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The relationship between intelligence and mindset

Brooke N. Macnamara*, Natasha S. Rupani

Case Western Reserve University, United States

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ABSTRACT

Intelligence mindset refers to one's belief that either intelligence is a malleable trait that can improve with effort—a "growth" mindset—or is a relatively stable trait—a "fixed" mindset. According to proponents of mindset theory, holding a growth mindset is beneficial (e.g., greater academic persistence) while holding a fixed mindset is detrimental. Is there a relationship between one's intelligence mindset and one's intelligence? Proponents of mindset theory suggest that the answer is yes, and that this relationship differs by gender, with more intelligent females holding more of a fixed mindset (aka, the "bright girl effect"). However, investigations of all three factors—measured intelligence, intelligence mindset, and gender—have only been conducted with children and adolescents. Therefore, we tested whether, among adults, women have more of a fixed mindset than men, and whether women with higher intelligence are more likely to hold fixed mindsets. We found no evidence for women holding fixed mindsets more so than men. We found very limited evidence for a "bright woman effect": Three-way interactions between age, gender, and intelligence predicting mindset emerged, however, the relationships were not consistently driven by brighter women (young or old) holding more of a fixed mindset than their less intelligent female counterparts or men. Furthermore, we did not find evidence to support the notion that holding more of a growth mindset results in greater academic persistence. We conclude that neither gender nor intelligence is consistently associated with mindset.

1. Introduction

According to mindset theory (aka *implicit theories* or *self theories*; Dweck, 2000)—a theory popular both within academia and the media—individuals hold varying beliefs about whether traits, such as intelligence, are relatively stable or whether they can be changed with effort. Those who believe that intelligence and other traits are relatively stable are said to have a "fixed mindset" (or hold an "entity theory") while those who believe that abilities are changeable with effort are said to have a "growth mindset" (or hold an "incremental theory.")

According to this theory, holding a growth mindset is beneficial. For example, individuals with growth mindsets are more likely to exert effort to overcome a challenge, leading to greater academic achievement (e.g., Blackwell, Trzesniewski, and Dweck, 2007; Dweck and Leggett, 1988). In contrast, individuals with fixed mindsets are more likely to avoid challenges, assume failure is attributable to ability that cannot be changed, be debilitated by failure, fall into a helpless pattern, and lose their desire to learn (Dweck, 2000, 2007a, 2007b). Mindsets are assumed to develop from the type of praise a child receives from teachers and parents. Children who receive "process praise," that is, praise for effort and perseverance, will develop growth mindsets, while children who receive praise for their intelligence and abilities, will develop fixed mindsets (Dweck, 2007b, see also Mueller and Dweck, 1988).

2. The bright girl effect

Mindset theory also suggests that girls and women might be more likely to hold fixed mindsets than boys and men because, "[s]tarting in infancy, parents tend to give boys more process praise, an advantage that results in a greater desire for challenge, and a growth mindset, later on" (Dweck and Simmons, 2014, para. 13). For example, as reported in Dweck (1986), Licht and Shapiro (1982) found that girls were more likely to attribute failure to their ability. Similarly, Dweck (1986) also reports that, among a sample of bright junior high students, the girls were more likely than boys to hold a fixed mindset (Leggett, 1985).

Indeed, bright girls in particular are believed to be especially likely to hold fixed mindsets, because they are the most likely to be praised for their intelligence. For example, Halvorson (2011) pens, "more often than not, bright girls believe that their abilities are innate and unchangeable, while bright boys believe that they can develop ability through effort and practice" (para 6). She goes on to explain the presumed reason for this difference: girls often develop self-control earlier and are praised in terms of their attributes (e.g., being a good student,

* Corresponding author at: Department of Psychological Sciences, Case Western Reserve University, Cleveland, OH 44106, United States.
E-mail address: brooke.macnamara@case.edu (B.N. Macnamara).

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being smart), with the smartest girls receiving the most attribute praise. In contrast, boys of the same age are often more hyperactive and are praised for their efforts to sit still and pay attention.

Similarly, Dweck (2000) writes,

> Bright girls…are a group that does not want challenge (Licht and Shapiro, 1982). And when they are presented with a challenge or obstacles, they are a group that readily blames their ability and falls into a helpless pattern (Licht and Dweck, 1984a, 1984b; Licht, Linden, Brown, and Sexton, 1984; Licht and Shapiro, 1982…. (p. 53)

Thus, two assumptions have become suggested in the mindset literature and in the popular media. The first is that girls and women are more likely to have fixed mindsets than boys and men. The second is that girls and women with high IQs are especially likely to have fixed mindsets.

However, little evidence supports these assumptions. For example, in a recent behavioral genetics study, Tucker-Drob, Briley, Engelhardt, Mann, and Harden (2016) examined mindsets among 811 third-eighth grade twins and triplets. If girls are more likely to have fixed mindsets because parents praise girls and boys differently, we should observe a significant difference between girls' and boys' mindsets in the expected direction, and environmental effects should be greater than genetic influence. This pattern of results was not observed. They found that girls' and boys' mindsets were not significantly different from each other. Furthermore, they found that mindsets among monozygotic twins, who share 100% of their genes, were significantly correlated, but that mindsets were not correlated between same-sex or opposite-sex dizygotic twins, who only share about 50% of their genes. These results suggest that one's mindset is largely heritable and is not substantially influenced by one's home environment (e.g., praise from parents) or one's gender. However, Tucker-Drob et al. (2016) did not examine how IQ impacts gender differences in mindsets, which is an important part of the bright girl effect.

Dweck (2007b) cites studies as evidence of how IQ interacts with gender, resulting in the debilitating bright girl effect. Describing Licht and Dweck's (1984a) research on 5th-graders who received confusing materials at the start of a task, Dweck (2007b) states,

> What we found was that bright girls did not cope at all well with this confusion. In fact, the higher the girl's IQ, the worse she did. Many high-IQ girls were unable to learn the material after experiencing confusion. This did not happen to boys. (p. 47)

Dweck and Simmons (2014) add, “Notably, the highest IQ girls struggled the most” (para 10). However, the results of the Licht and Dweck (1984a) study do not support the conclusion that the brighter the girl the more likely she will to give up when facing challenges, a presumed trait of holding a fixed mindset. First, Licht and Dweck (1984a) excluded the brightest students from the sample, those scoring above the 95th percentile on a standardized test. Additionally, Licht and Dweck (1984a) only had IQ scores for a subset of the sample. For this reason, they asked children to rank how smart they thought they were relative to their classmates, and this—not children's actual IQ—was the measure Licht and Dweck (1984a) used to correlate with performance on the task. Most importantly, the correlation between this measure of intelligence and performance on the task after experiencing confusion was not significant. Thus, the conclusion that, “the higher the girl's IQ, the worse she did,” is not supported.

Three other studies are commonly cited and discussed as evidence for “the bright girl effect”: Leggett (1985), Licht and Shapiro (1982), and Licht et al. (1984). However, none of these studies were ever published and are not accessible. Thus, there is little, if any, available evidence to support the bright girl effect.

3. Is there a bright woman effect?

Among adult samples, investigations of gender and mindset have either observed that women and men have similar mindsets of intelligence on average (Heyman, Martyna, and Bhatia, 2002; Kornilova, Kornilov, and Chumakova, 2009; Yan, Thai, and Bjork, 2014) or that women have more of a growth mindset than men (Spinath, Spinath, Riemann, and Angleitner, 2003). Similarly, while research suggests that holding a fixed mindset negatively predicts academic achievement in children (e.g., Blackwell et al., 2007), these results run counter to the finding that adults with higher levels of education are more likely to hold a fixed mindset than their less educated counterparts (Yan et al., 2014).

The present set of studies seeks to examine claims about gender, intelligence, and mindsets among adult samples. In Study 1, in a college-age sample, we test the prediction that women endorse a more fixed mindset compared to men. We also test whether intelligence interacts with this relationship, specifically, whether more intelligent women are more likely to hold fixed mindsets. In Study 2, in an online sample, we test the same assumptions as in Study 1, and also examine whether age interacts with gender, mindset, and intelligence. In Study 3, we replicate Study 2, and also ask whether mindsets influence level of education attained. Data for all three studies are openly available at https://osf.io/r4x53/.

4. Study 1

4.1. Method

4.1.1. Participants

One hundred three (57 female) General Psychology I students at Case Western Reserve University participated in exchange for partial course credit as part of a larger study.

4.1.2. Materials and procedure

After completing a brief demographics questionnaire asking participants to indicate their sex and age, participants completed the following measures in the following order.

4.1.2.1. Intelligence mindset questionnaire. A questionnaire (Dweck, 2000) asking participants to respond to statements about intelligence was administered. Participants responded to eight statements (e.g., “Your intelligence is something about you that you can't change very much.”) “Strongly Agree,” “Agree,” “Mostly Agree,” “Mostly Disagree,” “Disagree,” or “Strongly Disagree.” Responses were coded as 1, 2, 3, 4, 5, or 6 respectively and reverse scored when appropriate such that higher scores reflect more of a growth mindset.

4.1.2.2. Talent mindset questionnaire. A questionnaire (mindsetonline.com) asking participants to respond to statements about talent was administered. Participants responded to eight statements (e.g., “Your talent in an area is something about you that you can't change very much.”) “Strongly Agree,” “Agree,” “Mostly Agree,” “Mostly Disagree,” “Disagree,” or “Strongly Disagree.” Responses were coded as 1, 2, 3, 4, 5, or 6 respectively and reverse scored when appropriate such that higher scores reflect more of a growth mindset.

4.1.2.3. Raven's Advanced Progressive Matrices. In this measure of fluid intelligence (Raven, Raven, and Court, 1962), participants are asked to recognize patterns, reason, and problem solve to the best of their ability. Participants were given 2 practice problems, feedback about why the correct answers were correct, and the chance to ask questions. Odd numbered items from the full scale were presented. Participants had 10 min to complete as many as possible.

4.2. Results

The mean age of the participants was 18.95 (SD = 1.82). Contrary to assumption, women did not hold more fixed mindsets than men. In