.g., their coaches) may have limited the effect of the feedback. In subsequent studies, researchers may choose to have a critical person from the athletes’ motivational climate provide the feedback as opposed to researchers. For example, Gershgoren et al. (2011) had parents provide their sons with achievement-related feedback about their performance in a soccer task; such an approach may be more ecologically valid. Finally, we only tested grit as the potential moderator of the effects of motivational feedback. Researchers may choose to examine other potential moderators, such as sport experience, openness, achievement goal orientation, and perceived ability in future studies. Like in this study, the salience and influence of the feedback may depend on one or more of these potential moderators.

In general, feedback emphasizing hard work and effort (i.e., a mastery perspective) results in better sport outcomes than feedback emphasizing performance relative to others or innate ability (Harwood, Keegan, Smith, & Raine, 2015). This study’s results extend this by adding that these effects appear to be very strong for athletes who are low in grit. Athletes who do not have passion and perseverance for long-term goals are unlikely to persist in the face of obstacles and are likely to give up easily. Thus, receiving feedback that orients them to the value of working hard and putting forth effort in their sport may be particularly beneficial. When interacting with athletes, socializing agents, such as parents, teammates, and coaches, may want to focus on offering feedback that communicates the value of hard work and effort, and being self-referenced in performance evaluations. Research on mastery approaches to coaching (Smoll, Smith, & Cumming, 2007) has demonstrated the positive effects associated with coaches consistently communicating the importance of effort, hard work, internal motivation, and perseverance to their athletes. Athletes who train in such coach-created mastery-oriented
environments report greater psychosocial well-being, a greater focus on self-improvement and giving maximum effort, higher intrinsic motivation, and more positive affective states than athletes in performance-oriented sport environments (Harwood et al., 2015).

Although grit did not independently predict the athletes’ performance on the soccer task, it did interact with how they experienced the feedback they received. For those athletes who were low in grit, mastery-oriented feedback resulted in performances that were 37% better than those in the performance-oriented feedback condition. For those high in grit, no significant differences in performance were noted across the two types of feedback, though in the performance-oriented feedback condition athletes with high levels of grit scored 20% better than those low in grit. The current findings indicate that the type of feedback offered in relation to an ecologically relevant sport task interacts with players’ levels of grit to impact their performance. At a practical level within the sport environment, coaches should communicate the importance of hard work and effort in determining performance outcomes. An emphasis on athletes’ natural ability is likely to encourage behaviors aimed at preserving the appearance of talent, and not on learning and improving skills. Further, consistent mastery-oriented feedback from key socializing agents may help athletes to develop grit over time (Duckworth, 2013). Based on our results, grittier athletes are likely to put forth effort, engage in tasks, and perform consistently regardless of the feedback they receive. In the end, these athletes are likely to remain engaged in their sport and develop their skill to complement their desire to continue when their sport gets difficult, which may be critical for long-term sport success.
Table 1

Grit as a moderator of feedback predicting Trial 2 Task Success, Trial 2 Task Difficulty, Selection, and Task Persistence.

<table>
<thead>
<tr>
<th>Step/Predictor</th>
<th>Adjusted $R^2$</th>
<th>$\Delta R^2$</th>
<th>$\Delta F$</th>
<th>$B$</th>
<th>$SE$</th>
<th>$\beta$</th>
<th>$t$</th>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 1 Task 1 success</td>
<td>.04</td>
<td>.06</td>
<td>4.23*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 2 Feedback (A)</td>
<td>.11</td>
<td>.08</td>
<td>5.99*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Step 3 Grit (B)</td>
<td>.10</td>
<td>.00</td>
<td>.16</td>
<td></td>
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<tr>
<td>Step 4 AXB interaction</td>
<td>.13</td>
<td>.04</td>
<td>3.14</td>
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<td></td>
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<td>Predictors at Step 4</td>
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<tr>
<td>Task 1 Success</td>
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</tr>
<tr>
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<td>7.55</td>
<td>3.03</td>
<td>.28</td>
<td>2.50*</td>
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<td>3.07</td>
<td>.06</td>
<td>.54</td>
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<tr>
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<td>3.19</td>
<td>-1.7</td>
<td>-1.77</td>
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<tr>
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<td>.70</td>
<td>164.04</td>
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<td>Step 2 Feedback (A)</td>
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<td>.00</td>
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<tr>
<td>Step 3 Grit (B)</td>
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<td>.68</td>
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<td>.01</td>
<td>2.54</td>
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<td>-.05</td>
<td>.45</td>
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<td>Grit (B)</td>
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<td>.11</td>
<td>.05</td>
<td>.49</td>
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<tr>
<td>AXB interaction</td>
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<td>.11</td>
<td>.10</td>
<td>.12</td>
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<td>Predicting Task Persistence</td>
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<td>.00</td>
<td>.17</td>
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<td></td>
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<tr>
<td>Step 2 Grit (B)</td>
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<td>.00</td>
<td>.00</td>
<td></td>
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<td></td>
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<tr>
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<td>.01</td>
<td>.38</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Grit (B)</td>
<td></td>
<td></td>
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<tr>
<td>AXB interaction</td>
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</tbody>
</table>
Table 2

Analysis of the slopes of the regression lines associated with grit moderating the effect of feedback on various outcomes.

<table>
<thead>
<tr>
<th>Outcome Predicted</th>
<th>B</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trial 2 Success</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 standard deviation below the mean</td>
<td>13.32</td>
<td>2.99*</td>
</tr>
<tr>
<td>1 standard deviation above the mean</td>
<td>2.11</td>
<td>.49</td>
</tr>
<tr>
<td>High versus low</td>
<td>-5.66</td>
<td>-1.77</td>
</tr>
</tbody>
</table>

(N = 71). * denotes significant at p = .05.
Figure 1

The interaction between Feedback and Grit.
Figure 2

Performance based on feedback manipulation.
APPENDIX A

REVIEW OF LITERATURE
Achievement Motivation Theory

Achievement motivation theory is a psychological theory of motivation that has been used to explain and predict individuals’ behaviors in different performance domains, such as academics or athletics. Initially, the achievement motive was viewed as a general internal need for achievement that resulted in behaviors designed to improve performance and achieve desired outcomes (Atkinson, 1957; Elliot & Dweck, 1988; McClelland, 1961). Ultimately, though, achievement motivation theory was refined, focusing on two main achievement motives – mastery or performance (Dweck & Leggett, 1988; Grant & Dweck, 2003; Nicholls, 1984).

Within achievement motivation theory, achievement behaviors have been differentiated from general (nonperformance) behaviors that occur in other life domains. Achievement behaviors are thought to be determined by individuals’ achievement goal orientations and mindsets regarding their abilities as stable or changeable. Achievement goals, behaviors, and mindsets are determined through exposure to the psychological climates created by significant others (e.g., parents, coaches) in achievement domains. These socialization agents (e.g., teachers, peers, coaches) create the motivational climates through their communication/feedback about ability, effort, the difficulty of tasks, and what defines success. Thus, to understand individuals’ achievement behaviors and performances, researchers have focused on identifying and measuring motivational climates, mindsets, and goal orientations.

Motivational Climates

Coaches, parents, teachers, and peers are key socializing agents who influence individuals’ beliefs regarding achievement through the type of feedback they provide about performance outcomes (Roberts, Treasure, & Conroy, 2007). More specifically, through their feedback and behaviors regarding effort, ability, and outcome, these motivational agents create
the motivational climate and influence the achievement goal orientations adopted by the students and athletes who are in that environment. Over time, consistent messages and feedback regarding particular determinants of success create the motivational climate, which is subsequently internalized and carried forward as individuals approach achievement tasks. Ames (1992) identified two types of motivational climates – mastery and performance – that parallel the goal orientations and mindsets individuals may develop. In a mastery climate, success is defined in terms of self-improvement, mastery, effort, and dedication (Ames, 1992). Performance climates, on the other hand, value competence and “natural” ability, and development is placed within a context of winning rather than personal improvement (McArdle & Duda, 2002).

Through time and repeated exposure to these socializing agents’ beliefs about what causes success and failure, children develop understandings (i.e., schemas or internal theories) about ability, success, and effort, and what behaviors are desirable in performance domains (Dweck, 2003). These schemas (or theories), which in achievement motivation theory are referred to as goal orientations and mindsets, determine how individuals interpret, approach, and respond in achievement situations (Atkins, Johnson, Force, & Petrie, 2015; Nicholls, 1984). Thus, mindsets and goal orientations are viewed as dispositional components within achievement motivation theory, whereas the motivational climate is defined as situational and what ultimately helps determine children’s mindsets and goal orientations.

Mindset

Dweck (2003) theorized that children’s understandings of task difficulty, effort, ability, and how they are related to outcome(s) (which are all influenced by the information provided by socializing agents), are ultimately integrated into meaning systems. These meaning systems are currently referred to as mindsets, which determine what achievement behaviors are engaged in.
In mastery-oriented motivational climates, where parents, teachers, peers, and coaches, etc., focus on success in terms of task mastery, self-improvement, and giving maximum effort, children tend to develop a growth mindset and adopt more sophisticated and adaptive achievement strategies, like selecting challenging tasks to improve mastery, exerting maximum effort, and persistence. In contrast, performance-oriented motivational climates that define success in terms of social comparison or judgments lead children to develop fixed mindsets, which are associated with maladaptive achievement strategies that minimize their chances of appearing unskilled, often resulting in poor performance and withdrawal (Ames, 1992; Smith, Smoll, & Cumming, 2009).

Mindsets predict the adoption of specific achievement goals and their related behavior patterns, like attributing failure to lack of effort vs. lack of ability, persisting vs. withdrawing when faced with adversity, and using effectual strategies for problem-solving vs. demonstrating learned helplessness. Achievement goals are representations of the mindsets individuals hold in particular achievement domains (Ross, 1989 from Burnette, O’Boyle, VanEpps, Pollack, & Finkel, 2013; Stipek & Gralinski, 1996) such as when they aim to improve academic performance through practice because they believe intelligence is malleable and can be developed over time. Dweck (2011) has contended that mindsets have “profound consequences for how people function, how they relate to others, and what they achieve” (p. 43). In a meta-analytic review of mindsets and their relation to self-regulatory processes, Burnette et al. (2013) found that individuals holding a growth mindset tended to set goals focused on learning and took a mastery-oriented approach (e.g., persisted longer in the face of challenge, increasing effort) to meeting those goals. In contrast, individuals with a fixed mindset tended to set goals emphasizing the outcome and took a performance-oriented approach to meeting their goals (e.g.,
withdrawing when challenged, decreasing effort to avoid appearing unable); these individuals also were likely to respond helplessly when faced with adversity.

Goal Orientations

Mindsets create a framework for an individual’s understanding of how to approach an achievement task. The two different mindsets promote two different approaches to tasks – to appear competent or to improve skill level – that are known as achievement goals. Although many different terms have been used to describe goals within the achievement motivation literature, Grant and Dweck (2003) have suggested that two main classes of goals exist – mastery and performance. Individuals who hold mastery goals aim to improve their skill and performance in relation to self, which occurs through hard work and effort (Nicholls & Dweck, 1979). Individuals who hold performance goals want to demonstrate ability or avoid demonstrating lack of ability in relation to others, usually determined by positive judgments of ability or avoiding negative evaluations from others (Elliot & McGregor, 2001). Achievement goal orientations are orthogonal, such that an individual can score highly on both measures of performance and mastery goals (Roberts, Treasure, & Kavassanu, 1996). For example, an individual may believe that both ability and effort determine success, and may strive to appear competent as well as improve task mastery.

Achievement goals are critical determinants of achievement patterns and responses to tasks in performance domains (Elliot & Dweck, 1988). Further, Dweck (1986) has contended that the task choice and pursuit process is built around achievement goals. In her work, Dweck found that a mastery goal-orientation promoted challenge seeking, persistence in the face of obstacles, and consistent establishment and attainment of achievement goals. With this goal orientation, ability level and task difficulty are judged based on one’s performance (i.e., self-
referenced) and learning history (Nicholls, 1984). For these individuals, the achievement goal is movement toward competence and mastery of tasks; framing tasks as a learning opportunity induces a mastery-oriented approach and related behaviors (Nicholls, 1984).

A performance goal-orientation, on the other hand, is associated with avoiding challenges, low persistence when confronting obstacles, and an inability to effectively establish and obtain valued goals (Dweck, 2006; Mueller & Dweck, 1998). In this goal orientation, task difficulty and ability are framed in reference to the ability of other people. Thus, individuals use the performance of others to determine their own ability level, and gauge task difficulty based on how others are performing. Their goal is to appear competent as judged by others (and in relation to others’ performances). Staging tasks or skill demonstrations in ways that emphasize public self-awareness induces the second conception of ability (Nicholls, 1984). For example, being told that a person’s performance is being compared to others may lead them to become more performance-oriented.

Success and failure are particularly salient in achievement domains. Most research on achievement goals has emphasized the stark differences in response to failure based on the adoption of either a performance or mastery goal orientation (Dweck & Reppucci, 1973; Elliott & Dweck, 1988; Mueller & Dweck, 1998). People holding a performance goal orientation tend to respond to failure by exhibiting signs of learned helplessness, shying away from challenges, and attributing success or failure to innate ability (Dweck & Leggett, 1988; Dweck & Reppucci, 1973). In contrast, people holding a mastery goal orientation tend to respond to failure by putting forth greater effort, persisting longer in hopes of ultimately succeeding, and attributing their failure to a deficit in strategic knowledge for solving the problem or lack of effort rather than a

When comparing mastery-oriented and performance-oriented individuals across tasks and outcomes, mastery-oriented individuals have been found to report higher perceived effort, higher perceived mastery and ability, more success in academics, less anxiety (in individuals categorized as having low self-esteem), and reduced performance impairment (Nicholls, 1984). In general, mastery-oriented individuals also tend to focus more deliberately on the task, are more flexible and creative in responding to challenges, and experience greater enjoyment from their intrinsic motivation to complete the task than do performance-oriented individuals (Utman, 1997). This enjoyment may lead mastery-oriented individuals to believe they are doing what they want to do and are in control of the situation, allowing them to adapt and adjust to new challenges with the idea that mastery is desirable and within their reach (Nicholls, 1984). In contrast, performance-oriented individuals who also perceived themselves to be of low ability experienced performance decreases on intelligence testing, whereas those performance-oriented individuals who perceived themselves to be of high ability experienced performance increases (Nicholls, 1984). Regardless of perceived ability, performance-oriented individuals tend to respond inflexibly to challenging tasks, are motivated primarily by external sources, and do not enjoy tasks as much as they feel compelled to achieve (Utman, 1997). Performance-oriented individuals tend to view effort as indicative of low ability and tend to shy away from challenging tasks. For them, skill building is a means to an end (Nicholls, 1984).

Summary

Motivational climates, through feedback or information provided by significant socializing agents, create conditions in which individuals learn to pursue tasks in an organized
and meaningful way based on their beliefs about what constitutes success. As individuals come to understand how to succeed within their climate, they develop a particular mindset that enables them to integrate new information into their existing knowledge about how to succeed and guides how they pursue achievement tasks within a particular domain. As a result of the developed mindset, individuals choose achievement goals that allow them to pursue success consistent with the motivational climates’ suggestions of what constitutes success. Subsequently, individuals engage in unique achievement behaviors that allow them to reach that goal.

Two different motivational climates have been described, as have parallel mindsets, achievement goals, and achievement behaviors. In a mastery motivational climate, improvement is considered success. As a result, individuals develop a growth mindset that prompts them to pursue mastery-oriented achievement goals with the purpose of developing their skill level over time. These same individuals view failure as a sign that greater effort may be needed to develop the next level of skill. As a result, they persist longer, choose to try more challenging tasks, and respond to adversity with greater effortful intensity. In a performance motivational climate, success is determined by beating somebody else. Individuals in such a motivational climate develop a fixed mindset and pursue goals that they believe will make them appear competent and better than others. These individuals believe failure means they are of low ability, and thus respond to failure by giving up or withdrawing. These two different motivational climates create very different achievement contexts that drive the development of mindsets and achievement goals and behaviors that promote, or inhibit, future growth and learning.

Achievement Motivation within Academia

Much research regarding achievement motivation theory has been conducted within academic settings to understand and predict students’ performances and, in particular, students’
responses to success and failure based on particular goal orientations. Achievement motivation theory would suggest that students who hold a mastery goal orientation would be likely to use success or failure outcomes as information that signals a necessary change to current strategy and effort, regardless of their current perception of their ability (e.g., Diener & Dweck, 1978; Elliott & Dweck, 1988). Students with a performance goal orientation, however, would try to demonstrate competence in relation to others, and thus use success or failure outcomes as information regarding their ability (e.g., are they better than other students).

Research has indicated unique results of interpreting success and failure outcomes in these ways (Diener & Dweck, 1978; Dweck & Reppucci, 1973; Dweck & Leggett, 1988; Dweck, 2006). For example, through a sequence of studies of 5th graders who held performance or mastery goals, Diener and Dweck (1978) examined differences in strategy use for solving increasingly complex visual puzzles, attributions of ability, and verbalizations during task performance. Children were split at the median into performance or mastery groups based on their scores on the Intellectual Achievement Responsibility (IAR) scale, which measures how much responsibility an individual assumes after success or failure. The researchers also classified puzzle solving strategies into two categories: useful strategies (those that would eventually lead to a solution) and stereotypes (those that would not lead to a solution). Their results suggested that children who were oriented to mastery rarely attributed failure to a lack of ability, actively engaged in self-monitoring and self-instruction to help them solve the puzzles, and used effective strategies, such as hypothesis checking, to solve the puzzles. Children with a performance goal orientation, however, attributed failure to a lack of ability and used ineffective (or stereotypical) strategies (e.g., repeatedly giving the same answer despite previous failure) in their puzzle
solving; these children sometimes withdrew completely from the task by giving up and foregoing future attempts to solve the problem.

In a related study that examined how students respond to academic failures, Dweck and Reppucci (1973) offered 40 fifth-grade children the opportunity to solve puzzles that both had and did not have workable solutions. Certain children who were presented with unsolvable puzzles exhibited signs of learned helplessness, despite previous success in solving puzzles. These same children emphasized the role of innate ability in their lack of success, whereas the other children in the study who could not solve the puzzles repeatedly attributed their failure to a lack of effort and persisted much longer in their attempts. Further, results from the administration of the IAR indicated that children who believed their ability to succeed was outside of their control experienced the greatest decrements in performance in solving the puzzles. In short, children who had a performance goal orientation attributed failure to lack of ability.

Elliott and Dweck (1988) expanded on the Dweck and Reppucci (1973) study by seeking to understand if the adoption of performance or mastery goals would influence how instructions and information were processed. Children (grade 5) were asked to complete a pattern recognition task that was challenging for their age. In the instructions, experimenters told the children there was a chance to learn by doing the task, and then assigned the children to two conditions. In one condition, children received feedback indicating they had high ability to perform this task. In the other, children received feedback indicating they had low ability to perform this task. Children were then told to pick a puzzle out of two boxes. The label on one box emphasized that the task measured ability (performance goal) and offered varying difficulty levels; the second box emphasized that the puzzles presented an opportunity to learn (mastery goal). Children who chose puzzles from the performance goal box were told they would be filmed and compared to a
normative group by experts. Elliott and Dweck found that when performance goals were emphasized and perceived ability was high, children responded with a mastery-oriented approach by persisting longer in the face of obstacles in comparison to children with perceived low ability; however, these same performance oriented – high ability children also avoided a challenging task at which they might be judged incompetent. When perceived ability was low and performance goals were emphasized, despite being told that they had the ability to learn, the children responded with negative ability attributions (e.g., “I’m not very good at this”) and gave up more quickly than low ability children who had a mastery goal. When mastery goals were emphasized for the children through the task they selected, conceptions of current ability (i.e., high vs. low) were irrelevant with respect to challenge seeking, persistence, and spontaneous verbalizations regarding performance during a challenge.

Grant and Dweck (2003) linked mastery and performance goals to maintenance of intrinsic motivation and cognitive and affective processes. In one of their studies, 92 male and female college students were presented with a failure scenario that would be highly salient to them: failing a major exam or poor performance on a test to get into graduate school. Students were then asked to rate how they would think, feel, and behave if they experienced such a failure. Mastery goal orientations were associated with minimal loss of intrinsic motivation, planning future successes, decreases in withdrawal of energy needed to succeed, predicted effort-based attributions, as well as no changes in self-worth and positive reframes of their setbacks without denying past failure. Performance goal orientations, however, were related significantly to decrements of intrinsic motivation, and predicted ability-based attributions of failure, a loss of self-worth, and rumination, a feature of learned helplessness.
Overall, the results of studies by Dweck and her colleagues (e.g., Diener & Dweck, 1978; Dweck & Reppucci, 1973; Elliott & Dweck, 1988; Grant & Dweck, 2003) have demonstrated that, by altering strategies for solving tasks and strategies necessary for succeeding, like persisting in the face of adversity or applying greater effort, goal orientations are a central determinant of achievement-directed behavior in academically-related performance tasks. Further, their findings suggest that these achievement goals can be manipulated by contextual cues. For example, goals can be modified by providing options that emphasize learning or appearing able, or telling children that they must work hard or have high ability. Over time, and receiving consistent messages about ability and effort, children would begin to integrate these ideas into their understanding of what constitutes success, and subsequently alter their mindsets to match the new expectations of how to succeed.

Theoretically, mindsets and their associated goal orientations are believed to be influenced by interventions and feedback from parents, teachers, and peers suggesting that abilities can either be improved or are stable, or emphasizing the importance of effort or ability, in being able to successfully complete a task (e.g., Blackwell, Trzesniewski, & Dweck, 2007; Hong, Chiu, Dweck, Lin, & Han, 1999; Mueller & Dweck, 1998). For example, Mueller and Dweck (1998) conducted a series of six studies that demonstrated that praise for intelligence (i.e., “you must be smart at these problems”), which likely induced a performance goal perspective, had a negative impact on subsequent goal choice, persistence, and attributions of failure more so than did praise for effort, which likely induced mastery goal orientations. Specifically, they asked 128 boys and girls (mean age = 10.7 years) to complete three series of Raven’s Progressive Matrices. Upon successfully completing the first trial, the researchers praised children either for their ability or for their effort and then asked them to indicate a goal
they would like to pursue (e.g., “problems that aren’t too hard, so I won’t get many wrong”). After a second, more difficult trial, the researchers inquired about the children’s desire to persist in the task, their enjoyment of the task, and their perceptions of their performance, and their attributions regarding why they performed as they did. Children who received praise for their effort significantly preferred mastery goals (e.g., “problems that I’ll learn a lot from, even if I won’t look so smart”), attributed failure to a lack of effort, enjoyed the task more and wanted to persist longer in comparison to children receiving praise for their ability. Children who received praise for their ability preferred performance goals (e.g., “problems that are pretty easy, so I’ll do well”), attributed failure to a lack of ability, and enjoyed the tasks less than children praised for effort.

Feedback also might alter children’s perception of their goal attainment ability and future responses. Schunk (1982) found that children (ages 7 years 5 months to 10 years 7 months) who received feedback centered on effort expended during academic tasks made significantly faster progress on mastering specific math operations, developed greater skill in solving math problems, and perceived their self-efficacy in math performance to be higher than the children who received feedback about future achievement (i.e., “you need to work hard”) or no feedback at all. Further, these results suggested that one piece of feedback emphasizing the importance of hard work may promote achievement in future academic contexts. Future research may explore the importance of such effort vs. performance-based feedback in a sport context on subsequent skill development and perception of self-efficacy.

Researchers have also explored ways to alter individuals’ mindsets to promote more adaptive achievement behavior patterns (Blackwell, Trzesniewski, & Dweck, 2007; Hong, Chiu, Dweck, Lin, & Wan, 1999). For example, Blackwell et al. (2007) designed a motivational
climate intervention aimed at teaching 7th grade male and female students to adopt a growth mindset. In the intervention, students were taught that learning changes the brain, and that students are in charge of this process. Children in the intervention condition more strongly endorsed a growth mindset (Cohen’s $d = .66$) over the course of the study; children in the control group did not change their endorsement of a growth mindset over time (Cohen’s $d = .07$). Children in the intervention group also were rated by their teachers as having a positive change in motivation over the course of the study. These results support the idea that mindsets can be manipulated, through either instruction or feedback from significant social agents in the motivational climate, and that the manipulation can result in improvement in performance relative to no intervention.

Mindsets provide a context within which individuals frame and interpret specific goals, leading to the subsequent achievement behavior patterns (Grant & Dweck, 1999; Grant & Dweck, 2003; Hong, Chiu, Dweck, Lin, & Wan, 1999; Stone & Dweck, 1988). In academia, research on mindsets has tended to focus on intelligence as a fixed or malleable quality. For example, Stipek and Gralinski (1996) examined 319 students’ beliefs about intelligence and the role of these beliefs in explaining school performance. Children in 3rd, 4th, 5th, and 6th grade completed a measure assessing whether or not their beliefs about intelligence were fixed or growth oriented. Believing that intelligence was fixed was associated positively and strongly with beliefs that school performance should be relatively stable and that intelligence had widespread effects on performance. Children who held a growth perspective believed that effort had positive effects on intelligence and performance. Further, the children’s goal orientation partially mediated the effects of their mindsets on beliefs about performance, indicating that both mindsets and goal orientations are factors in determining achievement behaviors, though mindset
better predicted achievement goals than behavior patterns. These findings are consistent with the conception that mindsets lead to the development of a particular goal orientation, and subsequently, to specific behaviors.

Hong, Chiu, Dweck, Lin, and Wan (1999) examined, in a series of studies, the role of mindsets about intelligence in attributions of effort and ability and willingness to engage in remedial corrective action. Male and female undergraduates \((n = 97)\) took a conceptual reasoning test consisting of 90 problems (15 problems were completed at a time in 4 minute blocks). Upon test completion, the students were given a sheet of paper with a bar chart that represented their scores and that of another participant. Students were then asked to measure what factors most influenced their performance. After receiving negative feedback (i.e., a chart indicating their performance was lower than others), students with a growth mindset were likely to attribute task performance to their effort, whereas students with a fixed mindset responded by attributing their task performance to a deficit in ability.

In the second study, Hong et al. (1999) asked incoming college freshman at a university in Hong Kong to fill out a questionnaire that emphasized English proficiency as critical to academic success. Students then were asked how likely they would be to take a remedial English proficiency class and were given a measure designed to indicate if they had a growth or fixed mindset. In addition, students indicated previous performance on a proficiency examination on which English was a measured domain. The students with a growth mindset were more likely than students with a fixed mindset to take remedial action when they realized their skills in an important area, English proficiency, were lacking. Students with a fixed mindset were less likely than students with a growth mindset to take remedial action, despite being given the same information regarding the importance English proficiency for their future success.
In their final study, Hong et al. (1999) presented 60 male and female university students from China with passages designed to induce a fixed or growth mindset. For example, students were presented with a *Psychology Today* article stating intelligence could only be increased or decreased by 2 percent during a person’s life (fixed mindset) or with an article stating that 88 percent of a person’s intelligence was due to environmental factors (growth mindset). The students then completed problems from an intelligence test, and were given feedback about their test scores indicating that their performance was either satisfactory or unsatisfactory. Participants were then given an opportunity to choose a task that they were told was either an unrelated task of ability or a task that would effectively improve their performance on the intelligence task. After selecting the task, students indicated the desired difficulty level of items on a conceptual problem-solving task and to endorse items regarding the extent to which their performance was due to a number of factors including effort, difficulty of the task, luck, concentration, ability, and skill. When participants were told they performed unsatisfactorily on the intelligence task and read the passage about a fixed mindset, they were unlikely to take remedial action, like working on a tutorial they were told effectively improved performance on the intelligence test. However, when they were told they performed unsatisfactorily and read the passage about growth mindsets participants opted to take remedial action. For individuals with a growth mindset, attributing unsatisfactory performance to a lack of effort fully mediated the relationship between mindset and remedial action. Growth mindset students also preferred more difficult tasks than those with a fixed mindset.

Consistent with Hong et al. (1999), Blackwell, Trzesniewski, and Dweck (2007) found that in male and female adolescents (grade 7), a growth mindset about intelligence was related to an upward improvement in grades over the course of two years through a series of psychological
strategies; a fixed mindset was associated with no improvement over the course of two years. In their structural equation model, Blackwell et al. (2007) found that a growth mindset was related directly to the use of learning goals and positive effort beliefs. Learning goals subsequently predicted positive strategies, which were then related directly to an increase in grades. Positive effort beliefs also predicted positive strategies and low helpless attributions, which were each associated with an increase in grades. Together, these studies (e.g., Hong, Chiu, Dweck, Lin, & Han, 1999; Mueller & Dweck, 1998; Schunk, 1982) indicate comprehensive and consistent relations between mindsets, goal orientations, motivational climates, and patterns of achievement behavior within academia. Specifically, individuals who have a growth mindset are likely to adopt a mastery goal orientation and then exhibit many of the behaviors required for success in an academic domain, like persistence, increasing effort, enjoyment, and positive problem-solving strategies. In contrast individuals with a fixed mindset are likely to adopt a performance goal orientation and then engage in behaviors that will not improve success in the long run, such as withdrawal or decreasing effort. These relations also have been examined in sport, though few studies have attempted to experimentally manipulate mindsets, goal orientation, or motivational climate to prompt specific achievement behavior patterns. Sport presents an achievement domain in which research can continue to further the understanding of the influence of achievement goal orientation, mindset, and motivational climates on achievement behavior.

Achievement Motivation within Sport

Consistent with research findings on students’ performances in academic domains (e.g., Blackwell, Trzesniewski, & Dweck, 2007; Dweck & Leggett, 1988; Mueller & Dweck, 1998), the motivational climate is thought to significantly influence athletes’ experiences and performances. Although coaches often are considered to be the main source of information
regarding achievement-related behaviors and outcomes in sport environments (which includes information regarding ability, effort, and success), parents and teammates also have been shown to be influential (Atkins, Johnson, Force, & Petrie, 2013; Atkins, Johnson, Force, & Petrie, 2015). These three groups are, in fact, considered to be the primary socializing agents for young athletes and the individuals who, through their feedback and behaviors, create the motivational climates that will determine athletes’ mindsets and goal orientations.

Research in sport suggests that motivational climates lead to the development of particular goal orientations (Cury, Biddle, Famose, Sarrazin, Durand, & Goudas, 1996; Le Bars, Gernigo, Ninot, 2009; Nicholls, 1989). These goal orientations are thought to develop as parents, peers, and coaches provide athletes with information defining success, effort, and ability. For example, Cury et al. (1996) asked 700 girls (mean age = 14.5 years) to complete measures of their perceived motivational climate in a physical education course and their achievement goal orientations. Children who perceived the motivational climate as mastery-oriented were likely to express having a mastery goal orientation \( R^2 = .47 \). In contrast, children who perceived their motivational climate to be based on performance relative to others were more likely to endorse a performance goal orientation \( R^2 = .44 \). Similarly, in a sample of 800 students (mean age = 15.24 years), Wang, Chatzisarantis, Spray, and Biddle (2002) examined the relation of the perceived motivational climate created in their physical education class and their achievement goals for physical education. Perceptions of mastery or performance climates, respectively, were related significantly to the presence of similar goal orientations (mastery and performance) within the children.

Motivational climates also have been associated with outcomes other than goal orientations, such as well-being and enjoyment of sport (Atkins, Johnson, Force, & Petrie, 2013;
Atkins, Johnson, Force, & Petrie, 2015; Le Bars, Gernigon, & Ninot, 2009). For example, Le Bars et al. (2009) examined differences in judokas who did, and did not, persist in national training on their perceived motivational climate, goal orientations, self-perceptions, perceived competence, and intention of dropping out. Their sample consisted of 52 persistent judokas and 52 drop out judokas (mean age = 17.9 years) who were drawn from a national training center in France. The athletes completed measures of perceived motivational climate, goal orientation, self-perception, perceived competence, and intention of dropping out at six different points in time over a two-year period. They found that judokas who dropped out perceived their motivational climates to be less mastery, and more performance-oriented than persistent judokas. Dropouts were also less mastery-oriented in their approach than persistent judokas and reported a greater intention to drop out.

Consistent with Le Bars et al. (2009), Atkins et al. (2015) found that, in two independent samples of 205 and 200 8th grade male athletes, a mastery motivational climate created by peers and parents, but not coaches, predicted a mastery goal orientation, which subsequently predicted sport competence ($R^2 = .37$, $R^2 = .34$), self-esteem ($R^2 = .64$, $R^2 = .63$), and sport enjoyment ($R^2 = .22$, $R^2 = .41$). Further, only enjoyment was a significant predictor of intention to continue playing that sport. These results indicate that a mastery motivational climate, and the associated goal orientation, is indirectly related to the intention to remain in sport, but only through how much enjoyment the athlete is having in his/her sport. In a related study, Atkins, Johnson, Force, and Petrie (2013) surveyed 227 female athletes (mean age = 12.7 years) regarding their perceived parental involvement in sport, perceived mastery-oriented climate as created by peers, sport competence, self-esteem, sport enjoyment, and intention to continue playing their best sport. They found that a perceived mastery-oriented climate created by parents, but not peers,
was related directly to the athletes’ self-esteem ($R^2 = .40$), sport competence ($R^2 = .22$), and enjoyment ($R^2 = .18$). Again, only enjoyment was associated with a stronger intention to continue playing their sport over the next three years ($R^2 = .16$). These studies suggest that, consistent with previous research in academic environments (Ames, 1992; Nicholls, 1989), (a) athletes’ goal orientations generally are consistent with the perceived motivational climate as created by parents, coaches and teammates, and (b) motivational climates and goal orientations are related directly to a range of positive psychosocial outcomes (e.g., fun, self-esteem) and indirectly to behavioral intentions, such as remaining involved in sport.

Although the motivational climate plays a primary role in the adoption of specific achievement goals, research in sport has also explored just the connection between mastery and performance goal orientations and psychological outcomes. For example, Duda et al. (1992) examined the relation between goal orientations (performance or mastery) and boys’ and girls’ (mean age = 10.5 years) beliefs about success, interest, and enjoyment of sport activities. They found that a mastery goal orientation was positively related to cooperation and the view that motivation or effort leads to success. In contrast, children who had a performance goal orientation believed success was due to external factors, such as a task being too hard. These results were consistent with research done in the academic domain (e.g., Diener & Dweck, 1978; Hong, Chiu, Dweck, Lin, & Han, 1999; Mueller & Dweck, 1998; Schunk, 1982), which has suggested that a mastery orientation is linked to greater effort and internal attributions for success, whereas a performance orientation is linked to greater ability and external attributions for success.

In a subsequent study, White, Duda, and Keller (1998) examined the relation between achievement goal orientations and the perceived purpose of participating in sport. Their sample
consisted of 192 male and female high school athletes, representing a variety of sports such as swimming, basketball, and ice hockey. Athletes were first asked to complete a measure of their goal orientation, and then responded to prompts like “a very important thing sport should do is prepare us to respect authority” or “a very important thing sport should do is teach us to be satisfied when we tried our best.” Athletes endorsing a mastery goal orientation perceived that the purposes of sport were to increase self-esteem, teach good citizenship, enhance the value of cooperation and mastery, and encourage an active lifestyle. They also viewed sport to be more intrinsically rewarding and as a process through which these values could be learned and improved than those whose goal orientation was performance based. Athletes endorsing a performance goal orientation perceived that the purposes of sport were to obtain a high value career, weed out kids who do not have what it takes to succeed, and teach kids how to bend the rules to succeed.

In a study examining the relation between mastery and performance goals, cognitive evaluations of sport competition, and indicators of well-being, Adie, Duda, and Ntoumanis (2008) surveyed 424 athletes who participated in team sports (mean age = 24.25 years). They found support for a partially mediated relationship where achievement goals served as a framework for interpreting competition as a threat or a challenge, and the appraisal of the event subsequently predicted the athletes’ self-esteem and positive affect. Mastery goals, where the focus is on improvement and effort, were related to viewing competition as a challenge, which subsequently predicted positive affect and self-esteem. Performance goals were associated with both challenge and threat appraisals, which then were related to decreased self-esteem, decreased positive affect, and increased negative affect. These results suggest that there is a cost (lower mood) to adopting performance goals. Further, achievement goals in sport serve as a framework
for cognitive appraisals regarding sport-related events. Overall, athletes who are concerned with task mastery and personal improvement viewed sport-related events, such as a stressful competition, as challenges and opportunities for accomplishment and personal growth, which is consistent with Roberts (1986), who found that self-referenced athletes exerted maximal effort in sport competitions to overcome challenges.

Harwood, Keegan, Smith, and Raine (2014) reviewed 104 studies regarding motivational climates and their associated intrapersonal outcomes in both sport and physical activity contexts. They found that a mastery motivational climate was linked to motivational outcomes such as perceived competence, objective performance, self-esteem, intrinsic motivation, affective states, practice and competitive strategies, and the experience of flow. In contrast, a performance motivational climate was consistently linked to extrinsic motivation, negative affect, antisocial moral attitudes, perfectionism, and negatively associated with positive affect and feelings of autonomy and relatedness. The breadth of literature reviewed corroborates that mastery motivational climates, in contrast to performance climates, are linked to more adaptive achievement behavior patterns.

Within sport, mastery motivational climates (as created by coaches, teammates, and parents), as well as athletes’ mastery goal orientations have been related to a host of positive performance and mental health outcomes, such as intrinsic motivation, giving maximal effort, positive affect, and self-esteem (Adie, Duda, Ntoumanis, 2008; Alvarez, Balaguer, Castillo, & Duda, 2012; White, Duda, & Keller, 1998). The effects of feedback (i.e., mastery vs. performance) on subsequent performance, however, which has been studied extensively and established within academic performance settings (e.g., Blackwell, Trzesniewski, & Dweck, 2007; Dweck & Leggett, 1988; Dweck & Reppucci, 1973; Elliott & Dweck, 1979; Elliott &
Dweck, 1988; Heyman & Dweck, 1998; Hong, Chiu, Dweck, Lin, & Wan, 1999; Mueller & Dweck, 1998; Stipek & Gralinski, 1996) has received limited attention within sport environments. Currently, only a handful of studies have examined how mastery and growth-oriented motivational approaches and messages, as delivered by coaches and parents, may affect the performance and psychosocial well-being of athletes in different contexts (Gershgoren, Tenenbaum, Gershgoren, & Eklund, 2011; Smith, Smoll, & Cumming, 2007; Smith, Smoll, & Cumming, 2009). For example, Smith, Smoll, and Cumming (2009) found that athletes’ goal orientations were influenced by the motivational climate created by coaches. In their longitudinal study of 47 youth basketball teams comprised of athletes ages 9 to 13 years, they found that when coaches emphasized a mastery approach to sport, the athletes had a significant increase in mastery goal orientation and a decrease in performance goal orientation over the course of their 3-month season. When coaches emphasized a performance-oriented approach to sport, the athletes had a significant increase in a performance goal orientation. These relations existed regardless of the athletes’ age or gender.

In a study examining the influence of parental feedback on male high school athletes’ achievement goals, Gershgoren et al. (2011) randomly assigned the soccer players to one of two groups that received either performance-oriented or mastery-oriented feedback. Parents provided the feedback to their son after he attempted a series of penalty kicks. For athletes assigned to the mastery condition, parents said, “I watched your performance and it seems like you are focusing too much on scoring more than others. The most important thing in penalty kicking practice is improving your penalty kicking skill. Scoring is not essential as long as you learn to perform the kick correctly.” This feedback was designed to emphasize task mastery as well as improvement over past performance. For athletes assigned to the performance condition, parents said, “I
watched your performance and it looks to me that you are focusing too much on improving your penalty kicking skill. The most important thing in penalty kicking practice is scoring more than others. A perfect kick is not needed if the ball is in the back of the net.” This feedback was designed to emphasize outperforming other athletes. The players who received mastery-oriented feedback reported significant increases in general and parental perceived motivational climate and task-involvement, as well as decreases in ego-involvement and the perception of a performance motivational climate from pre-trial to post-trial. In contrast, players who received the performance-oriented feedback from their parents experienced an increase in performance perceived motivational climate and in their own performance-goal involvement. These results suggest that goal orientation and perceptions of motivational climate can be manipulated by feedback from important socializing agents, such as a parent, in the sport domain. Of note, this study did not examine related achievement behaviors, such as persistence, selection of task difficulty, and actual performance, which could be affected by the type of feedback athletes receive. For example, performance-oriented feedback may lead to athletes selecting tasks to demonstrate competence and avoiding challenges that may demonstrate inability and performance decrements, whereas mastery oriented feedback could result in increased persistence, taking on challenging tasks, and improvements in actual performance.

Taken together, the research on achievement motivation in sport creates a foundation for understanding a range of psychosocial outcomes and successes, including enjoyment, self-esteem, perceived competence, and positive affect (e.g., Adie, Duda, & Ntoumanis, 2008; Atkins, Johnson, Force, & Petrie, 2013; Atkins, Johnson, Force, & Petrie, 2015; Duda, Fox, Biddle, & Armstrong1992). However, research in the sport domain examining the connection between motivationally-oriented feedback and subsequent performance on a sport skill or
important psychological states, such as the athletes’ task persistence or choice to pursue difficult
tasks, has been limited. More research is needed in this area to better understand the effects of
motivational feedback. Further, recent studies (e.g., Duckworth, Kirby, Tsukayama, Berstein, &
Ericsson, 2010; Duckworth, Peterson, Matthews, & Kelly, 2007) have suggested that the pursuit
of some achievement goals is influenced by another stable, noncognitive trait: grit. Grit, or
passion and perseverance for long-term goals, has been associated with adaptive achievement
behaviors similar to those of a mastery goal orientation, like task persistence, selecting more
difficult tasks, and success (Duckworth, Peterson, Matthews, & Kelly, 2007). Thus, grit is
important in that it might moderate how athletes’ experience (and react to) motivational climates
and feedback (in particular performance based feedback and climates) from important socializing
agents.

Grit as a Determinant of Achievement Behavior

Although yet to be examined extensively in the sport context, grit may be one factor
contributing to athletes’ success, in that grittier athletes may be more likely to select tasks that
promote individual growth through challenge and to persist longer in the face of obstacles.
Duckworth (2006) has suggested that the development of grit is dependent on how individuals
choose to pursue their goals which, as mentioned before, is reflective of achievement motivation
theory. Grit may lead to sustained and focused application of resources toward achieving goals.
As a result, grittier individuals are less likely to be negatively affected by feedback orienting
them away from their achievement strategy, and may respond more strongly to feedback
suggesting to them that their effort is critical to their success.

Duckworth et al. (2007) has examined the incremental validity of grit beyond baseline
intellectual talent across myriad domains, including the United States Military Academy, the
National Spelling Bee, and grade point average at an Ivy League Institution. Grit, or passion and perseverance for long-term goals, encompasses strenuously working toward goals, maintaining effort and interest, and using failure or disappointment as information to evaluate progress and adjust strategies as needed (Duckworth, 2007). And, even after failure, grittier individuals generally choose to stay the course to achieve their goals (Duckworth et. al, 2007).

In the first of three related studies, Duckworth et al. (2007) examined relations among GPA, SAT scores, and grit in a sample of college students from an Ivy League university. Grit was associated with greater academic achievement as measured by the students’ cumulative GPA, and, interestingly, with lower SAT scores. This finding suggests that, although all these students generally were of high intellectual ability given their attendance at an Ivy League institution, students who had scored lower on their SATs were able to effectively compensate for this deficit by working hard and persevering over the course of their semesters. Ultimately, this deficit did not affect them and they were able to surpass their peers in academic achievement at the institution.

In their second study, Duckworth et al. (2007) examined grit as a predictor of success in completing intensive summer training at an elite military academy. They assessed the cadets’ grit using the original grit scale upon arriving to West Point, and used that in addition to Whole Candidate Score (WCS), the measure used to admit candidates, self-control, and GPA. About 1 in 20 cadets drop out of summer training (known as Beast Barracks) because of its intensive nature. Grit predicted completion of the intensive training program greater than any other predictor ($\beta = .48$), including WCS ($\beta = .09$). As the authors noted, this type of training requires a different sort of fortitude and the ability to sustain effort in the face of adversity to overcome the physical and mental challenges presented.
In their third study, prior to the actual contest, Duckworth et al. (2007) surveyed national spelling bee participants about the amount of time they studied for the competition, how far they had advanced in a prior competition, their grit, and number of prior competitions, and then tested them to determine their verbal IQ. Grit predicted advancement to higher rounds in competition \((\beta = .34)\); grittier participants also engaged in more weekend study time for the competition, which partially mediated the relationship between grit and final round reached in the competition. The authors concluded that gritty participants outperformed their less gritty peers, at least in part, because they worked longer and harder.

In a subsequent study of this same group of spelling bee participants, Duckworth et al. (2010) looked at the role of grit in deliberate practice, or practice in which demands of the practice task meet or exceed current skill levels and present a new challenge ultimately designed to improve performance (Ericsson, Krampe, & Tesch-Römer, 1993). During such practice, individuals receive immediate feedback on their performance and can repeat the same task, or a similar task, to correct their mistakes and improve on the identified weakness. The deliberate practice measured was time spent studying and memorizing words alone, whereas other practice involved a more playful orientation to learning, like taking quizzes with someone else or a computer game. Participants also reported how enjoyable and effortful the activities were, and how relevant each one was to improving performance, measured by final round reached in the spelling bee. Overall, deliberate practice was significantly less enjoyable and more effortful than being quizzed or leisurely reading. However, of the preparation activities, deliberate practice was the strongest predictor of spelling bee performance \((OR = 2.85)\). Grit was also a significant predictor of spelling bee performance \((\beta = .22)\). Further, grit predicted deliberate practice, and deliberate practice mediated the relationship between grit and spelling bee performance. These
results suggest that, although not necessarily enjoyable, grittier participants are likely to engage in tasks that require effort and generally result in improved performance.

In order to further determine the long-term effects of grit, Robertson-Kraft and Duckworth (2014) examined it in relation to teacher retention and effectiveness in low-income school districts. Using a sample of male and female novice schoolteachers’ \((n = 154)\), two independent coders examined teacher resumes for evidence of grit in college activities and work experience. In addition, the researchers gathered information on the teachers’ leadership potential from interviews, and obtained their college GPA and SAT scores. Grittier teachers were more than twice as likely to remain committed to their new position throughout the school year than their less gritty peers \((OR = 2.34)\) and were viewed as more effective teachers \((OR = 1.60)\) based on student ratings; no other variables assessed by the researchers contributed to the prediction of the teachers’ effectiveness or retention. This finding suggests that grit is an important characteristic to account for when measuring long-term success, given the commitment required in order to be successful in challenging professions. This research also suggests that grit is a critical determiner of who may remain and be effective in challenging situations and tasks over time.

To date, no research has been published examining the relationship between grit and the attainment of goals in athletics or performance in athletics. However, given grit’s role in predicting deliberate practice and performance, it is plausible that grit may play a role in athletes’ long-term goal attainment. Further, because grit indicates the stability of goals and is related to more challenging practice, it is plausible that a growth motivational climate and growth mindset may lead to grittier behaviors. The associated behavior patterns with grit (i.e., persistence in the face of adversity, engagement in deliberate practice) may influence a person’s sustained
commitment to a mastery goal orientation, leading to greater performance in athletics or other challenging contexts. Thus, grittier individuals may experience an increase in motivation and effort when given feedback emphasizing the importance of effort on performance. Further, grittier participants may be less susceptible to feedback emphasizing the importance of other features, like ability, on performance, because their goals are unlikely to reflect an inherent performance goal orientation.

Previous research has also indicated what constitutes effective feedback. Nicol and MacFarlane-Dick (2006) noted 7 principles of good feedback. Good feedback: (1) helps clarify what constitutes a good performance, and the goals or criteria of a good performance; (2) facilitates development of self-reflection; (3) delivers quality information about learning; (4) encourages dialogue around learning; (5) encourages positive beliefs and greater self-esteem; (6) provides opportunities to make improvements on the gap between current performance and desired performance; and (7) provides information to teachers to shape teaching. More briefly, Kilminster, Cottrell, Grant, & Jolly (2007) noted that effective constructive feedback should be aimed at improving performance through identifying and reinforcing the strengths of a performance and identifying weaknesses, while providing information on how to improve them. Given these criteria regarding effective feedback, the current study’s feedback emphasize self-reflection (e.g., you must be a really hard-working or naturally talented soccer player); encourages positive beliefs (e.g., good job, you did really well), provides opportunities to improve (e.g., you will now have a chance to do the task again); identifies strengths (e.g., you must be a really hard-working soccer player or you must be a naturally talented soccer player), and subtly implies, in one feedback manipulation, how the participant can improve their score (e.g., hard-work).
APPENDIX B

QUESTIONNAIRE
DEMOGRAPHIC QUESTIONNAIRE

Please answer the following questions honestly. It is important that you answer every question. There are no “wrong” or “right” answers, so just do the best you can.

1. Gender:
   ______ Male
   ______ Female

2. Age: ______

3. Race/ethnicity:
   ______ Caucasian/White
   ______ Hispanic/Latino/Mexican American
   ______ African-American/Black
   ______ American Indian
   ______ Asian American/Pacific Islander
   ______ Other (specify: ________________________________)

4. Number of Years you have Participated in Organized Soccer (including this year)
   a. in high school: ______
   b. in your life: ______

5. Current Academic Status:
   ______ Freshman
   ______ Sophomore
   ______ Junior
   ______ Senior

6. Current GPA: ______

7. What is your level of participation on your high school soccer team in the past year?
   This is my first year on the varsity team ______
   This is my second year on the varsity team ______
   This is my third year on the varsity team ______
   This is my fourth year on the varsity team ______
   I don’t play on a varsity team ______

7a. If you participated on a high school soccer team in the past year, on average, how many hours did you spend in practice and competition per week? ______
8. What position do you primarily play on your high school team? (only choose one)
   □ Offense/Forward/Striker
   □ Midfield
   □ Defense
   □ Goalie

9. What is/was your primary playing status on your high school team? (only choose one)
   □ Starter
   □ Reserve, but play more than half a game
   □ Reserve, but play less than half a game
   □ Do not play

10. Have you played for a club soccer team in the past year?
   Yes □
   No □

10a. If yes, on average, how many hours did you spend in practice and competition per week during the season?

11. What position do/did you primarily play on your club team? (only choose one)
    □ Offense/Forward/Striker
    □ Midfield
    □ Defense
    □ Goalie
    □ I don’t play club soccer

12. What is/was your primary playing status on your club team? (only choose one)
    □ Starter
    □ Reserve, but play more than half a game
    □ Reserve, but play less than half a game
    □ Do not play
    □ I do not play club soccer

   FEEDBACK MANIPULATION QUESTION

   Please place a checkmark in the box underneath the feedback you received during the task.

   □ “You must be a really hard-working soccer player.”

   □ “You must be a naturally talented soccer player.”
8- Item Grit Scale

Directions: Here are a number of statements that may or may not apply to you. For the most accurate score, when responding, think of how you compare to most people -- not just the people you know well, but most people in the world. There are no right or wrong answers, so just answer honestly! Place an X or a Check Mark to indicate your response.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Very much like me</th>
<th>Mostly like me</th>
<th>Somewhat like me</th>
<th>Not much like me</th>
<th>Not at all like me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. New ideas and projects sometimes distract me from previous ones.</td>
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<td></td>
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<tr>
<td>2. Setbacks don’t discourage me.</td>
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<td>3. I have been obsessed with a certain idea or project for a short time but later lost interest.</td>
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<td>4. I am a hard worker.</td>
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<tr>
<td>5. I often set a goal but later choose to pursue a different one.</td>
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<td>6. I have difficulty maintaining my focus on projects that take more than a few months to complete.</td>
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<td>7. I finish whatever I begin.</td>
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<tr>
<td>8. I am diligent.</td>
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<td></td>
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</tbody>
</table>

TP

Instructions: Answer the following 2 questions honestly based on what you would like to do.

<table>
<thead>
<tr>
<th>Question</th>
<th>Not at all</th>
<th>Very much</th>
</tr>
</thead>
<tbody>
<tr>
<td>If I had the time, I would attempt the task a 3rd time to try and improve my score.</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

TP-2

If you were to attempt the task a 3rd time, please indicate the number of balls (out of 12) that you would shoot at each goal.

_______________ 10 yards  ________________ 15 yards  ________________ 20 yards
Script, Part 1:

Instructor: “Hi, my name is (name). We are developing a task designed to improve shooting and passing skills in high school soccer players. I will be working with you on this task today and recording your performance as we go along. The goal of this task is to score as many points as possible within a two minute time period. You score points for each of the 12 soccer balls that you kick into one of the target goals (POINT TO THE GOALS). These three goals are placed at distances of 10, 15, and 20 yards (POINT TO EACH ONE IN TURN). If you kick a ball into the goal placed 10 yards away, you will score 10 points; you will get 15 points if you kick the ball into the 15-yard goal; and you will get 20 points if you kick the ball into the 20-yard goal. As I said already, you will have 2 minutes to complete this task. You must kick each ball from within this box (point to box), just like a corner kick. You may not dribble the ball out of the box before you kick it. You are only allowed to place (and kick) one ball at a time from the box, but you may set the balls up outside of the box however you want. Your time will begin once you kick the first ball. Remember, you may kick any or all of the balls at any of the goals you want, but your overall goal for this task is to score as many points as possible with your kicks. If you finish kicking all 10 balls in under the 2-minute time limit, you will be awarded up to 20 bonus points. I will tell you your actual score after you have completed the entire task. Do you have any questions?”

(Answers questions)

Instructor: “Ok, you will now have time to take some practice kicks. Please take 4 practice kicks towards each of the 3 goals.

(Participant takes 12 practice kicks towards the 3 goals.)
Instructor: “Ok, before you begin the task, I would like you to answer these three questions. Remember, as you answer these questions, think about how you are feeling right now in relation to the soccer task you are about to do. (HAND THE PLAYER A CLIP BOARD WITH THE THREE QUESTIONS ON IT…HE CIRCLES HIS RESPONSE TO EACH ONE. RESEARCHER GETS CLIPBOARD WHEN DONE).

(Participant responds to questions)

Instructor: “Ok, you will now have one minute to set up the balls however you see fit outside of the box. Just remember that you can only have one soccer ball in the kicking box at a time. Once you kick the first ball towards a goal, your time on the drill will begin. Also, once you have kicked a ball, you may immediately set up and kick another if you want. The only rule is that you may only have one ball in the box at a time. When you are ready, you may begin. We will let you know when one minute is up and when you have 30 seconds left.”

Script, Part 2 (after participant completes the task the first time):

Instructor: “Please give me a moment to score your performance.”

(Experimental feedback given)

Instructor: “Good job, you scored really well. You must be a really hard working soccer player.” OR

Instructor: “Good job, you scored really well. You must be a naturally talented soccer player.”

Instructor: “I’m now going to give you one more chance to do the shooting task. Again, your goal is to score as many points as you can within the two minutes; if you finish before the time limit you will earn up to 20 bonus points. The number of points you may earn for each goal will remain the same for this round – 10, 15, and 20 (point to each goal as you remind them of the points associated with each). Do you have any questions?”
(Answers questions)

Instructor: “Ok, before you begin the task, I would like you to answer these three questions. Again, as you answer these questions, think about how you are feeling right now in relation to the soccer task you are about to do. (HAND THE PLAYER A CLIP BOARD WITH THE THREE QUESTIONS ON IT…HE CIRCLES HIS RESPONSE TO EACH ONE. RESEARCHER GETS CLIPBOARD WHEN DONE).

(Participant responds to both questions)

Instructor: “Ok, you will now have one minute to set up the balls however you see fit outside of the box. Just remember that you can only have one soccer ball in the kicking box at a time. Once you kick the first ball towards a goal, your time on the drill will begin. Also, once you have kicked a ball, you may immediately set up and kick another if you want. The only rule is that you may only have one ball in the box at a time. When you are ready, you may begin. We will let you know when one minute is up and when you have 30 seconds left.”

Script, Part 3 (after participant completes the task the second time):

Instructor: “As I score your performance on this second round, would you please answer the questions on this sheet” (HAND CLIPBOARD WITH QUESTIONS).

(Participant answers questions)

Instructor: “Thank you for your participation. You did really well today on the task, you must be a hard working soccer player.”

(Give score if player asks for it at this time.)

Queries and Response Set:

Question: How many bonus points will I score for finishing under the time limit?
Answer: The most you can score is 20 bonus points. You will get significantly more points for kicking the balls into the goals.

Question: Do my scores roll over?
Answer: No.

Question: How many points did I score?
Answer: You will be told how many points you scored at the end of the experiment.

Question: Do I have to kick each ball in a certain time limit?
Answer: No. Your task is to score as many points as you can, but you want to finish within the two minute timeframe.

Question: Can I use different feet to kick the ball?
Answer: Yes.

Question: Does using different feet matter?
Answer: No.

Question: Do I have to kick the balls towards any goals in particular?
Answer: No. Your task is to score as many points as you can within the two minute timeframe.

Question: Am I allowed to move before kicking the ball?
Answer: You are allowed to move around but you cannot dribble the ball outside of the kicking box. Remember, you may place the balls how you would like around the kicking box before the task begins.

Question: Do I have to keep the ball on the ground/in the air when I kick it?
Answer: No.

Question: Does it matter if the ball is on the ground/in the air when I kick the next ball?
Answer: No.
Question: How many points do the gates stand for?

Answer: The closest goal to you is worth 10 points. The second closest goal is worth 20 points. The furthest goal is worth 30 points.

Question: Do I have to say which goal I am aiming for before I kick it?

Answer: No.

Question: How much will I be penalized for missing a kick?

Answer: You won’t be penalized.

Question: Am I going to get a penalty for not kicking all 10 balls?

Answer: No.

Question: Will I get a second chance to try?

Answer: No. Your task is to score as many points as you can in this round.

Question: Will I get any practice kicks?

Answer: Yes, you will be allotted 4 practice kicks towards each goal before we begin.
APPENDIX D

PERFORMANCE SCORING SHEET
## Practice Scoring Sheet

Date: ____________  

PID: ________________  

**Practice Kicks x 12**  

Scorer: ________________  

(Tally the appropriate results)

<table>
<thead>
<tr>
<th></th>
<th>15</th>
<th>10</th>
<th>20</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X15</td>
<td>X10</td>
<td>X20</td>
<td>Total</td>
</tr>
</tbody>
</table>

**Total:**

Time = ________

**Behavioral Obs:** _________________________________
## Trial Scoring Sheet

**Date:**

**PID:**

**Trial #:** 1

**Scorer:**

(Tally the appropriate results)

<table>
<thead>
<tr>
<th></th>
<th>15</th>
<th>10</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kick Attempt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kick Success</td>
<td>X15</td>
<td>X10</td>
<td>X20</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Time =**

**Behavioral Obs:**

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**Trial #:** 2

<table>
<thead>
<tr>
<th></th>
<th>15</th>
<th>10</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kick Attempt</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kick Success</td>
<td>X15</td>
<td>X10</td>
<td>X20</td>
</tr>
<tr>
<td>Total:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Time =**

**Behavioral Obs:**

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Performance Outcome:

**Points scored** = Total Goals Made Points + Time Bonus (Max 20 points)

Time Bonus = ((120 seconds - Time to Complete Task in seconds) / 10 seconds) \* 5*

*Note time max bonus points (20) are achieved at 80 seconds completion time or less*


