Mindset, Motivation and Metaphor in School and Sport:

Bifurcated Beliefs and Behavior in Two Different Achievement Domains

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Abstract

The belief that a trait can be cultivated with effort, known as an *incremental theory* or *growth mindset*, promotes behavior that leads to higher levels of achievement, such as the enthusiastic embrace of challenges and resilience to obstacles. Roughly 40% of the general student population in the United States, however, conceptualizes intelligence as an innate and immutable trait, a belief that tends to inhibit motivation and learning. To better inculcate an incremental theory of intelligence, educators and psychologists should identity traits that a majority of students believe are malleable, and investigate the dynamics that facilitate optimism about their developmental potential. In service to this end, the present study illuminates a bifurcation of both belief and behavior related to student engagement in the domains of school and sport. A survey of 251 middle school students confirmed two hypotheses: individuals are significantly more likely (a) to have a growth mindset of athletic ability compared to intelligence, and (b) to exhibit mastery-oriented responses in athletic versus academic environments. The organizational infrastructure of athletic programs, which institutionalizes practice, emphasizes effort, and values the coach as a developmental expert, is thought to powerfully cultivate the idea of athletic ability as a malleable trait—and offers clues about how to design educational interventions that increase the number of students who believe intelligence is something they can improve with effort.

Keywords: self-theories, implicit beliefs, motivation, mindset, intelligence, school, sport, goal orientation

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Individuals tend to understand the potential and limitations of their abilities through one of two frameworks: particular traits and characteristics are either innate and immutable, or learned and changeable (Dweck, 1986, 1999; Nicholls, 1984). The first framework is rooted in an *entity theory* of ability. Individuals who endorse this idea believe traits and characteristics are hardwired, intractable, and predetermined, perhaps etched in our genetic code. As such, entity theorists judge any effort to manipulate a static trait as inherently ineffectual. For them, you either have 'it,' or not. Individuals with this *fixed mindset* are contrasted with those who have a *growth mindset*, or *incremental theory* of ability (*cf*., Dweck, 2006). Incremental theorists believe traits and attributes are developed with guidance and effort, and that the malleable nature of ability means it is something that can always be improved (Bandura & Dweck, 1985; Dweck, Chiu, & Hong, 1995; Dweck & Leggett, 1988; Dweck & Molden, 2005).

Most research in the self-theory literature has focused on student conceptions about the nature of intelligence. Psychologists have found that roughly 40% of the general student population exhibits an entity theory of intelligence, roughly 40% have an incremental theory, and around 20% have ambiguous or mixed mindsets of intelligence (Dweck, 2008). These mindsets provide more than a heuristic to understand whether individuals think intelligence is a static or malleable trait. They also have vast and dramatic consequences on one's motivation and achievement in school. In a powerful summary of more than 20 years of Dweck's research, Krakovsky (2007) highlights the "effort effect" that results from our implicit beliefs of

intelligence. A "fixed mindset leads to a desire to look smart." Individuals who think "intelligence is static" tend to:

> Avoid challenges, give up easily, see effort as fruitless or worse, ignore useful negative feedback, and feel threatened by the success of others. As a result, they may plateau early and achieve less than their fill potential. All this confirms a deterministic view of the world.

In contrast, a "growth mindset leads to a desire to learn." Individuals who think "intelligence can be developed" tend to:

> Embrace challenges, persist in the face of obstacle, see effort as the path to mastery, and find lessons and inspiration in the success of others. As a result, they reach ever-higher levels of achievement. All this gives them a greater sense of free will (Krakovsky, 2007).

It is important to note that self-theories are a domain-specific versus global construct (Dweck, 1999, 2006). This is to say, people often endorse the idea that certain personality traits and social attributes are malleable and others are more stable, if not entirely fixed. Some students, for example, can be fatalistic about the developmental potential of their abilities in math ("I'm just no good with numbers"), while incredibly optimistic about the developmental potential of their foreign language skills ("You just have to immerse yourself and study hard"). Other students might think that leadership is an innate and immutable characteristic, while negotiation skills are something anyone can learn. The present study, in fact, was inspired by a student named James who exhibited radically different ideas about his potential to improve in

two different achievement domains, school and sport, and an experiment we designed that used sports metaphors to change his mindset about school.

An Academic Playing Field

I used to organize various extracurricular activities in James' neighborhood and managed a sports program he regularly attended. In his junior year of high school, however, his low grade point average threatened his eligibility status as a participant. In an attempt to change his academic trajectory, I asked James to explain his struggles in school. "I'm just not smart," he said. "Never have been, never will be." Pushed to elaborate, he shared a story from when he was in middle school. Somewhere in the 7th or 8th grades, he and all of his classmates took a test that was used by administrators to identify and track students based on their academic potential. The next semester, James was placed in a series of remedial courses, or as he understood it, "Classes for dumb kids." And ever since, he thought of himself as a dumb kid—a cruel fate that was useless to try and change. He said his teachers expressed pleasant surprise if he simply showed-up for school, and he was aware that the guidance counselor would consider it a minor miracle if he even graduated from high school. As such, he saw no reason to pretend it was possible to attend college, and he rarely did any homework. In many ways, James exhibited textbook tendencies of someone with an entity theory of intelligence.

I also knew James had an incremental theory of athletic ability. When he first entered high school, he aspired to make the junior varsity basketball team, but he was in the midst of puberty and clumsy with body. Throughout the week of tryouts, he awkwardly flailed his skinny arms on defense and regularly tripped over his still-growing feet when he lumbered through drills. He was also unfamiliar with some of the terms used by the coaching staff and lacked

certain fundamental skills, since he never played organized basketball in any type of instructional league. When the final roster was posted, an assistant coach pulled James aside and suggested he explore a different extracurricular activity, such as theater or speech and debate. For some reason, though, this failed to deter James; rather, it seemed to motivate him. Over the next few years, he started to lift weights, ran with the cross-country team to improve his cardiovascular base, and sought-out pick-up basketball games with stronger and faster peers. While he never made the school's team, he still believed it was possible to play at the professional level.

I asked James to help make sense of his curious responses to two different institutional judgments on his ability. In school, authority figures clearly communicated the idea that James was not smart, and he soon adopted a fixed mindset of intelligence and resigned himself to academic mediocrity. In sport, however, an authority figure said James lacked athletic talent. His growth mindset of athletic ability, however, allowed him to commit to a rigorous training program designed to mold him into a better athlete. A more dramatic contrast in attitude and action cannot be exhibited, and might be comical if it did not have such serious academic consequences.

James noted that Michael Jordan was cut from his high school team and eventually became the greatest basketball player of all-time. But it was not just the salient story of Jordan's biography that infused James with the belief he could improve as a basketball player. Athletic ability itself was something inherently malleable. "Everyone gets better when they try hard in sports," he said. "That's why you practice." So, I asked him, why not think of schoolwork as practice? If that is what helped him to improve in sport, maybe it would help him to improve in school.

Over the next few weeks, James and I worked together to re-imagine the classroom as an academic playing field. He was required to attend special math tutoring sessions, which we began to call 'algebra practice.' I suggested he think of his teachers not as traditional educators, but as academic coaches. He even began to call his science teacher, Mr. Conway, 'Coach Conway.' James worked hard to interact with his classmates as he would teammates on the basketball court, i.e., as a unit with a shared goal to win. And in order to win in school, he first had to engage in lots of 'academic scrimmages,' which were previously known as tests. This was not an easy exercise, but James came to approach school as he approached sports. He even started to think of his brain as a muscle that gets stronger the more it is exercised—a classic growth mindset analogy. Eventually, his grades improved, he regained academic eligibility, and he rejoined the after-school program he so much enjoyed.

Research Agenda

Throughout this experiment with James, I wondered if other students tend to think about their intellectual and athletic abilities in a similar way—the former as relatively fixed, and the latter as relatively malleable. If so, then educators and psychologists should investigate the dynamics that inhibit and promote such self-theories. This might allow us to design better academic interventions that increase mastery-oriented behavior in school and incremental theories of intelligence, such as the application of explicit sport analogies like those employed with James.

The present study investigates these ideas. First, a review about how to measure self-theories is presented, along with a further discussion about the implications of implicit beliefs in achievement domains. Second, two hypotheses are tested: (a) students are more likely to exhibit

incremental self-theories of athletic ability compared to intelligence, and (b) students are more likely to exhibit mastery-oriented behavior in sport compared to school. Third, reflections about the results of the study are offered, and areas for future research are suggested. As a reminder of what is at stakes with our work in this field, Dweck notes, "There is no more damaging view for students than the belief that effort is unnecessary (if you're smart) and ineffective (if you're not)" (Dweck in Aronson, 2004, p. 300).

The Measurement of Mindset

Implicit beliefs of intelligence. The most widely used instrument to study perceptions about the developmental potential of intelligence is the Implicit Theories of Intelligence Scale, developed by Dweck (Dweck, Chiu, & Hong, 1995; Dweck & Henderson, 1989; Hong, Chiu, Dweck, Lin, & Wan, 1999; Levy & Dweck, 1997). A six-item version of this scale is composed of three affirmative statements about the immutable nature of intelligence (e.g., *You have a certain amount of intelligence, and you can't really do much to change it*) intermixed with three affirmative statements about the malleable nature of intelligence (e.g., *No matter who you are, you can change your intelligence a lot*). Individuals reference a six-level Likert scale (*strongly agree* to *strongly disagree*) to note the degree of their (dis)agreement to each of the statements.

As observed by Abd-El-Fattah and Yates (2006), however, "most studies" (p. 399) of implicit beliefs use a modified version of Dweck's scale with only the three entity-endorsing statements. They delineate two specific reasons for this: (a) the social desirability to agree with ideas of efforts-based development results in "a strong tendency for people to endorse items depicting an incremental theory of intelligence" and (b) six continuous questions that inquire about the same construct may be "somewhat tedious to the respondents" (p. 399). In a collection

of research essays about the power of self-theories to influence motivation and development, Dweck (1999) notes that "the entity-only [version of the] scale is preferable" in many circumstances (p. 176). It eliminates the possibility for people to agree with statements about which they *want* to believe, and is thus a more accurate measurement of what people *actually* believe. In the development stage of this scale, Dweck and her colleagues (Dweck, Chiu, & Hong, 1995) reported high internal consistency among the three entity theory items (α = 0.94–0.98).

With the entity-only version of Dweck's Implicit Theories of Intelligence measure, each of the six levels on the Likert response scale is assigned a point value (1 for *strongly agree* up to 6 for *strongly disagree*), and individuals are put into one of three categorical groups based on their mean score (i.e., total number of points divided by the number of items to which they responded) (Dweck, 2008; Levy & Dweck, 1999). Participants who average a score between 1.0 and 3.0 are considered to have an entity theory of intelligence, since they tend to agree with declarative statements about its innate and fixed nature. Participants with a score between 3.0 and 4.0 are considered to have a mixed or ambiguous mindset, since they expressed both significant agreement and disagreement with the items. Participants with an average response between 4.0 and 6.0 are considered to have an incremental theory of intelligence, since they tend to reject the idea that it is a static trait.

A flexible scale. Most self-theory literature has investigated students' conceptions about the nature of intelligence. Dweck's scale, however, is flexible and powerful enough to investigate mindset about the developmental potential of any individual trait or ability in any achievement domain, e.g., business skill or artistic talent. Even beliefs about the immutability or

changeable nature of personality and character can be studied (Dweck, 1999, 2006). To do so, researchers simply change the word 'intelligence' in Dweck's (1999) Implicit Theories of Intelligence Scale to the appropriate word or phrase that describes the trait they want to study.

Smith (2005), for example, was interested in the relationship between goal orientation and beliefs about the nature of musicality. In a survey of 344 undergraduate instrumentalists attending 17 colleges and universities, "the statements [in Dweck's scale] were reworded, substituting the terms 'musical ability,' 'musical talent,' 'musical aptitude,' and 'musical potential' for 'intelligence'" (p. 41). Consistent with the literature, Smith revealed that entity theorists of musicality were positively correlated with performance goals ($r = 0.16$, $p < 0.01$) and negatively related with mastery-learning goals ($r = -0.14$, $p < 0.01$). This relationship between belief and behavior seems to be quite robust. Modified versions of Dweck's scale have been used to investigate implicit theories and goal-orientation in a wide variety of domains, such as mathematics (Blackwell, Trzesniewski, & Dweck, 2007; Good & Dweck, 2006), science (Good, Rattan, & Dweck, 2004), foreign language (Mercer & Ryan, 2009), and creativity (Alpay & Ireson, 2006; Plucker & Renzulli, 1999). In all of these empirical studies, entity beliefs were found to inhibit mastery-oriented behavior, while incremental beliefs promoted it.

The study of implicit beliefs about social phenomena yields equally fascinating data. Knee (1998), for example, discovered that people who believed in romantic destiny (what might be considered a fixed mindset of relationships) were significantly more likely to terminate a partnership after a negative shared experience, relative to people who believed "a successful relationship evolves through hard work" (or what might be considered a growth mindset of relationships). Chiu, Dweck, Tong, and Fu (1997) performed five studies and discovered that

implicit theories "about the nature (i.e., malleability) of [participants'] social-moral reality" accurately predicted whether individuals subscribed to a duty-based or rights-based moral code (p. 923). A fixed conception, or entity theory, of morality was associated with an endorsement of deontological ethics. In other words, individuals who tended to think that reality was a predetermined and unchangeable force prioritized the maintenance of social and government rules. They felt people should be judged on whether they fulfilled their obligation to society—moral actions were duty-bound. In contrast, students with a fluid conception, or incremental theory, of reality tended to believe moral codes are flexible, shaped by individuals, and that systems should be built or rearranged to guarantee natural, universal, equal, and inalienable human rights, like autonomy and free expression.

All this is to say that the power of mindset cannot be underestimated. An entity theory promotes a deterministic view of the world. In achievement domains, this leads to decreased effort and "makes you concerned with how you'll be judged." An incremental theory promotes a sense of free will. In achievement domains, this leads to a greater investment of effort, and "makes you concerned with improving" (Dweck, 2006, p. 13).

Implicit beliefs of athletic ability. Sarrazin, Biddle, Famose, Cury, Fox, and Durand. (1996) were curious about the relationship between goal orientation and conceptions of sport ability in children and youth. To investigate this, they also modified Dweck's Implicit Theories of Intelligence scale and replaced 'intelligence' with the phrase 'sports ability.' Their Sport Incremental Ability Scale (SIAS) thus solicited a six-level range of agreement to three entity statements, e.g., *You have a certain amount of sports ability and you can't really do much to change it*. It was initially used to assess the mindset of 194 children between 11 and 12 years of

age who lived in southwest England (Cronbach's alpha was 0.71). Fifty-five percent of them exhibited an incremental theory of sport ability and a chi-squared test confirmed that this mindset was significantly more likely to be associated with a preference for learning goals ($X^2 = 6.20$, $p < 0.05$). "In addition," Sarrzin et al. note:

> [A] one-way ANOVA was computed on continuous SIAS scores using goal choices as the independent variable. [Again,] a significant difference was found ($F(2,191) = 3.40$, $p < 0.04$ [sic]). *Post hoc* Scheffe tests showed that children choosing the learning goal were significantly higher on SIAS scores than those choosing performance goals. These high scores reflected more incremental beliefs. Dweck & Leggett's (1988) hypothesis that learning goals are associated with incremental beliefs is therefore supported in a different achievement domain (p. 403).

In the second of two studies—this one with 304 students between the ages of 11 and 17 years-old who lived in Paris, France—Sarrazin et al. introduced the Conceptions of the Nature of Athletic Ability Questionnaire (CNAAQ), a novel 21-item survey with "six [theoretical] subscales corresponding to different representations of the nature of sport ability" (p. 405). Responses to the CNAAQ were analyzed with responses to the Perception of Success Questionnaire (POSQ; see Roberts & Balague, 1989), a 12-item survey with the common stem, *I feel successful in sport when…* The POSQ is composed of "two independent subscales and measures individual differences in the tendency to emphasize social comparison (ego) (e.g., *I beat other people, I do better than my opponents*) and/or task mastery and learning in sport (e.g., *I overcome difficulties, I do my best*)" (p. 405).

Intercorrelation between subscale responses on the CNAAQ and POSQ confirmed and enriched the findings from Sarrazin et al.'s first study: conceptions of the nature of sport ability as a natural gift (i.e., entity theory) were negatively correlated with a mastery goal orientation (−0.17, $p < 0.01$) and positively correlated with an ego/social comparison goal orientation (0.26, $p < 0.001$). An incremental theory of sport ability was positively correlated with a mastery goal orientation (0.36, $p < 0.001$). Biddle, who was second author on the Sarrazin et al. 1996 paper, tested the replicability of these findings with a study of 159 young children in Zimbabwe (Biddle, Akande, Vlachopoulos, & Fox, 1996). Again, individuals with weak "effort beliefs" were significantly more likely to exhibit high ego and low mastery goals, while those with strong effort beliefs were significantly more likely to exhibit low ego and high mastery goals. In a research review of student motivation in athletic environments, Biddle (1999) notes that these findings "provide support for the proposition of Dweck and Leggett (1988) and show that such notions could be extended into the domain of sport" (p. 113).

The Present Study

The above literature review illuminates the profound power of implicit beliefs to shape attitudes, behavior, and achievement in a wide variety of domains. Thus it should be the task of every educator to inculcate among students an optimism about the developmental potential of intelligence—a task that may be best accomplished if we can identify the dynamics that foster a growth mindset about ability in nonacademic environments. I have yet, however, to come across any research that compares within a single population of students their conceptions about the nature of ability and their motivation in two different domains, e.g., a side-by-side study of implicit beliefs of intelligence and athletic ability.

Such comparative studies are necessary to better understand how beliefs and behavior are reinforced in various competitive environments. The present study, therefore, seeks to test two hypotheses: students are (a) more likely to have an incremental theory of athletic ability relative to intelligence, and (b) more likely to be motivated by challenge-learning and mastery goals in sports compared to school. This kind of research might provide educators and psychologists with ideas about how to design academic interventions that increase the number of students with malleable beliefs of intelligence.

Method

Participants and Procedure

A total of 251 students (48% female, 52% male, M_{age} = 12.62, age range: 9–14 years) within a single middle school in the San Francisco Bay Area were surveyed about (a) their implicit beliefs of intelligence and athletic ability, and (b) the value they place on learning and performance goals in academic and athletic environments. Human subject research protocol standards guided the design and administration of the paper-and-pencil survey, which was distributed and completed at the beginning of students' daily science class: participation was completely optional, all interested students could participate, no personally identifiable information was collected, and aggregate results were shared with students at the end of the data-collection phase. Participants were given a piece of candy when they handed-in the survey, which took about 10 minutes for students to complete.

Instruments

Implicit beliefs of intelligence scale. The entity-only version of Dweck's Implicit Theories of Intelligence Scale was used to put students into one of three groups: those with a

conception of intelligence as a relatively fixed (entity theory) or changeable trait (incremental theory), and those who were uncertain about its nature (ambiguous theory). In the present study, responses to the three items yielded a Cronbach's alpha of .84.

Implicit beliefs of athletic ability scale. Sarrazin et al.'s (1996) Sport Incremental Ability Scale was used to similarly distinguish among students with an entity, incremental, or ambiguous theory of athletic ability. One slight modification was made to this scale, however —'sport ability' (a phrase more familiar in continental Europe than America) was replaced with 'athletic ability.' Cronbach's alpha was .85.

Goal measures. Two different instruments were used to compare participant goal orientation in school and sport settings, both of which force participants to indicate what they find most important in an achievement domain: "looking smart [or] attempting challenging learning tasks" (p. 184).

Task-choice Goal Measure. Dweck's (1999; Dweck & Henderson, 1989) Task-choice Goal Measure prompts participants to select the type of activity they would most like to work on from an answer stem with four choices. Two of the four answer choices are pure performance tasks that allow individuals to completely avoid any type of challenge, e.g., *Problems that are not too hard, so I don't get many wrong*; *Problems that are pretty easy, so I'll do well*. These items are examples of what is often referred to in motivational literature as *ego-avoid* goals (Elliot, 1999; Elliot & Sheldon, 1997; Middleton & Midgley, 1997). Participants who select one of these two options tend to be most concerned with "avoiding demonstrations of lack of ability relative to others" (Smith, 2005, p. 37).

The Task-choice Goal Measure also includes an *ego-approach* item: *Problems that I'm pretty good at, so I can show I'm smart*. Participants who select this option tend to be most concerned with "demonstrating high ability relative to others" (Smith, 2005, p. 37). Intermixed within the three performance goals is a personal improvement goal that allows individuals to fully embrace a challenge: *Problems that I'll learn a lot from, even if I won't look so smart*. Multiple performance tasks are included within the answer stem to increase their social desirability (Dweck, 1999).

A modified version of this measure was used to investigate participant goal motivations in a hypothetical sports context. The prompt was, *When practicing or playing sports, I would most like to work on…* Answer choices mimicked the same structure outlined above: *Exercises and drills that (a) are not too hard, so I don't fail* [ego-avoid]*; (b) I'll learn a lot from, even if I'm not very good* [mastery goal]*; (c) are pretty easy, so I'll do well* [ego-avoid]*;* or *(d) I'm pretty good at, so I can show I'm athletic* [ego-approach]. Despite the difference in ego orientation of the social comparison goal items (ego-avoid vs. ego-approach), all three of them were considered a performance goal in the current analysis. Sarrazin et al. (1996) similarly collapsed performance goals into a single category to juxtapose participant preferences with mastery goals.

Goal Choice Item. Both an original and a modified version of an item from Dweck's Questionnaire Goal Choice (1999) were used to measure goal orientation. Participants were asked to choose their preference between "getting a good grade in class" (performance goal) or "being challenged in class" (mastery goal). They were also asked to choose their preference between "being the best player on a mediocre team (which would allow me to highlight my

athletic ability)" or "being a mediocre player on a team of superstar athletes (which would challenge me to be a better player)."

Results

There was no significant difference by gender in mean scores on Dweck's Self-Theories of Intelligence Scale (overall $M = 4.32$, $SD = 1.21$) nor on Sarrazin et al.'s Sport Incremental Ability Scale (overall $M = 4.45$, $SD = 1.23$). Thus, data from male and female respondents were combined in a single data set.

As hypothesized, students were significantly more likely to exhibit an incremental belief of athletic ability (74%) compared to an incremental belief of intelligence (65%) ($p = 0.025$; two-tailed Fisher's exact test, FET). This does not necessarily mean, however, that more students conceived of intelligence as a fixed trait (19%) compared to athletic ability (17%) ($p = 0.643$, FET). Rather, twice as many of them had a mixed mindset of intelligence (19%) compared to athletic ability (9%) ($p = 0.013$, FET). Students seem certain that athletic ability is either a malleable or unchangeable trait, but have more ambiguous beliefs about whether the nature of intelligence can be similarly dichotomized.

The hypothesis about behavior and engagement in academic versus athletic environments was also confirmed. Students were significantly more likely to prefer working on tasks that have an intrinsic challenge when they were in sport (60%) compared to when they were in school (44%) ($p = 0.0006$, FET). On the measure that asked students to note whether their ultimate goal in school and sport was to be challenged or to appear competent, responses were even more stark. By a three-to-one margin, students were oriented towards a performance goal in school (75%) compared to a mastery goal (25%). In sports, the ratio was reversed. More than three

times as many (77%) were oriented towards a mastery goal in sport compared to a performance goal (23%). The difference by domain on the goal choice item was highly significant ($p = 9.661^{-31}$, FET).

As expected from a review of the literature, a 3 × 2 (implicit beliefs: fixed mindset/entity theory vs. growth mindset/incremental theory vs. mixed mindset × goal measure: challenge-learning vs. performance) chi-square revealed a significant relationship between both (a) conceptions of intelligence and the task-choice goal measure in school ($X^2 = 10.17$, $p < 0.05$) and (b) conceptions of athletic ability and the task choice goal measure in sport ($X^2 = 11.15$, $p < 0.005$).

Additionally, performance at the high-end and low-end of academic achievement was significantly correlated with both the direction and magnitude of beliefs about intelligence, a finding that is consistent with the motivation achievement literature. Mean scores on Dweck's Implicit Self-Theories of Intelligence scale were regressed on variables constructed for grades that students reported they earned in the core subjects of history, English, science, and math. Students who earned straight B's in all these courses were the reference group and had an average score of 3.59 (mixed mindset). Students who earned a combination of A's and B's in these courses had a significantly higher mean score (4.28, $p < 0.05$; incremental theory); those who earned straight A's were even more likely to express optimism about the developmental potential of intelligence ($M = 4.61$, $p < 0.01$; incremental theory). Students with grades lower than C's in the core subjects of middle school, however, tended to endorse statements about the innate and immutable nature of intelligence ($M = 2.25$, $p < 0.05$; entity theory).

The subgroup of students who earned straight A's was also the only with a majority (53%) who embraced the opportunity to tackle "Problems that I'll learn a lot from, even if I won't look so smart." More than half (61%) of every other group instead selected the opportunity to work on problems in school that were either devoid of any challenge or allowed them to easily demonstrate mastery. This difference in preference for challenge-learning tasks over performance tasks was highly significant ($p = 0.312$, FET). Nevertheless, on the measure for their ultimate objective in school, which asked students to choose between "being challenged" (mastery goal) and "getting a good grade" (performance goal), every subgroup (including the group of students who earned all A's) was more than three times as likely to choose the performance goal. It seems students simply want to look good, rather than actually engage in an authentic learning experience. Students with the highest levels of achievement want to be stimulated, but not at the expense of a lesser grade.

Students who played sports less than three days a week were significantly more likely to prefer athletic activities that simply promoted an illusion of their athletic competency, relative to students who more frequently engaged in athletic activities ($p = 0.0003$, FET). Yet on the measure that inquired about their desired end goal in a sports program, every subgroup of students (even a majority of non-athletes and irregular sport participants) would rather be overshadowed by better players if they could develop more talent, rather than be the best player on a mediocre team. It seems the opportunity to demonstrate awesome (or even competent) displays of athleticism in a physical contest is a poor substitute for a genuine athletic challenge.

Discussion

The present study is perhaps the first to juxtapose within a single population of students their mindset and motivation in two different achievement domains. Consistent with the literature, self-theories of intelligence were significantly correlated with mastery goal orientations in school, and self-theories of athletic ability were significantly correlated with mastery goal orientations in sport. As predicted, students were significantly more likely to have an incremental theory of athletic ability compared to intelligence. A second hypothesis about goal orientations was also confirmed: in school, students preferred tasks and objectives with an extrinsic reward structure. In sports, however, students were motivated by tasks and objectives with a challenge-learning and mastery component. These trends were consistent across variables for gender, race, academic achievement, and frequency of sports participation.

There are three possible explanations for this phenomenon. First, on the issue of implicit beliefs—individuals might be more optimistic about the developmental potential of athletic ability because there is an immediate and visceral biophysical response to exercise. When we engage in vigorous physical activity, we literally feel our bodies change: our pulse rate goes up, we breathe deeper, we perspire, and our muscles contract and expand occasionally to the point of soreness. Sometimes we lose weight, increase muscle density, and generally feel healthier. With enough concentrated effort, we can train ourselves to run farther, swim faster, jump higher, hit a curveball, be more flexible, and to reliably make a free throw basket. In the domain of athletic activity, the feedback is individualized and the results are tangible. Heart rate monitors can even tell us the percentage of our maximum effort that we exercise. It is hard to imagine a corollary response to, or measurement of, intellectual effort. Educators are left to wonder about how to reliably and objectively assess how hard a student works in a classroom environment.

Second, on the issue of motivation—school is high-stakes. In a society where achievement (or simply the appearance of achievement) validates one's intellectual promise, learning might be understood as a luxury that distracts students from the ruthless pursuit of extrinsic rewards. The nature of challenging academic activities is that they are difficult to master. Students may desire to be engaged and stimulated, but not at the expense of a high grade. College admission committees do not, after all, have a measure to directly assess levels of intrinsic motivation. Thus, ambitious students are encouraged to invest their time and energy in pursuit of high grades and SAT scores, scarce resources that we have accepted as among the most objective assessments of intelligence. To be perceived as smart, students do not have to actually be smart; they simply need to look smart.

Third, it is important to recognize the fact that attending school is mandatory while participation in sports programs are voluntary. It seems obvious that people would exhibit greater levels of intrinsic motivation about activities they are free to choose.

I found it curious, then, that in conversations with students about the factors that influenced their self-theories and motivation in various achievement domains (Atwood, in preparation), nobody referenced any of the three potential explanations sketched above. Instead, students identified more subtle factors that emphasized their beliefs of ability in school and sport. One conversation with a girl named Hannah was particularly illustrative.

When we talked, Hannah was a high school sophomore and aspired to be a professional soccer player. For her, school was an afterthought, a place she had to be in between practices and games to maintain eligibility. Hannah was asked why she preferred athletics to academics,

and offered thoughtful observations that compared the language commonly used in the institutions of school and sport.

"The adult leader [for example]… Coaches help you achieve your best," whereas teachers, as Hannah understood them, "either lecture at you, talk-at you, or discipline you." Her peers, too, played dramatically different roles for her, depending on their domain of interaction. "Teammates help you be better [in your sport]," whereas classmates may "ruin the curve in a class. ...In P.E. [for example] you are divided into teams and led by a student captain and you compete *with* each other [emphasis added]. In class, though, you are told to keep your head down, not to talk, not to collaborate otherwise it's cheating. It's almost like in school we compete *against* each other [emphasis added]."

Hannah identified some of the aspects about sport that I tried to leverage when I worked with James to help him re-imagine school as an academic playing field (see introduction). She commented on the fact that where sports use the term 'practice,' schools use the term 'homework.' "I'd rather practice than do work. You can't do practice wrong—you just show up and try hard. But work, is, well… boring," she said. Additionally, she noted that sports culminate in "games where people come to cheer you on," whereas school culminates "with a bunch of tests that other kids hope you fail so they look smarter." I asked if she was able to remember any motivational signs or posters in her classrooms at school. "No," she answered. Though when I asked about whether there were any such images and phrases in the gym or locker room, Hannah said, "Oh, yeah! There's this large [mural] of our [school] mascot and underneath it, it says, 'Anything is possible!'" When I asked her if she thought anything *was* possible, she said, "In sports, yeah. In school, no" (Atwood, in preparation).

Other students echoed the observations made by Hannah about the motivational climates of school and sport. A male football player, for example, said, "You have to care about your teammates, otherwise your team is no good. In class, no one cares about anybody." A student who does not regularly play or watch sports nonetheless noted, "Coaches are like your friends and dads and big brother [sic]. They are supposed to help you get better. Teachers don't have to [help students do better in school]. They don't think certain kids can [get better]" (Atwood, in preparation).

Implications and Directions for Future Research

The present study was an investigation of student mindset and motivation at one middle school in northern California. Despite the discovery that students are significantly more likely to have an incremental self-theory of athletic ability compared to intelligence, more research is needed to best identify how to act on this information. Nevertheless, educators may want to employ sport analogies and metaphors when they engage students in conversations about the relationship between effort and achievement in academic environments, similar to those delineated in the introduction during the "sport as school" experiment with James: introduce teachers as coaches, since 'coach' is a role with a more salient developmental responsibility; brand homework as 'academic practice' and academic tests and assessments as 'academic scrimmages'; and explain that classmates play a similar supporting role as athletic teammates.

In a literature review of epistemological beliefs, beliefs change, cognition, and learning theory, Cuyno (1999) notes, "Roth and Roychoudhury (1994) identified five categories of metaphors used by students" to better understand knowledge. One of these metaphors was

> brain as muscle (requiring practice and exercise)… Metaphors are not simply a matter of language; they are the very foundation of our conceptual system with which we think and act (Arbib & Hesse, 1986; Lakoff & Johnson, 1980, cited in Roth & Roychoudhury, 1994) (Cuyno, 1999, p. 85).

Directing students to explicitly think of the brain as a muscle is not a novel idea for an intervention. In fact, there is strong evidence that it is an effective strategy for cultivating incremental self-theories of intelligence among middle school students.

Over the course of eight weeks, Blackwell, Trzesniewski, and Dweck (2007) taught 48 seventh graders to think of their brain as a muscle—i.e., intelligence improves if one engages in challenging intellectual exercises, just as a muscle grows if it is properly exercised. Compared to a control group of 43 students, the experimental group became significantly more engaged in school and saw an increase in their math grades. This effect was significant for the entire length of the two year intervention study. Since then, the brain as muscle metaphor has become a foundational component of a software program Dweck designed, called Brainology, that aims to turn students with a fixed mindset of intelligence into students with a growth mindset of intelligence. My recommendation is simply to extend and emphasize this metaphor to better illustrate the relationship between effort and achievement in an academic domain.

The findings and implications of this study should be read with cautious optimism. Drawing an analogy between the classroom and sports field may not be the best or most effective way to change the beliefs students have about the nature of intelligence and their behavior in school. One might expect that people become less optimistic about the developmental potential of athletic ability with their physical limits become more salient. Thus, the procedure in the

present study should be replicated with larger and more diverse groups of people, i.e., students from all racial or ethnic and socioeconomic backgrounds in elementary school, middle school, high school, and in college or universities. Using the brain as muscle metaphor may be most effective with certain subgroups and ineffective with others. Students with chronic health problems or who are physically challenged, for example, might be significantly less likely to have a growth mindset of athletic ability.

Additionally, researchers should track the rates of incremental theories about intelligence and athletic domain within populations of students over time. These longitudinal studies might highlight certain points in development when students are most and least likely to think these traits are fixed and malleable. If, for example, there is a sharp decrease in growth mindset of intelligence around the transition from middle school to high school, educators and researchers might be able to identify the dynamics that are responsible for such change—and thus design more appropriate and responsive interventions. Cross-cultural studies that juxtapose mindset and motivation in two achievement domains would also be interesting, and could challenge or support the idea that there is some universal tendency to be more optimistic about the potential for physical change than intellectual change.

Most importantly, however, researchers should continue to compare self-theories of intelligence alongside self-theories of other traits and characteristics (i.e., not simply of athletic ability) to identify other attributes that majorities of people tend to believe are malleable. Sports may not be the best achievement domain from which to learn how to design better learning environments. It is possible, for example, that nearly everyone believes technological literacy

can be improved with effort—or at least more so than athletic ability. If so, we need to learn why certain domains inhibit motivation and why others promote it.

Conclusion

The present study is a model for comparative investigations of mindset and motivation in various achievement domains. Too few students believe they can improve their intelligence, while an overwhelming number believe they can improve their athletic ability with hard work. It is vital for students to be optimistic about the possibility for intellectual growth, as an incremental self-theory predicts mastery-oriented behavior and achievement. Sports provide a familiar reference for students to nurture a growth mindset, and the brain as muscle metaphor has helped students to re-imagine intelligence as a malleable versus fixed trait. The efficacy of this simple intervention, however, can be greatly enhanced if analogies that link the classroom to the playing field are better emphasized. When researchers can identify the dynamics and structures that powerfully facilitate incremental self-theories of ability in a wide variety of domains, they will be positioned to help students hit an academic home run.

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