

Spring 2018

# A growth mindset intervention in female collegiate athletes

Cierra LaTrice Williams

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A Growth Mindset Intervention in Female Collegiate Athletes

Cierra LaTrice Williams

A thesis submitted to the Graduate Faculty of

JAMES MADISON UNIVERSITY

In

Partial Fulfillment of the Requirements

for the degree of

Master of Arts

Department of Graduate Psychology

May 2018

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## Acknowledgements and Dedication

I would like to begin by thanking my advisor, Dr. Bob Harmison, for his efforts in supporting me throughout my time in the Psychological Sciences and during this research process. I would also like to thank my committee members, Dr. Allison Ames and Dr. Kenneth Barron, who have provided me with many suggestions to improve this research project and become a better researcher. This work is dedicated to my mom, Patrice Williams. Thank you for the many sacrifices you have made over your life to provide me with countless opportunities for success. Your dedication does not go unnoticed, and I am forever grateful for you. To my grandmother, Norma Maker, thank you for always consistently praying over me, being a listening ear when I need it most, and loving me the way that only you can.

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## Abstract

Growth mindset interventions have been evaluated within academic settings for years and have demonstrated links between one's mindset and achievement goals. However, despite this research, limited research has evaluated the effectiveness of a growth mindset intervention within an athletic setting. This research aimed to remedy this shortcoming by conducting a growth mindset intervention within a sample of 27 female collegiate athletes. Participants viewed two videos about the malleability of the brain, listened to the researcher discuss personal sport experiences, and wrote a letter to a future athlete. Measures of growth mindset, fixed mindset, competitiveness, win orientation, and goal orientation were obtained pre- and post-intervention. It was hypothesized the intervention would facilitate a growth mindset while decreasing win orientation and increasing goal orientation. A series of 2 x 2 Repeated Measures Mixed ANOVA's revealed these hypotheses were not supported. However, several moderate to large effect sizes emerged and provided practical significance for some of the presented mean differences and relationships. Given these findings, limitations and directions for further research in growth mindset in athletes are offered.

*Keywords:* growth mindset, intervention, competitiveness



## A Growth Mindset Intervention in Female Collegiate Athletes

### **Growth Mindset**

Think back to a time when you were faced with a challenge that tested your ability as a successful student. Maybe you thought about your second semester in graduate school when you received your first metacognitive quiz grade in multivariate statistics. You look at the grade at the top of your paper, and your stomach drops; you received an “F.” When you were taking the quiz you were confident in your understanding of the material that you were expecting an “A,” but that one sheet of paper proved otherwise. What do you say to yourself? Perhaps it would be easiest to say, “Understanding statistical concepts has never been one of my strengths.” Or you could say, “I did not do as well as I wanted to on this quiz, but I am not supposed to understand everything right away. If I seek help and practice these new concepts, I will learn how to better prepare and perform on the rest of the quizzes.” Ultimately, your final grade in multivariate statistics would be contingent on your mindset to view the quiz grade as an opportunity to expand your knowledge in the subject or your decision to pass on the opportunity.

If you chose to view your quiz grade as an opportunity for progress, you would be demonstrating what Carol Dweck would now call a growth mindset. In her book titled *Mindset: The New Psychology of Success*, based on her implicit theories of intelligence, Dweck (2006) states that individuals with a growth mindset, or an incremental self-theory, have a belief that their “basic qualities are things you can cultivate through your efforts” (p. 7). In contrast, Dweck defines those with a fixed mindset, or an entity self-theory, as individuals who believe their basic “qualities are carved in stone” (p. 6). With

the increased popularity of Dweck's book (e.g., Boaler, 2013; Gates, 2015; Hagel & Brown, 2010), more individuals have sought out strategies to change the orientation of their mindset to be more growth mindset oriented in areas such as business, relationships, and education. In addition, the available literature supports the use of growth mindset interventions in the academic setting across age groups (e.g., Aronson, Fried, & Good, 2002; Blackwell, Trzesniewski, & Dweck, 2007; Donohoe, Topping, & Hannah, 2012; Paunesku et al., 2015; Yeager, Trzesniewski, & Dweck, 2013).

So, it seems imperative that people would want to adopt a growth mindset. But how do these growth and fixed mindsets apply to sport contexts? Consider mindset in this example: you are on your university's varsity soccer team, and for the last year you have been one of the starting forwards on the team. During a game against your team's archrival, you are riding the bench and your coach has started a new player in your place. You noticed at practice that the new player has impressive accuracy for corner shots on goal, a skill that is vital to the team winning this game and one that you have yet to master. With a fixed mindset you could think, "Coach thinks she is a better player than me. I do not have the accuracy she does for making those corner shots, so I will probably ride the bench for the whole game." However, if you have a growth mindset you may think, "The new player really has an eye for making corner shots on goal. If we have time during practice this week, I will ask her to help me with my form to get better at making those goals." In this example, seeking help from the new player on the team would be a learning opportunity, and you would be demonstrating a growth mindset.

So, why would anyone care about having a growth or fixed mindset in sports? Reflect for a moment on the late John Wooden, former UCLA men's basketball head

coach and one of the most revered coaches in the history of sports. In a 2001 TED Talk, he explained his commitment to focusing on the effort, learning, and improvements of his players, a few key ingredients of a growth mindset (Wooden, 2001). Whether the players realized it or not, Coach Wooden's coaching style allowed them to experience the benefits of a growth mindset, which ultimately contributed to UCLA winning ten national championships. Coach Wooden also demonstrated a more liberal view of competing in terms of winning versus succeeding. Consider his statement from the 2001 TED Conference (Wooden, 2001):

...That's what really matters: if you make an effort to do the best you can regularly, the results will be about what they should be. Not necessarily what you'd want them to be, but they'll be about what they should; only you will know whether you can do that.

It is evident that Coach Wooden posits that effort yields the outcomes that one desires; when effort is lacking performance is lacking, when effort is high performance is high. Given effort is a facet one has partial control of (i.e., outside of injury, skill level, etc.), exerting your best effort given the circumstances will aid in achieving the best performance in that situation. Considering Dweck's (2006) definition of an individual with growth mindset (i.e., one who feels their basic qualities can be cultivated through effort), parallels can be drawn between her work and Wooden's view on the importance of one's effort. Thus, assessing growth mindset with athletic settings is imperative in order to determine how athletes present within this research area.

## **Competitiveness and Achievement Motivation**

The soccer example and Coach Wooden's TED talk referenced above highlight the fundamental role that competitiveness plays in sport. While Wooden did not commit to a strict view of competitiveness (i.e., winning is everything), he did illuminate competitiveness in a way that is not the status quo of American sporting culture (i.e., success is not synonymous with winning). For years, researchers have made numerous attempts to arrive at a cohesive definition of competitiveness (e.g., Kildea, 1983; Smither & Houston, 1992; Triplett, 1898). Some researchers (e.g., Murray, 1938) have described this concept in context of achievement motivation, such as competing to win or the desire to outperform others. Others (e.g., Helmreich & Spence, 1978) have described it as a personality characteristic, such as competing to excel or the desire to succeed in interpersonal situations (e.g., personal goals).

The present study will utilize Gill and Deeter's (1988) conceptualization that defines competitiveness "as the desire to enter and strive for success in sport competition" (p. 200). Those individuals who possess this form of competitive orientation demonstrate strong work ethic, possess the desire to master skills required for success, and enjoy meeting competitive challenges. Furthermore, Gill and Deeter outlined two additional competitive orientations: win orientation and goal orientation. Win orientation reflects the explicit focus on winning in a competition and/or making comparisons to other competitors. These athletes tend to place a high value on winning, outperforming competitors, and demonstrating superiority over other competitors. On the other hand, goal orientation reflects the focus on personal performance standards and/or making self-comparisons. These athletes are less focused on how they compare to other

competitors, and are more focused on achieving personal goals, mastering skills, and performing to the best of their skill level.

It is interesting to note that Gill (1993) has argued that competitiveness might be best understood as a sport-specific form of achievement motivation. Based on developmental work with children, Nicholls (1989) identified two perspectives among achievement motivation goals: task (or learning) goals and ego (or performance) goals. Individuals who adopt task goals seek out opportunities that allow them to acquire different skills, master new tasks, and improve on their abilities (Dweck, 2007; Nicholls, 1989). Individuals who adopt ego goals seek to demonstrate competence, avoid being deemed incompetent, and/or set goals that affirm that they have an “admirable amount” of talent or ability when compared to others (Dweck, 2007; Nicholls, 1989).

Research (e.g., Biddle, Wang, Chatzisaray, & Spray, 2003; Wang & Koh, 2006) has revealed connections between achievement goals and mindset. Furthermore, Dweck (1999) has demonstrated that individuals who possess a growth mindset and task goals tend to strive for personal excellence and improve upon their abilities, while individuals with a fixed mindset and ego goals tend to aim for superior performances over others and seek opportunities that allow them to “look good” on a task. These traits appear to be consistent with Gill and Deeter’s (1988) conceptualization of goal orientation and win orientation, respectively. However, limited research to date has directly examined the relationships between mindset and competitive orientation.

### **Purpose of the Present Study**

Given the apparent connection between mindset, achievement motivation, and competitiveness, it would seem that it would be beneficial for athletes to adopt a growth

versus fixed mindset. Not only would they gain an outlook on athletic ability as a malleable skill, they also may exhibit positive changes in their competitiveness and achievement motivation as the result of being more growth mindset oriented. Thus, the primary purpose of the present study was to determine if a tailored lesson plan can foster a growth mindset towards athletic ability in a sample of female collegiate athletes. A secondary purpose of the present study was to determine if changes in growth mindset are related to changes in self-reported competitiveness in a sample of female collegiate athletes.

## **Review of Literature**

The following section will review some of the research that has explored the relationship between mindset, achievement orientation, and competitiveness, as well as the effectiveness of growth mindset interventions within physical education (P.E.)/sport settings and academic settings. The research included reflects studies that have examined these factors in tandem, utilized college students or collegiate athletes, are seminal articles in their respective research fields, and/or have provided support for later methods used by the researcher. Of particular interest, there have been numerous studies that have addressed growth mindset interventions within the academic realm (Blackwell et al. 2007; Paunesku et al., 2015; Yeager et al., 2013). Overall, these interventions have aimed to convey intelligence is malleable and that academic struggles serve as an opportunity for growth. For purposes of this research, I selected a few articles that reflect these main findings or utilized intervention activities that are used in the present study.

### **Mindset, Achievement Goals and Competitiveness**

Previous research has provided a glimpse of the impact one's mindset has on achievement motivation and how these mindsets may be adaptive or maladaptive. In addition, inferences can be drawn regarding how the behaviors that athletes exhibit in relation to their mindset will impact their overall success as an athlete. For example, Ryska (2001) conducted a study among Division I collegiate athletes in which he assessed the relationships between achievement goals (e.g., task goal and ego goal), competitive orientation, and physical ability. He found that athletes who held a competing to excel orientation, and were more task goal oriented, demonstrated higher levels of confidence in their athletic ability. In contrast, athletes who adopted a

competing to win orientation and ego goals scored lower on levels of confidence. Ryska further suggested that these findings support the benefits of an athlete who demonstrates more of a competing to excel orientation in comparison to a competing to win orientation.

Biddle et al. (2003) conducted a multi-part study with over 300 children and youth-aged physical education students aiming to parse out relationships between beliefs of athletic ability, goal orientations, and other variables. Each student completed a series of questionnaires, including one that measured achievement goals (i.e., Task and Ego Orientation in Sport Questionnaire) and one that assessed mindset toward athletic ability (i.e., Conceptions of the Nature of Athletic Ability Questionnaire - 2; CNAAQ-2). Via structural equation modeling, Biddle et al. found that fixed and growth mindsets appear to orient adolescent athletes toward different achievement goals. More specifically, athletes that were more growth mindset oriented adopted task goals, whereas more fixed mindset athletes adopted ego goals. In addition, a growth mindset and task goals were found to be predictive of greater enjoyment of P.E. and sport as well.

In a similar study specific to college aged students, Wang and Koh (2006) evaluated the sport ability (i.e., athletic ability) of 219 Singaporean post-graduate preservice P.E. educator trainees in relation to achievement goals, among additional variables of interest. Most of the participants were former high school or university athletes and were required to complete a battery of questionnaires, including a measure of goal orientation (i.e., Perception of Success in Sport Questionnaire; POSQ) and the CNAAQ-2. Wang and Koh found that growth mindset orientations were positively related with task goals and fixed mindsets were positively correlated with ego goals.



These results suggest the relationships between achievement goals and athletic ability are held constant within a college setting, and among college aged students, as they are in research utilizing adolescent aged participants.

Lastly, Ommundsen (2001) aimed to investigate the relationships between students' mindset and achievement goals on self-handicapping in P.E. classes. Three-hundred forty-three adolescent aged students participated in the study and completed the POSQ, the perceived competence subscale of the Intrinsic Motivation Inventory, the Self-Handicapping Scale, and the CNAAQ-2. Ommundsen found that fixed mindsets and ego goals were positively related with increased self-handicapping behaviors, whereas growth mindset and task goals were related to a decrease in self-handicapping behaviors. More specifically, the fixed mindset students avoided seeking help and utilized behaviors that avoided demonstrating incompetence. On the contrary, growth mindset students viewed difficulties in P.E. as a chance to change the way they approached a problem or as an opportunity to seek help. Thus, when considering the relationships between mindset and achievement motivation, it appears that a fixed mindset is associated with the maladaptive behavior of self-handicapping, which is in stark contrast to the competitive athlete (e.g., strong work ethic, desire to master skills, enjoy challenge) as conceptualized by Gill and Deeter (1988).

In sum, the research that has explored the relationships between mindset, achievement goals, and competitiveness suggests that adopting a growth mindset may be more beneficial than a fixed mindset. Individuals who adopt more of a growth mindset tend to exhibit task goals and competing to excel orientations. Research also has shown that a growth mindset is associated with viewing challenges as an opportunity and greater

enjoyment of P.E. and sport. On the contrary, individuals who adopt a fixed mindset generally exhibit ego goals and competing to win orientations. In addition to these relationships, fixed mindset has been associated with avoiding seeking help and maladaptive self-handicapping behaviors.

### **Growth Mindset Interventions in Academic Settings**

Expanding upon Dweck's initial research on implicit theories of intelligence, researchers have conducted intervention studies with hopes of cultivating growth mindsets. Blackwell et al. (2007) conducted a study in which they taught a growth mindset to 99 low-achieving seventh graders with hopes they would demonstrate positive motivation in the classroom and yield higher grade achievements. The researchers outlined eight sessions for the intervention which included: (a) two lessons on the brain's anatomy and functioning, (b) two lessons on a growth mindset (a reading and an activity), (c) one lesson on anti-stereotyping, (d) one lesson on study skills, and (e) two discussion sessions about "learning makes you smarter" and "avoiding labels" (e.g., dumb, stupid). The results revealed that the experimental group demonstrated a significantly higher rating of growth mindset over the control group and endorsed a growth mindset more strongly post-intervention than pre-intervention.

Furthermore, Yeager et al. (2013) conducted a growth mindset intervention designed to teach adolescent students that personality (i.e., aggression) is not a fixed trait. Two-hundred forty-six ninth and tenth graders participated in the study and were randomly assigned to one of three groups: growth mindset intervention, coping skills intervention, or no intervention. Six growth mindset sessions were outlined by the researchers and included: (a) two lessons on neuroanatomy and malleability, (b) two

lessons on incremental theory of personality, and (c) two lessons reinforcing an incremental theory of personality. The researchers combined the two control groups (coping skills intervention and no intervention) due to there being no imperative group differences. The results revealed that participants in the growth mindset intervention demonstrated less of a fixed mindset towards personality and more of a growth mindset towards personality when compared to the control groups. From this, the researchers concluded that a growth mindset intervention was capable of countering fixed mindset beliefs of personality for more growth mindset beliefs.

Donohoe et al. (2012) piloted a study on an internet-based growth mindset intervention called *Brainology*® by *Mindset Works*®, a company co-founded by Dweck and colleagues, with hopes of increasing 33 Scottish secondary school students' growth mindsets, sense of mastery, and resiliency. Students were assigned either to the intervention group or the control group who received no intervention. The experimental group participated in the four-unit *Brainology*® program, which consisted of modules on brain basics, behaviors, building, and boosters. The researchers found a significant increase in secondary students' growth mindset from pre-test to post-test for the experimental group. This finding was further supported by a statistically significant increase in growth mindset from pre- intervention to post-intervention within the experimental group.

Following similar content and procedures of previous studies (e.g., Blackwell et al., 2007; Donohoe et al., 2012; Yeager et al., 2013), Paunesku et al. (2015) revised a growth mindset intervention to be implemented in one 45-minute online session with a sample of at-risk for dropping out high school students and non-at-risk high school

students. Within the session, participants read an article on the brain's neuroplasticity, summarized the findings of the article in their own words, and provided advice to a hypothetical student who believed they were not smart enough to do well in school. Paunesku et al. found that the brief online growth mindset intervention resulted in a more malleable view of intelligence in the high school students. Furthermore, they found that the students who participated in the experimental group yielded an overall increase of semester grade point averages (GPA) and increased the rate by which they demonstrated a satisfactory performance in their core courses following the growth mindset intervention.

Lastly, Aronson, Fried, and Good (2002) conducted a pen pal mindset intervention study with a sample of Stanford University undergraduate students in which they explored the relationship between views of intelligence and academic performance and engagement in academics. Participants consisted of seventy-nine Caucasian ( $n= 37$ ) and African American ( $n= 42$ ) students who were randomly assigned to one of six groups crossing race and treatment condition (malleable pen pal intervention, control pen pal intervention, non-pen pal condition). Those in the malleable pen pal condition watched a video on the brain's neuroplasticity and wrote a letter to a middle school student outlining that intelligence is malleable. The control pen pal condition watched a video of psychologists discussing that intelligence is composed of many varying abilities and wrote a letter to a middle school student that outlined intelligence as a multifaceted construct made up of strengths and weaknesses. Lastly, those in the non-pen pal condition did not participate in the intervention and served as a control to both intervention groups. The researchers found that participants in the malleable pen pal

condition demonstrated an increase in intelligence as a malleable trait (growth mindset) compared to the participants in the control pen pal condition and non-pen pal condition. Furthermore, there was no statistically significant difference between the control pen pal and non-pen pal conditions, suggesting the intervention was successful at altering beliefs of intelligence in the malleable pen pal condition. Researchers also found differences in enjoyment of the education process across groups. Namely, the African American students who participated in the malleable pen pal condition reported valuing academics more and a greater enjoyment of the educational process than the African American students in the other conditions. For the Caucasian students, there was also an increase in educational process enjoyment. However, those in the non-pen pal condition scored significantly higher than students in the pen-pal control group. There was no difference in the value of academics across the Caucasian students. With these findings in mind, Aronson et al. suggested the need to determine what additional factors separate each student group and how it impacts the effectiveness of a growth mindset intervention.

In sum, the research that has examined growth mindset interventions in academic settings has yielded support for the utilization of a growth mindset interventions. This has been demonstrated in samples of students ranging from school-aged students to college-aged students. Not only have the participants of the above studies demonstrated more of a growth mindset, they have reaped some of the subsequent benefits (e.g., increased semester GPA, greater enjoyment of the educational process). This research also has demonstrated varying intervention activities can be utilized and still have a beneficial effect on one's growth mindset.

## **Growth Mindset Interventions in Physical Education and Sport Settings**

As previously mentioned, there are a multitude of studies (e.g., Blackwell et al. 2007; Donohoe et al., 2012; Paunesku et al., 2015) that have shown the effectiveness of a growth mindset intervention in the academic realm. However, within P.E. and sport settings, this research has been limited and has explored the impact of mindset-based interventions on influencing cognitions of athletic ability.

To date, Spray et al. (2006) appears to be the only empirical research article exploring the impact of a mindset intervention on beliefs of athletic ability. Spray et al. manipulated 123 secondary students' mindsets and examined the relationship with failure on a golf putting task. The participants were randomly assigned to either the fixed mindset manipulation group, the growth mindset manipulation group, or a control group that received no manipulation of beliefs. Spray et al. found significant group differences on belief of golf ability. Specifically, students in the growth mindset group demonstrated higher levels of growth beliefs in comparison to the fixed mindset group, whereas the fixed mindset group demonstrated higher levels of fixed beliefs compared to both the growth mindset and control groups. The researchers also discovered a difference among the groups and the adoption of ego goals pre-failure feedback. Specifically, the fixed mindset group demonstrated a higher level of intention to outperform others (e.g., competing to win) when compared to the growth mindset group. However, all three groups exhibited high task goals for the golf putting task. Lastly, the researchers found a significant difference in achievement goal adoption related to post-failure feedback for all three groups. Particularly, the growth mindset group was more likely to adopt learning goals than the fixed mindset group, whereas the fixed mindset group was more likely to

adopt ego goals than the growth mindset group or the control group. Spray et al. concluded that growth mindsets and fixed mindsets about athletic ability can be experimentally induced and differentiated from one another and that the types of goals they adopt differ following failure.

### **Literature Review Summary**

While there has been a decent amount of research conducted on the effectiveness of growth mindset interventions within the field of education, there has been a limited amount of research on mindset interventions and attitudes toward athletic ability. Of the research available, researchers have gravitated towards influencing cognitions of athletic ability (e.g., Spray et al., 2006). Thus, it seems imperative to determine the effectiveness of a growth mindset intervention for athletic ability within a sample of collegiate athletes.

Lastly, there is a need for research that addresses the relationship of growth and fixed mindset with sport-specific competitiveness. From the literature available (e.g., Wang & Koh, 2006), researchers have found that individuals with a growth mindset are more likely to adopt task (i.e., learning) goals, and thus, be inclined towards competing to excel. On the other hand, individuals with a fixed mindset more are likely to demonstrate ego (i.e., performance) goals, and thus, be inclined to compete to win. Therefore, the primary purpose of the present study aimed to determine if a tailored lesson plan can foster a growth mindset towards athletic ability in a sample of female collegiate athletes. A secondary purpose of the present study was to determine if changes in growth mindset are related to changes in self-reported competitiveness in a sample of female collegiate athletes.

## **Hypotheses**

This study explored if growth mindset can be facilitated in collegiate athletes using a tailored mindset intervention. Furthermore, the experimenter was interested in whether the changes in growth mindset of the participants would influence changes in competitiveness. There were two main hypotheses:

- 1) It was hypothesized that participants undergoing a tailored growth mindset intervention will adopt more of a growth mindset, in comparison to a fixed mindset, regarding their athletic ability as measured by the CNAAQ-2.
- 2) It was further hypothesized that following the growth mindset intervention, participants will demonstrate an increase in goal orientation and a decrease in win orientation as measured by the SOQ.



## Method

### Participants

Participants included 27 NCAA Division III female student-athletes from a university located in the southeastern U.S. who self-selected to participate in the study. It is important to note that these athletes do not receive athletic scholarships, have limited practice schedules, and participate in sport for the love of competition (NCAA, n.d.). Overall, all track and field/cross-country athletes ( $M_{age} = 19.5$  years,  $SD = 1.15$  years) and 11 of the 13 softball athletes were included in this study ( $M_{age} = 20.1$  years,  $SD = 1.57$  years). On average the track and field/cross-country athletes participated in in track and field/cross-country for 1.06 years ( $SD = 2.04$  years), whereas the softball athletes had been participating for an average of 10.01 years ( $SD = 5.22$  years). Of the 27 participants, 15 % ( $n = 4$ ) identified as college freshman, 48% ( $n = 13$ ) as college sophomores, 7% ( $n = 2$ ) as college juniors and 30% ( $n = 8$ ) as college seniors. Furthermore, 52% percent ( $n = 14$ ) of the participants identified as Caucasian followed by 22% ( $n = 6$ ) African American, 15 % ( $n = 4$ ) Hispanic/Latino, and 11% multiracial ( $n = 3$ ). All participants were provided informed consent prior to participating in the study.

### Measures

**Demographic Information.** All participants completed a demographics questionnaire that assessed age, race/ethnicity, current year in school, sports team, position (if applicable), and number of years participating in their current sport.

**CNAAQ-2.** Implicit theories of athletic ability were measured using the Conceptions of the Nature of Athletic Ability Questionnaire-2 (CNAAQ-2; Biddle et al., 2003). This 12-item instrument measures both growth mindset orientation (i.e.,

incremental beliefs) and fixed mindset orientation (i.e., entity beliefs). Growth mindset orientation consists of two subscales: Learning (e.g., “To reach a high level of performance in sport, you must go through periods of learning and training”) and Improvement (e.g., “In sport, if you work hard at it, you will always get better”). Fixed mindset orientation consists of two subscales: Stable (e.g., “Even if you try, the level you reach in sport will change very little”) and Gift (e.g., “To be good at sport you need to be naturally gifted”). Responses are given on a five-point Likert Scale anchored from 1 (strongly disagree) to 5 (strongly agree). The CNAAQ-2 is considered to be a reliable measure as indicated by Cronbach’s alpha coefficients of  $\alpha = .80$  for overall growth mindset and  $\alpha = .70$  for overall fixed mindset (Biddle et al., 2003). The CNAAQ-2 has been used to examine implicit theories of ability in physical education trainees (Wang & Koh, 2006), college age students (Wang, Liu, Lochbaum, & Stevenson, 2009), junior college student-athletes (Chian & Wang, 2008), team sport athletes (Stenling, Hassmén, & Holmström, 2014), and high level amateur and semiprofessional soccer players (Gardner, Vella, & Magee, 2015).

**SOQ.** Competitiveness was assessed using the Sport Orientation Questionnaire (SOQ; Gill & Deeter, 1988). This 25-item scale measures sport specific achievement according to three factors: Competitiveness (e.g., “I look forward to competing”), Win Orientation (e.g., “The only time I am satisfied is when I win”), and Goal Orientation (e.g., “The best way to determine my ability is to set a goal and try to reach it”). Responses are given on a five-point Likert Scale anchored from 1 (strongly agree) to 5 (strongly disagree). For the purposes of the current study, only scores from the Win Orientation and Goal Orientation subscales were included in the analyses. The SOQ is

considered to be a reliable measure as indicated by Cronbach's alpha coefficients of  $\alpha = .94$  for the Competitiveness subscale,  $\alpha = .86$  for the Win Orientation subscale, and  $\alpha = .80$  for the Goal Orientation subscale (Gill & Deeter, 1988). The SOQ has been used to examine sport specific achievement in college students (Wright, O'Halloran, & Stukas, 2016), collegiate athletes (Chang, Najarian, Chang, Hill, & Lee, 2017; Jackson & Roberts, 1992), and intramural college athletes (Jones & Swain, 1992).

### **Growth Mindset Intervention**

The researcher designed a brief intervention tailored specifically to a college student-athlete population to foster a growth mindset toward athletic ability. The *Growth Mindset Lesson Plan*, available to download from the PERTS website (Khan Academy & PERTS, 2015) and intended to be used to teach growth mindset in middle school aged children, was modified and adapted for the purposes of this study. More recently, Gripshover et al. (2017) developed a similar growth mindset intervention for use within a community college student population. Within this lesson plan there are three main activities for educators to teach growth mindset in the classroom: Videos and Debrief, Personal Discussion, and Letter to a Future Student. For purposes of this study, the researcher utilized all three of these activities to create a revised growth mindset lesson plan for a college student-athlete population (see Appendix D for the tailored activities). The manner in which the intervention was implemented is outlined below under procedures.

### **Procedure**

Before commencing data collection, this research was reviewed and approved by the James Madison University Institutional Review Board. Participants of this study were

recruited from a local NCAA Division III university. The athletic director was approached to discuss the intentions of the researcher and was provided basic information about how the intervention would be conducted. The athletic director then disseminated the researcher's contact information and a brief intervention description through email to the track and field/cross-country and softball coaches and athletes. Once recruited, the researcher coordinated a mutual ninety-minute meeting time with the coaches to implement the intervention with the athletes.

One week prior to the set intervention meeting, all participants provided informed consent via a Qualtrics online survey that provided a brief explanation on what they could expect throughout the duration of the study. The Qualtrics online survey also contained the initial measure of the CNAAQ-2, SOQ, and Demographic Information questionnaire. Furthermore, participants were informed of the option to decline participation at any time.

One week following, a 90-minute intervention session was conducted with the athletes. Participants viewed two short videos titled "Growing your Mind" and "Neuroplasticity" (*Growing your mind*, video file; *Neuroplasticity*, video file). They were then led through a discussion about how the content in the videos applied to athletic ability and how neuroplasticity works. Following the end of the discussion, participants listened to the experimenter discuss two experiences in which she overcame a struggle in athletic ability. Participants were given time to process what the experimenter discussed, ask questions about her experiences, and share personal experiences. Lastly, participants were guided through an exercise in which they wrote a letter to a future athlete. During this activity, the participants considered a time when they overcame a struggle in athletic

ability and wrote about that experience, how they felt during that time, how they overcame that experience, and what they learned. They also were instructed to provide any advice on how the hypothetical future athlete can overcome obstacles. Following the end of the intervention, all participants completed the CNAAQ-2 and SOQ a second time. Once all data were collected, the experimenter made participants aware of the purposes of the study. At that time participants were invited to contact the experimenter if they had any additional questions or concerns about the study. No further follow-ups were conducted.

## Results

The obtained data and proposed hypotheses were analyzed using SPSS Version 24 software. Descriptive statistics for the participants' score on growth mindset, fixed mindset, competitiveness, goal orientation, and win orientation reported separately by sport can be found below in Table 1. No hypotheses were posed for the competitiveness subscale of the SOQ but were exploratory in nature.

Table 1

*Means and (Standard Deviations) for Mindset and Competitiveness in a Sample of NCAA Division III Female Athletes*

	Track and Field/ Cross-Country ( <i>n</i> = 16)		Softball ( <i>n</i> = 11)	
	Pre	Post	Pre	Post
Growth Mindset	4.38 (.46)	4.68 (.30)	4.29 (.40)	4.30 (.42)
Fixed Mindset	2.11 (.54)	1.79 (.49)	2.15 (.69)	1.94 (.47)
Win Orientation	2.78 (.71)	2.77 (.76)	3.50 (.69)	3.59 (.68)
Goal Orientation	4.32 (.35)	4.38 (.44)	4.09 (.42)	4.18 (.26)

### Preliminary Analysis

To assess if the questionnaires utilized were internally consistent within the sample utilized for the present study, reliability was assessed (see Table 2 below). The results revealed that the internal consistency of the growth mindset and fixed mindset scales of the CNAAQ-2 ranged from poor to good across the sample of track and field/cross-country and softball athletes. Specific to the SOQ, the results revealed that the internal consistency of the competitiveness, win orientation, and goal orientation scales ranged from poor to excellent across the sample.

Table 2

*Cronbach's Alpha Coefficients for Measures of Mindset and Competitiveness in a Sample of NCAA Division III Female Athletes*

	Track and Field/ Cross-Country ( <i>n</i> = 16)		Softball ( <i>n</i> = 11)	
	Pre	Post	Pre	Post
Growth Mindset	.56	.64	.54	.83
Fixed Mindset	.64	.51	.85	.69
Competitiveness	.70	.60	.94	.92
Win Orientation	.81	.80	.87	.83
Goal Orientation	.67	.74	.67	.40

Furthermore, Pearson's correlations (see Table 3 below) revealed significant correlations between pre- and post-intervention scores on CNAAQ-2 and SOQ scores. Significant relationships were found for pre-intervention scores between fixed mindset and win orientation ( $r = .43$ ), fixed mindset and goal orientation ( $r = -.45$ ), and win orientation and competitiveness ( $r = .51$ ). These findings suggest that athletes with a fixed mindset tend to rate themselves as having more of a win orientation versus a goal orientation pre-intervention. Furthermore, it appears that athletes who tend to rate themselves having more of a win orientation also rate themselves having higher competitiveness pre-intervention. Significant relationships also were found for post-intervention scores between growth mindset and goal orientation ( $r = .74$ ), fixed mindset and win orientation ( $r = .56$ ), fixed mindset and goal orientation ( $r = -.56$ ), growth mindset and fixed mindset ( $r = -.55$ ), and win orientation and competitiveness ( $r = .43$ ). These findings suggest that athletes with a growth mindset tend to rate themselves as having more of a goal orientation versus win orientation and athletes with a fixed mindset tend to rate themselves as having more of a win orientation versus goal orientation post-

intervention. Lastly, it also appears that athletes who tend to rate themselves having more of a win orientation also rate themselves having higher competitiveness post-intervention.

Table 3

*Pre- and Post-intervention Correlations between Measures of Mindset and Competitiveness in a Sample of NCAA Division III Female Athletes*

Variable	1	2	3	4	5	6	7	8	9	10
1.Growth Mindset <sub>Pre</sub>	-									
2.Fixed Mindset <sub>Pre</sub>	-.15	-								
3.Competitiveness <sub>Pre</sub>	.15	-.08	-							
4.Win Orientation <sub>Pre</sub>	-.31	.43*	.51**	-						
5.Goal Orientation <sub>Pre</sub>	.36	-.45*	.27	-.28	-					
6.Growth Mindset <sub>Post</sub>	.15	.12	-.02	-.36	.19	-				
7.Fixed Mindset <sub>Post</sub>	-.03	-.11	-.14	.25	-.27	-.55**	-			
8.Competitiveness <sub>Post</sub>	-.19	.30	-.04	.21	-.29	-.02	.06	-		
9.Win Orientation <sub>Post</sub>	.01	-.12	.26	.31	-.01	-.33	.56**	.43*	-	
10.Goal Orientation <sub>Post</sub>	-.04	.08	-.09	-.33	.07	.74**	-.56*	.16	-.28	-

Note.  $n = 27$ ; \*  $p < .05$ , \*\*  $p < .01$

## Main Analyses

Five, 2 (sport) x 2 (time) repeated measures mixed-design analysis of variance (ANOVA) statistical tests were conducted to examine scores on the CNAAQ-2 (i.e., growth mindset and fixed mindset) and SOQ (i.e., competitiveness, win orientation and goal orientation) over the course of intervention for each sport.

**Growth and Fixed Mindset.** No significant sport by time interaction was observed for growth mindset,  $F(1, 25) = 1.78, p = .19$  partial  $\eta^2 = .07$ . There also was no main effect for time,  $F(1, 25) = 2.19, p = .15$ , partial  $\eta^2 = .08$ . However, a main effect for sport,  $F(1, 25) = 4.17, p = .05$ , partial  $\eta^2 = .14$ , was demonstrated. As displayed in Figure 1, this finding suggests there was a statistically significant difference in the scores of



growth mindset between the track and field/cross-country athletes and softball athletes, with the track and field/cross-country athletes demonstrating higher levels of growth mindset compared to the softball athletes.

Specific to fixed mindset, no significant sport by time interaction was observed,  $F(1, 25) = .12, p = .73, \text{partial } \eta^2 = .00$ . There also was no main effect for time,  $F(1, 25) = 2.80, p = .11, \text{partial } \eta^2 = .10$ , or sport,  $F(1, 25) = .42, p = .52, \text{partial } \eta^2 = .02$ . See Figure 2 for a graphic display of these results.

**Competitiveness, Win Orientation and Goal Orientation.** No significant sport by time interaction was observed for competitiveness,  $F(1, 25) = .01, p = .94, \text{partial } \eta^2 = .00$ . There also was no main effect for time,  $F(1, 25) = .05, p = .82, \text{partial } \eta^2 = .00$ . However, a main effect for sport,  $F(1, 25) = 10.82, p < .01, \text{partial } \eta^2 = .30$ , was demonstrated. As displayed in Figure 3, this finding suggests there was a statistically significant difference in the scores of competitiveness between the track and field/cross-country athletes and softball athletes, with the softball athletes demonstrating higher levels of competitiveness compared to the track and field/cross-country athletes.

Specific to win orientation, no significant sport by time interaction was observed for win orientation,  $F(1, 25) = .07, p = .79, \text{partial } \eta^2 = .00$ . There also was no main effect for time,  $F(1, 25) = .04, p = .83, \text{partial } \eta^2 = .00$ . However, a main effect for sport,  $F(1, 25) = 13.56, p < .01, \text{partial } \eta^2 = .35$ , was demonstrated. As displayed in Figure 4, this finding suggests there was a statistically significant difference in the scores of win orientation between the track and field/cross-country athletes and softball athletes, with the softball athletes demonstrating higher levels of win orientation compared to the track and field/cross-country athletes.

Specific to goal orientation, no significant sport by time interaction was observed,  $F(1, 25) = .04, p = .85, \text{partial } \eta^2 = .00$ . There also was no main effect for time,  $F(1, 25) = .47, p = .50, \text{partial } \eta^2 = .02$ . However, a main effect for sport,  $F(1, 25) = 4.16, p = .05, \text{partial } \eta^2 = .14$ , was demonstrated. As displayed in Figure 5, this finding suggests there was a statistically significant difference in the scores of goal orientation between the track and field/cross-country athletes and softball athletes, with the track and field/cross-country athletes demonstrating higher levels of goal orientation compared to the softball athletes.

## Discussion

This research examined the effect of a tailored growth mindset intervention on athletes' mindset towards athletic ability, win orientation, and goal orientation. More specifically, female collegiate track and field/cross-country and softball athletes participated in a 90-minute growth mindset intervention session consisting of watching videos and engaging in a debrief, listening to a personal discussion, and writing a letter to a hypothetical future athlete and were assessed for pre- and post-intervention changes.

**Relationships between Mindset and Competitiveness.** No explicit research hypotheses were made for reliability scores given the small sample size, nor were there research hypotheses for pre- and post-intervention correlations between growth mindset and fixed mindset scores in relation to win orientation and goal orientation scores. However, consistent with past research (Biddle et al., 2003; Gill & Deeter, 1988) higher internal consistency values were found for the subscales of the CNAAQ-2 and SOQ. In addition, a relationship presented in the current data that is consistent with previous research (e.g., Biddle et al., 2003; Wang & Koh, 2006). Namely, a significantly negative relationship was demonstrated between post-intervention growth mindset and fixed mindset scores. This finding was to be expected given growth mindset and fixed mindset are conflicting constructs that should not be positively related.

However, new correlational results were found between competitiveness and mindset that previously had not been demonstrated in the literature. Specifically, a positive relationship was found between pre-intervention win orientation and fixed mindset scores, in addition to pre-intervention win orientation and competitiveness scores and post-intervention win orientation and competitiveness scores. Negative relationships

also were discovered between both pre- and post-intervention goal orientation and fixed mindset scores. Positive relationships were revealed for post-intervention scores between goal orientation and growth mindset and between win orientation and fixed mindset. These relationships appear to align with Dweck's (1999) findings that found support for growth mindset individuals possessing task goals (i.e., striving for personal excellence and improvement upon their abilities) and fixed mindset individuals possessing ego goals (i.e., tending to aim for superior performances over others and seeking opportunities that will allow them to "look good" on a task). Although Dweck does not refer to striving for personal excellence as goal orientation or aiming for superior performances over others as win orientation, Gill and Deeter's (1988) conceptualizations of goal orientation and win orientation seem to parallel Dweck's descriptions of task and ego goals respectively.

Overall, based on the obtained  $r$  values of the correlations (see Table 3) between pre-intervention scores and post-intervention scores, several small to large effect sizes are demonstrated according to Cohen's (1988) effect sizes. Given the smaller sample size of this research, some of these effect sizes may be indicative of future statistically significant relationships between variables for this research.

**Growth and Fixed Mindset.** It was predicted that athletes participating in a tailored growth mindset intervention would adopt more of a growth mindset in comparison to a fixed mindset regarding athletic ability. This hypothesis was not supported by the findings of this study. More specifically, results revealed that while the track and field/cross-country and softball athletes demonstrated higher levels of growth mindset and lower levels of fixed mindset from pre-intervention to post-intervention, these changes were not statistically different. This finding may be partially due to the

higher levels of growth mindset seen in the participants pre-intervention (see Table 1). A case can be made that the athletes in this study were predisposed to higher levels of growth mindset prior to the start of this intervention. Spray et al. (2006) reported a similar observation in his sample of secondary students. To address this, it may be of value to screen future athletes for low growth mindset and/or high fixed mindset scores to determine if a growth mindset intervention demonstrates more utility for a sample of athletes who hold more fixed mindset or less growth mindset beliefs. This strategy is similar to the approach Wang and Biddle (2001) utilized in their research in which they had motivational groups of high growth mindset and fixed mindset students, and low growth mindset and fixed mindset students.

Of particular interest, moderate to large effect sizes for growth mindset and fixed mindset provide emerging evidence that time and sport contribute to the observed differences between groups. For growth mindset, the interaction term (partial  $\eta^2 = .07$ ) and main effects of time (partial  $\eta^2 = .08$ ) and sport (partial  $\eta^2 = .14$ ) were representative of medium and large effect sizes as deemed by Cohen (1988). Stated in a different way, the interaction between sport and time (pre- and post-intervention) explains 7% of the variance in growth mindset score. The within-subjects main effect of time explains 8% of the variance in growth mindset score, whereas the between subjects effect of sport explains 14% of the variance in growth mindset scores. Specific to fixed mindset, a medium effect size was demonstrated for the main effect for time with 10% of the variability in fixed mindset scores being explained by this within-subjects term. Given these effect sizes and sample size, it may be plausible that future research utilizing a

growth mindset intervention in larger sample of athletes and/or a control group may achieve statistical significance.

**Competitiveness, Win Orientation and Goal Orientation.** No explicit hypothesis was posited for competitiveness; thus, the findings were exploratory in nature. The results revealed no significant differences between sports after the growth mindset intervention on competitiveness as measured by the SOQ. Overall, the results demonstrated competitiveness remained the same for both the track and field/cross-country athletes and the softball athletes. Furthermore, it was hypothesized that athletes participating in a tailored growth mindset intervention would demonstrate an increase in goal orientation and a decrease in win orientation post-intervention as measured by the SOQ. This hypothesis also was not supported by the findings of this study. The results demonstrated mixed findings for the track and field/cross-country and softball athletes. Post-intervention, the track and field/ cross-country athletes exhibited a decrease in win orientation, whereas the softball athletes demonstrated an increase in win orientation. However, both sets of athletes demonstrated higher scores of goal orientation post-intervention. Yet, none of these differences reached statistical significance. Given this study assessed measures of competitiveness versus achievement goals in relation to a growth mindset intervention, direct parallels cannot be drawn with previous literature addressing mindset and achievement goals (i.e., Wang & Koh, 2006). However, Ryska (2001) found that athletes who competed to excel and were more task goal oriented demonstrated higher levels of athletic ability, whereas athletes who competed to win and demonstrated ego goals scored lower on levels of physical ability. Contrary to Ryska's study, this research utilized the SOQ, which is a measure that assesses competitive

orientations (i.e., dispositional attributions) towards individual/personal standards and standards of interpersonal competitiveness (Gill & Deeter, 1988). Yet, the scales utilized by Ryska (2001) are measures of situation-specific attitudes (i.e., competitive sport settings). Subsequently, it may be the case that greater changes in competitiveness may be seen when measuring it as a situation-specific attitude versus a dispositional attribution. Based on this, similar findings between mindset and competitiveness may have not emerged in this study given the assessment tool(s) for competitiveness were not measuring competitiveness in the same manner.

Moderate to large effect sizes also were observed in portions of the analyses for competitiveness, win orientation and goal orientation. Specific to competitiveness, a large effect size was demonstrated for sport. Thirty percent of the variability in competitiveness scores could be explained by sport. For win orientation, a large effect size was also demonstrated for sport. Thirty-five percent of the variability in win orientation scores could be explained by sport. Furthermore, sport explained 14% of the variability in goal orientation scores, indicative of a large effect size. As previously mentioned, these effect sizes may be evident of statistical significance in future growth mindset intervention studies given they represent the magnitude of difference between a set of groups (Sullivan & Feinn, 2012). However, further research examining the effectiveness of a growth mindset intervention in collegiate athletes is necessary to determine if these effect sizes can be replicated and if the mindset intervention will yield statistically significant differences between groups of athletes.

### **Limitations and Future Directions**

It should be noted that the teams that participated in this intervention had previous interactions with the researcher through her practicum placement. Given the growth mindset intervention took place face-to-face with the athletes and included an activity in which the researcher discussed a personal athletic experience of struggling with athletic ability, it is possible that a Hawthorne effect occurred. This effect addresses the phenomenon in which a participant tends to modify their behavior to satisfy the observer (Hawthorne effect, n.d.). While there was no evidence of this effect taking place, future researchers may consider the relationship(s) shared with participants and the influence personal experiences from a familiar source have on the outcomes of intervention. In addition, the researcher also conducted two-part growth mindset workshop with all coaches of the respective university. Information was provided to these coaches on how growth mindset could be beneficial to their athletes in addition to behaviors they could engage in that would aid in fostering growth mindset among their teams. Given the coaches of both teams attended these workshops, it is possible the athletes received indirect growth mindset exposure through topics discussed in these workshops (e.g., autonomous motivation, autonomy supportive coaching).

Furthermore, this study was a quasi-experiment. Given the scheduling conflicts between the participants and researcher the desired control group (i.e., wait-list control group) was not utilized, which would have allowed for participant randomization. This is contrary to what is seen in most empirical research in this topic area (e.g., Aronson et al., 2002; Yeager et al., 2013). Given participants were not randomly assigned, they all attended the one intervention session and analysis was performed across athletic team.



Due to these limitations, it was not possible to determine whether the group differences seen on growth mindset and the competitiveness subscales were due solely to the proposed intervention. To adjust for this, future research should consider utilizing a control group who either does not receive the growth mindset intervention, a group who receives a different intervention, and/or a wait-list control group that receives the intervention at a later time as demonstrated in previous research (e.g., Hides, Stanton, Mendis, Gildea, & Sexton, 2012; McLaren, Eys, & Murray, 2015; Smith & Petrie, 2008).

In addition, all participants were female collegiate athletes from a single southeastern NCAA Division III school. As seen in the mindset literature in P.E. and athletics (e.g., Chen et al., 2008; Potgieter & Steyn, 2010; Wang et al., 2009), co-educational samples of undergraduate college students have been represented in this research. When considering a growth mindset intervention in collegiate athletes, it is imperative to obtain a sample that includes male athletes, and athletes from other NCAA divisions, as well. By doing so, the sample becomes more representative of the population of collegiate athletes and provides additional information about the utility of a growth mindset intervention across gender and NCAA divisions.

It also is imperative to note participation differences between the track and field/cross-country athletes and softball athletes. On average the track and field/cross-country athletes had been participating in in track and field/cross-country for 1.06 years ( $SD = 2.04$  years), whereas the softball athletes had been participating for an average of 10.01 years ( $SD = 5.22$  years). Given this, years of participation in sport may have been a covariate within the conducted and reported analyses. Specific to the track and field/cross-country athletes, participating in this sport for the first time may be indicative

of seeking opportunities to acquire different skills and/or improve on their abilities (i.e., task goal orientation) that is related to a growth mindset (Dweck, 1999; Dweck, 2007; Nicholls, 1989; Wang & Koh, 2006). Though the softball team demonstrated changes in mindset and competitive orientation post-intervention, years of participation may have impacted the extent to which the intervention had an effect on these variables. As previously mentioned, competitiveness was assessed as a dispositional attribution, that does not change from situation to situation, by the SOQ (Gill & Deeter, 1989). For these athletes, years of participating in softball may have reinforced one competitive orientation over another, and possibly one mindset over another.

Specific to future research, utilization of a performance measure should be considered. By doing this, it will become possible to determine if the growth mindset intervention was effective over time in affecting meaningful outcomes. For example, Paunesku et al. (2015) examined students' course completion rates in core classes and determined the growth mindset intervention had a lasting effect over the school year. Given that differences were found between sports in the current study, this performance outcome may be different across group(s) and will necessitate a specific, yet measurable outcome that is comparable across sports.

Reflecting on the growth mindset intervention utilized in this research, and the fact there is no one set of activities that have been utilized in other growth mindset interventions (i.e., Aronson et al., 2002; Donohoe et al. 2012; Gripshover et al., 2017), it appears that the activities presented here were appropriate to use within this sample. It is important to note that within an athletic setting it may be beneficial to frame how the initial videos and discussion questions apply to sport settings. From the present

experience, it appears athletes did not fully grasp the concept of growth and fixed mindset within the sports setting and/or make connections between neuroplasticity and molding the brain until the researcher began discussing her personal experiences in soccer and competitive cheerleading.

In addition, researchers should consider collecting the letters that the participants wrote to a future athlete. By doing this, the researcher can determine if the growth mindset intervention had an effect on the athletes' mindset (i.e., manipulation check), obtain more information about the way the participants interpret the information presented in the intervention, and mine for themes of growth mindset and fixed mindset. This information may better explain the obtained quantitative results and/or provide additional data that the quantitative data did not disclose.

## Conclusion

In sum, past research has primarily focused on growth mindset interventions within non-athletic populations (e.g., Paunesku et al., 2015). Of the literature available within an athletic setting (i.e., Spray et al., 2006), researchers influenced cognitions of athletic ability versus implementing an intervention targeted at changing one's outlook on athletic ability (e.g., growth mindset towards athletic ability). With the primary goal of the current study being the utilization of a growth mindset intervention in a sample of female collegiate athletes towards athletic ability, this research study appears to be the first to analyze the effectiveness of a growth mindset intervention within an athletic setting. It will be of interest if future research in this area utilizes a control group. By doing this, researchers will be able to determine if a growth mindset intervention is capable of fostering a growth mindset towards athletic ability and can yield results that will better shape subsequent intervention approaches.

The secondary goal of this research was to determine the effect that a growth mindset intervention would have on athletes' win and goal orientations. Again, no statistically significant findings were found within this sample. Dweck (1999) posited individuals possessing a growth mindset and task goals tend to strive for personal excellence and improve upon their abilities. Furthermore, she postulated that fixed mindset individuals holding ego goals tend to aim for superior performances over others and seek opportunities that allow them to "look good" on a task. While these traits are similar to Gill and Deeter's (1988) conceptualizations of goal orientation and win orientation, more research is necessary examine the relationship(s) between mindset and competitive orientation.

Though statistical significance was not found for the proposed hypotheses, practical significance was observed within the obtained effect sizes. These results provide insight into how a growth mindset intervention may be expressed within a sample of collegiate athletes and the relationship it has with competitive orientations across sport and time. Overall, this study appears to be the first of its kind to assess the utility of a growth mindset intervention in an athletic setting. With further refinement of the methods and procedures, promising results may be achieved yielding better practical implications for researchers, coaches, and other athletic staff.

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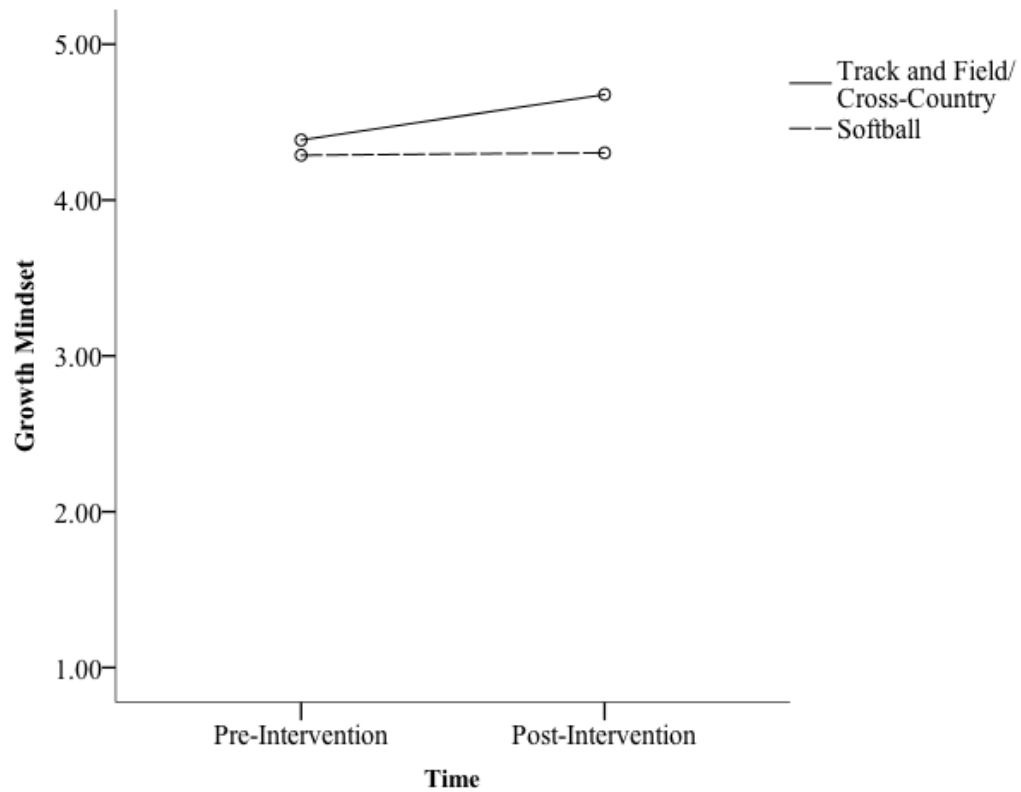


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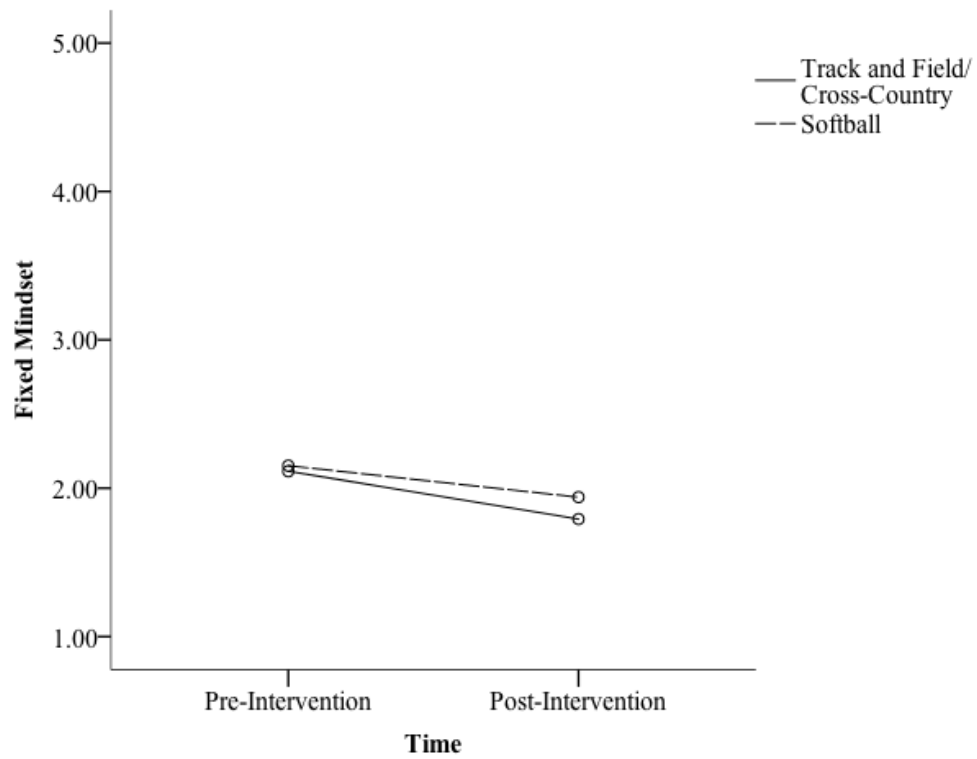
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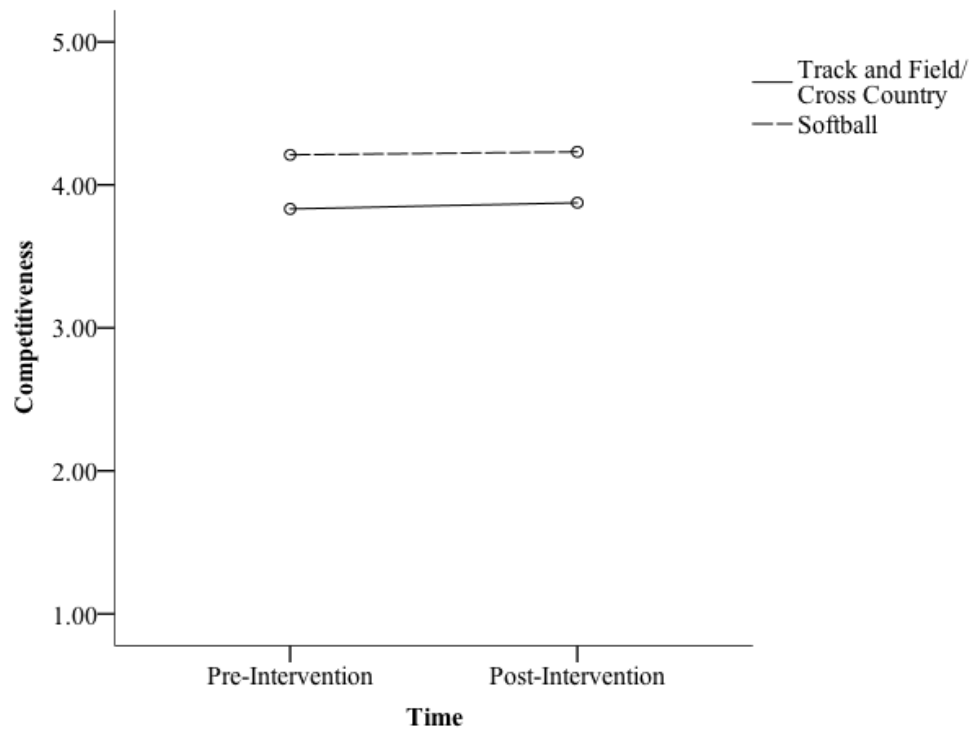
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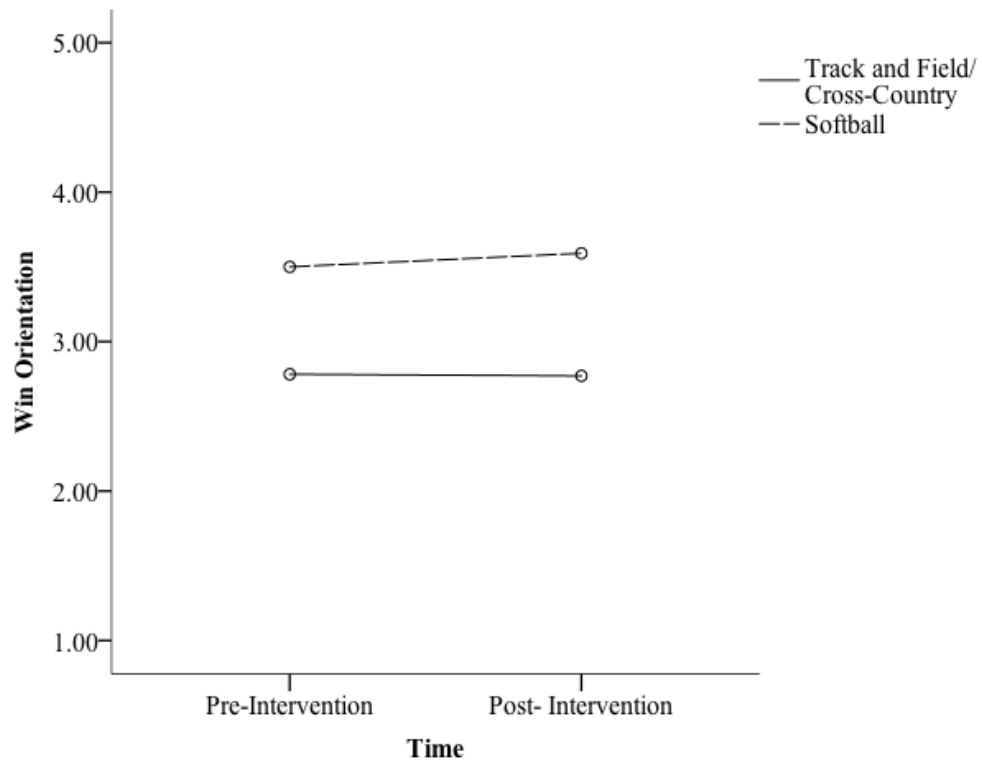
*Figure 1.* Mean differences in growth mindset scores pre- and post-intervention for female collegiate track and field/cross-country ( $n = 16$ ) and softball ( $n = 11$ ) athletes.



*Figure 2.* Mean differences in fixed mindset scores pre- and post-intervention for female collegiate track and field/cross-country ( $n = 16$ ) and softball ( $n = 11$ ) athletes.

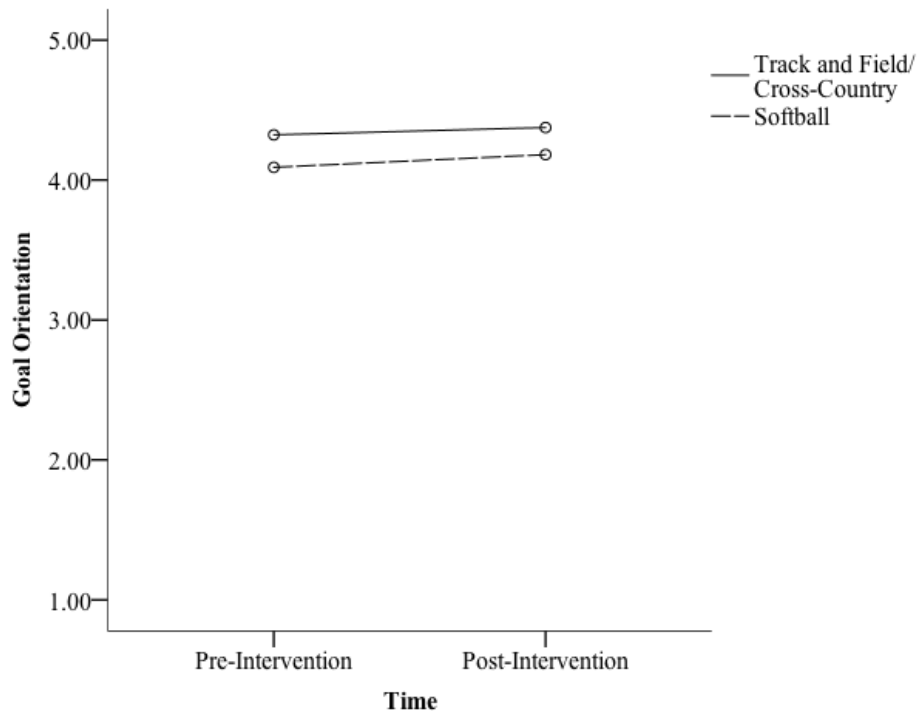


*Figure 3.* Mean differences in competitiveness pre- and post-intervention for female collegiate track and field/cross-country ( $n = 16$ ) and softball ( $n = 11$ ) athletes.



*Figure 4.* Mean differences in win orientation scores pre- and post-intervention for female collegiate track and field/cross-country ( $n = 16$ ) and softball ( $n = 11$ ) athletes.





*Figure 5.* Mean differences in goal orientation scores pre- and post-intervention for female collegiate track and field/cross-country ( $n = 16$ ) and softball ( $n = 11$ ) athletes.

## Appendix A

## Demographic Information Questionnaire

*Directions:* Please complete the following information to the best of your ability.

What is your age? \_\_\_\_\_

What is your race? (Mark all that apply)

Black or African American

Caucasian

Hispanic or Latino

Native American or American Indian

Asian/ Pacific Islander

Other: \_\_\_\_\_

What is your current year in school? (Mark one response)

Freshman

Sophomore

Junior

Senior

What sport team do you primarily participate in? \_\_\_\_\_

How many years have you participated in this sport? \_\_\_\_\_

If applicable, what position do you primarily play? \_\_\_\_\_

## Appendix B

## Conceptions of the Nature of Athletic Ability Questionnaire-2

*Directions:* the following statements describe beliefs regarding athletic ability. We want to know how you feel about athletic ability. Read each statement and circle the number that indicates how much you agree or disagree with each statement on the scale. There are no right or wrong answers; simply answer as you honestly feel. Do not spend too much time on any one statement. Remember, choose the letter which describes how you feel about athletic ability.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. You have a certain level of ability in sport and you cannot really do much to change that level.	1	2	3	4	5
2. To be successful in sport you need to learn techniques and skills, and practice them regularly.	1	2	3	4	5
3. Even if you try, the level you reach in sport will change very little.	1	2	3	4	5
4. You need to have certain "gifts" to be good at sport.	1	2	3	4	5
5. You need to learn and to work hard to be good at sport.	1	2	3	4	5
6. In sport, if you work hard at it, you will <i>always</i> get better.	1	2	3	4	5
7. To be good at sport, you need to be born with the basic qualities that allow you success.	1	2	3	4	5
8. To reach a high level of performance in sport, you must go through periods of learning and training.	1	2	3	4	5
9. How good you are at sport will <i>always</i> improve if you work at it.	1	2	3	4	5
10. It is difficult to change how good you are at sport.	1	2	3	4	5
11. To be good at sport you need to be naturally gifted.	1	2	3	4	5
12. If you put enough effort into it, you will <i>always</i> get better at sport.	1	2	3	4	5

## Appendix C

## Sport Orientation Questionnaire

*Directions:* the following statements describe reactions to sports situation. We want to know how you usually feel about sports and competition. Read each statement and circle the number that indicates how much you agree or disagree with each statement on the scale. There are no right or wrong answers; simply answer as you honestly feel. Do not spend too much time on any one statement. Remember, choose the letter which describes how you usually feel about sports and competition.

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I am a determined competitor.	1	2	3	4	5
2. Winning is important.	1	2	3	4	5
3. I am a competitive person.	1	2	3	4	5
4. I set goals for myself when I compete.	1	2	3	4	5
5. I try my hardest to win.	1	2	3	4	5
6. Scoring more points than my opponent is very important to me.	1	2	3	4	5
7. I look forward to competing.	1	2	3	4	5
8. I am most competitive when I try to achieve personal goals.	1	2	3	4	5
9. I enjoy competing against others.	1	2	3	4	5
10. I hate to lose.	1	2	3	4	5
11. I thrive on competition.	1	2	3	4	5
12. I try hardest when I have a specific goal.	1	2	3	4	5
13. My goal is to be the best athlete possible.	1	2	3	4	5

<b>Statement</b>	<b>Strongly Disagree</b>	<b>Disagree</b>	<b>Neutral</b>	<b>Agree</b>	<b>Strongly Agree</b>
<b>14.</b> The only time I am satisfied is when I win.	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>15.</b> I want to be successful in sports.	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>16.</b> Performing to the best of my ability is very important to me.	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>17.</b> I work hard to be successful in sports.	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>18.</b> Losing upsets me.	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>19.</b> The best test of my ability is competing against others.	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>20.</b> Reaching personal performance goals is very important to me.	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>21.</b> I look forward to the opportunity to test my skills in competition.	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>22.</b> I have the most fun when I win.	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>23.</b> I perform my best when I am competing against an opponent.	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>24.</b> The best way to determine my ability is to set a goal and try to reach it.	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>25.</b> I want to be the best every time I compete.	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>

## Appendix D

### Tailored Growth Mindset Intervention Activities

#### Activity One: Video and Discussion

“Growing your mind” by *Khan Academy*®

- How do people become better in their athletic ability?
- How does the diagram of the neurons “At birth vs. At age 6” demonstrate this?
- What about the second diagram of the nerves of the animal living in a cage vs. an animal living with other animals and toys?
- How are our brains like muscles?
- When do our brains grow the most?

“Neuroplasticity” by *Sentis*®

- What is neuroplasticity?
- How does neuroplasticity work?
- How can you “rewire” your brain?

#### Activity Two: Experimenter Personal Discussion

Discuss a time when you, as the experimenter, overcame a struggle in the sports setting and learned to solve a problem.

#### Activity Three: Letter to a Future Athlete

Ask the athletes to write about how they overcame a struggle in their sport. Tell them to write a letter to this future student to tell them about their struggle, what they learned from it, and any advice they could give for the student.