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Ryan Royston

Roni Reiter-Palmon

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# Creative self-efficacy as mediator between creative mindsets and creative problem-solving

Ryan Royston, Roni Reiter-Palmon, University of Nebraska at Omaha

## ABSTRACT

An emerging area of research is how one's mindset regarding the fixedness and malleability of creative ability relates to creative performance. Malleable creative mindsets tend to be positively related to creativity while fixed mindsets often show a negative association. Similarly, creative self-efficacy, or one's beliefs that they have the capacity to be creative, is also related to creative performance and creative mindsets. While previous studies tested the direct relationship between mindsets and creativity, this study tested creative self-efficacy in this relationship. A total of 152 students from a Midwestern university participated in the study. They were provided with measures of creative self-efficacy, creative mindsets, and creative problem-solving. Solutions were assessed in terms of quality and originality. Results indicated that both malleable creative mindsets and creative self-efficacy were positively related to solution quality and originality while fixed creative mindsets were negatively related. Mediation analysis using Preacher and Hayes' (2004) bootstrapping macro showed that creative self-efficacy mediated the relationship between malleable mindsets and quality and originality as well as the relationship between fixed mindsets and quality and originality. This research advances the study of creativity by demonstrating that creative self-efficacy is an important mechanism through which creative mindsets relate to creative performance.

## Keywords:

creativity, creative mindsets, creative self-efficacy, creative problem-solving

The study of creative mindsets has only recently emerged in the creativity literature, yet these mindsets have shown to be important in predicting creative performance and are related to creative self-concepts such as creative personal identity and creative self-efficacy (Hass, Katz-Buonincontro, & Reiter-Palmon, 2016; Karwowski, 2014; O'Connor, Nemeth, & Akutsu, 2013). Malleable creative mindsets refer to perceptions that creative ability can be developed and refined over time and with effort. Fixed creative mindsets refer to beliefs that creative ability is innate and stable and thus cannot be further developed (O'Connor et al., 2013). Creative mindsets are critical to consider for performance because they often influence how individuals attempt to learn

new skills and further develop their abilities and the level of effort individuals put into learning new skills and further developing their abilities (Dweck, 1986; Dweck, Chiu, & Hong, 1995). However, despite what we know about the importance of these lay beliefs in domains such as academic or athletic performance (e.g., Button, Mathieu, & Zajac, 1996; Dweck & Leggett, 1988), relatively few studies have investigated how creative mindsets relate to creative performance. Several recent studies have investigated the relationship between constructs such as creative self-efficacy and creative personal identity (e.g., Karwowski, 2014). These studies tend to show that malleable creative mindsets are positively related to other self-perceptions of creativity such as creative self-efficacy and personal identity, while fixed mindsets tend to be negatively related to these constructs.

Despite recent advances in our understanding of how creative mindsets directly relate to creative performance (e.g., Karwowski, 2014; O'Connor et al., 2013), we know little about the mechanisms through which creative mindsets relate to creative performance. At present, it is unclear whether in addition to the direct relationship between creative mindsets and creative performance, creative mindsets also show an indirect effect on creative performance through other beliefs related to creativity. Creative self-efficacy has been shown to mediate the relationship between a number of constructs related to creative mindsets and creative performance. For instance, creative self-efficacy is thought to mediate the relationship between creative potential and creative performance (Karwowski, 2016). Similarly, Gong, Huang, and Farh (2009) found that creative self-efficacy mediated the relationship between mastery goal orientation and creativity. Knowing whether creative mindsets exert an indirect influence through creative self-efficacy allows us to better understand the relationship between one's perceptions of the malleability or fixedness of creativity and actual creative performance as well as how one's perceptions of their own creative capability play a role in creative performance. Therefore, the purpose of this study is to investigate whether creative self-efficacy also serves as an important mechanism through which creative mindsets relate to creative performance.

## **CREATIVE MINDSETS**

Work on fixed and malleable mindsets in other domains is not new; however, the application of fixed and malleable mindsets to the field of creativity has only emerged in the last few years. Much of the early work on mindsets was conducted in the fields of academic performance and intelligence (e.g., Dweck, 1986, 1989; Dweck & Leggett, 1988; Dweck et al., 1995). Initially, fixed and malleable mindsets were seen as two ends of a continuum, with people holding either a fixed or a malleable mindset in a given domain such as intelligence or athletic performance (Dweck, 1986; Dweck & Leggett, 1988). However, more recent work has shown that individuals may actually hold both fixed and malleable mindsets simultaneously and that mind-sets should be viewed as two separate dimensions altogether (Burnette, O'Boyle, Van Epps, Pollack, & Finkel, 2013; Dweck et al., 1995; Hass et al., 2016; Karwowski, 2014).

The strength of one's fixed and malleable mindsets appears to influence performance and how they react to challenges. People holding strong malleable mindsets tend to credit their performance to their effort, try again after failing, seek to increase their competence, and show increased self-esteem (Hong, Chiu, Dweck, Lin, & Wan, 1999; King, 2012; Miele, Finn, & Molden, 2011; Smiley & Dweck, 1994). People who hold strong fixed mindsets tend to see their performance as resulting from their innate ability and may feel the need to validate or prove their ability. They may also feel frustrated or helpless when confronted with difficult challenges in which they feel that they have reached the limits of their ability (Dweck, 1986, 1989; Dweck & Leggett, 1988; King, 2012; Robins & Pals, 2002; Smiley & Dweck, 1994).

In order to assess individuals' perceptions of the fixedness of creative ability, some studies have reworded an existing implicit mindset of intelligence scale to reflect creativity (e.g., Makel, 2009; O'Connor et al., 2013). Both Makel (2009) and O'Connor et al. (2013) viewed fixed and malleable creative mindsets as being on either end of a continuum and found that people who held malleable mindsets tended to show higher performance on insight problem-solving (Makel, 2009) and showed a higher number of creative achievements than those holding fixed mindsets (O'Connor et al., 2013). However, insight problem-solving is sometimes questioned as a real-world indicator of creativity (Beatty, Nusbaum, & Silvia, 2014). Beatty et al. (2014) found that while insight problem-solving ability was correlated with intelligence, there was no evidence that insight problem-solving ability predicted either self-reported creativity or creative behavior. Another issue with using insight problems to measure creativity is that there is only one correct solution to insight problems, which is problematic when considering that originality is a vital component of creativity.

Rather than rewording an existing intelligence or academic ability mindset scale to reflect creativity, Karwowski (2014) developed a scale specifically designed to measure both fixed and malleable creative mindsets. He found through factor analysis that fixed and malleable creative mindsets were two separate constructs altogether and that people could hold both mindsets simultaneously. Recently, Hass et al. (2016) conducted a study and confirmed both the fixed and malleable creative mindsets as separate factors. They also found that the items from Karwowski's (2014) creative mindset scale performed better than an implicit theory scale that was reworded to reflect creativity. Karwowski (2014) found that malleable creative mindsets were positively related to insight problem-solving, while fixed mindsets were negatively related. Karwowski (2014) also found that malleable mindsets were positively related to creative self-efficacy and creative self-identity, while fixed mindsets were negatively related to these same variables.

## **CREATIVE SELF-EFFICACY**

Creative self-efficacy has received extensive attention as an important predictor of creative achievement and performance (e.g., Karwowski, 2011; Karwowski & Lebuda, 2016; Puente-Diaz, 2016; Tierney & Farmer, 2002). Creative self-efficacy refers to

perceptions that one has the confidence and capacity to be creative in their work and to produce creative outcomes (Tierney & Farmer, 2002). Creative self-efficacy grew out of Bandura's (1997) work on general self-efficacy and is critical to creative production. Tierney and Farmer (2002) first applied Bandura's work on general self-efficacy to organizational creativity and found that creative self-efficacy predicted creative performance above and beyond job-related self-efficacy. Since Tierney and Farmer's (2002) study, creative self-efficacy has been recognized as a critical component to understanding how to increase individual, team, and organizational creative performance (Carmeli & Schaubroeck, 2007; Choi, 2004). Creative self-efficacy has shown to predict one's creative self-identity and creative performance (Karwowski, 2014; Mathisen & Bronnick, 2009). In contrast to creative mindsets, which tend to be perceptions about the malleability and fixedness of creative ability in the general population, creative self-efficacy is measured in regard to one's own capacity to be creative. As mentioned, holding a growth mindset about creative ability appears to be positively related to creative self-efficacy, while fixed creative mindsets appear to be negatively related (Karwowski, 2014). Consequently, feeling that creativity is a characteristic that can be grown appears to be related to perceptions that one has the ability to produce creative outcomes and handle tasks requiring creativity.

Ratings of one's own creativity appear to be related to creative self-efficacy; however, this relationship may depend on one's understanding of what it means to be creative (Karwowski, 2011). Furthermore, creative self-efficacy has also been shown to mediate the relationship between some personality factors and creativity. For example, Choi (2004) showed that creative self-efficacy mediated the relationship between individual factors such as ability, personality, and motivation and creativity in a sample of university students. Karwowski (2016) also suggested that creative self-efficacy mediates the relationship between creative potential and creative achievement. As creative self-efficacy appears to mediate the relationship between self-ratings of creativity and actual creativity, it is possible that creative self-efficacy may also mediate the relationship between perceptions of the malleability and fixedness of creative abilities and creative performance. Wood and Bandura (1989) pointed out that in regard to intelligence, when people feel that intelligence is a fixed attribute, they tend to show decreased self-efficacy. This decreased self-efficacy then negatively influences actual performance (Karwowski, 2011). However, it is unclear whether this same phenomenon occurs when considering the fixedness or malleability of creative ability rather than intelligence. Expanding our knowledge of how creative mindsets relate to creative self-efficacy when predicting creative performance may be useful when developing organizational creativity training programs as well as promoting growth mindsets in academic settings.

## **THE PRESENT STUDY**

Karwowski (2011) suggested that creative self-efficacy may be influenced by one's implicit theories of creativity as well as one's understanding of creativity. When

developing this study, we considered that one's creative mindset is related to both creative self-efficacy and measures of creative performance, such as insight problem-solving (Karwowski, 2014; Makel, 2009) and creative achievements (O'Connor et al., 2013). However, while we know that creative mindsets have a direct effect on creative performance, we know little of the mechanisms through which creative mindsets may influence creativity. This study sought to determine whether creative self-efficacy mediates the relationship between creative mindsets and creativity. Creative mindsets may serve as a critical antecedent to creative self-efficacy because when one feels that creative ability is an attribute that can be grown, they may feel more confident and capable in producing creative work, which then is associated with increased creative performance. Conversely, if people hold strong fixed mindsets regarding creative ability, they may feel less confident of their creative ability, which in turn is associated with decreased creative performance. Thus, we propose the following hypotheses:

Hypothesis 1a: Malleable creative mindsets will be positively related to creative self-efficacy.

Hypothesis 1b: Fixed creative mindsets will be negatively related to creative self-efficacy.

Hypothesis 2a: Malleable creative mindsets will be positively related to the quality and originality of solutions to creative problem-solving tasks.

Hypothesis 2b: Fixed creative mindsets will be negatively related to the quality and originality of creative problem-solving tasks.

Hypothesis 3: Creative self-efficacy will be positively related to the quality and originality of solutions to creative problem-solving tasks.

Hypothesis 4: Creative self-efficacy will mediate the relationship between malleable creative mindsets and the quality and originality of solutions to creative problem-solving tasks.

Hypothesis 5: Creative self-efficacy will mediate the relationship between fixed creative mindsets and the quality and originality of solutions to creative problem-solving tasks.

## **METHOD**

### **PARTICIPANTS**

One hundred and fifty-two undergraduate students (76% female, 23% male, 1% undisclosed) from a Midwestern university were recruited for this study. Age ranged from 18 to 49 with a mean of 22.06 years old ( $SD=4.89$ ). Ninety percent of the sample was between the ages of 18 and 28. The majority of participants identified as Caucasian (73.9%), with Hispanic being the next highest ethnicity (10.8% of participants). Participants' year in university was nearly evenly distributed. Twenty-one percent of participants reported being freshman, 24.2% were sophomores, 26.1% were juniors,

25.5% were seniors, and 3.2% reported being “other.” Participants reported grade point average (GPA) ranging from 1.7 to 4.0 with a mean of 3.29 (SD=0.54).

## **MEASURES**

### **Creative mindsets**

We used Karwowski’s (2014) 10-item scale, which is composed of two subscales, to measure creative mindsets. Five items measure participants’ beliefs in the fixedness of creative ability (e.g., “You either are creative or you are not—even trying very hard you cannot change much”) and five items measure perceived perceptions of the malleability of creative ability (e.g., “Everyone can create something great at some point if he or she is given appropriate conditions”). Participants indicated the extent to which they feel the 10 items reflect their beliefs about creative ability on a five-point Likert scale from one (definitely not) to five (definitely yes). While the original scale was constructed in Polish, it has recently been used in a US sample and has shown appropriate psychometric properties (Hass et al., 2016). For this study, internal consistency was  $\alpha=.74$  for the fixed mindset scale and  $\alpha=.50$  for the malleable mindset scale.

### **Creative self-efficacy**

Karwowski’s (2012) six-item creative self-efficacy scale was used to measure one’s beliefs in their capability and confidence in their ability to produce creative outcomes (e.g., “I trust my creative abilities”). Participants rated their agreement with each item on a five-point Likert scale from one (definitely not) to five (definitely yes). This scale is one of the two subscales that compose Karwowski’s (2012) Short Scale of Creative Self. While the original scale was constructed in Polish, it has recently been used in a US sample and has shown appropriate psychometric properties (Hass et al., 2016). For this study, internal consistency for the creative self-efficacy scale was  $\alpha=.77$ .

### **Creative problem-solving task**

Participants solved a complex and ill-defined scenario-based problem appropriate for college students. Participants were instructed to provide a creative solution to a scenario describing a college student who is looking for ways to increase her job opportunities after graduating from college while balancing school and work challenges.

Three independent judges rated each participant’s solution in terms of originality, or the novelty and uniqueness of solutions. Another three independent judges rated the quality, or the feasibility, usefulness, and effectiveness of each solution. Judges were student research assistants with extensive training in creativity and the use of the consensual assessment technique (Amabile, 1996) which was used in this study. Judges rated the originality and quality of each solution on a scale ranging from one (very unoriginal/very low quality) to five (very original/very high quality). Judges’ individual ratings were then averaged to form overall indices of originality and quality for

each participant. Inter-rater agreement was assessed using within-group variance (James, Demaree, & Wolf, 1984) and intra-class correlations (Shrout & Fleiss, 1979). Inter-rater agreement was good for both originality (ICC=.88, rwg=.85) and quality (ICC=.88, rwg=.88) in this study.

## PROCEDURE

Participants completed the study online using a link provided through the university's research management system. Participants received extra credit in an undergraduate psychology course in exchange for their participation. Measures were counterbalanced to alleviate order effects, such that a random half of participants received the independent measures of creative self-perceptions first followed by dependent measures of creative ability, while the other half received the dependent measures first, followed by independent measures. All participants were asked to provide their age, gender, ethnicity, year in school, and GPA at the end of the study.

## RESULTS

Table 1 presents the correlations between the study variables. Creative self-efficacy was positively related to malleable creative mindsets ( $r=.33, p<.01$ ), and negatively related to fixed creative mindsets ( $r=.24, p<.01$ ). Therefore, this finding provided support for hypotheses 1a and 1b. In terms of creative problem-solving, malleable creative mindsets were positively related to solution quality ( $r=.16, p=.02$ ) and originality ( $r=.19, p=.01$ ), while fixed creative mindsets were negatively associated with both solution quality ( $r=.19, p<.01$ ) and originality ( $r=.15, p=.03$ ). Thus, we found support for hypotheses 2a and 2b. Creative self-efficacy was positively associated with both solution quality ( $r=.22, p<.01$ ) and originality ( $r=.22, p<.01$ ), providing support for hypothesis 3.

To test hypothesis 4, whether the relationship between malleable creative mindsets with both solution quality and originality was mediated by creative self-efficacy, we used Preacher and Hayes' (2004) SPSS macro to estimate indirect effects within each mediation model, based on 5,000 randomly selected subsamples for each model and with 95% bias-corrected confidence intervals. Separate mediation models were built for quality and originality. Malleable mindset was positively related to solution quality ( $b=.31, SE=.15, p=.05$ ) and creative self-efficacy ( $b=.44, SE=.10, p<.01$ ). Creative self-efficacy was positively related to solution quality ( $b=.28, SE=.13, p=.03$ ). After controlling for creative self-efficacy as a mediator, the relationship between malleable creative mindset and solution quality became nonsignificant ( $b=.19, SE=.16, p=.25$ ). Bootstrapping showed that the unstandardized indirect effect of malleable mindsets on solution quality was significant at .12 and 95% confidence intervals ranging from 0.02 to 0.28, providing support that malleable mindsets exert an indirect effect on solution quality through creative self-efficacy. Thus, the first mediation analysis indicated that creative self-efficacy mediated the effect of malleable mind-sets on solution quality (see Figure 1).



Similarly, using Preacher and Hayes' (2004) SPSS macro, the second mediation analysis tested whether creative self-efficacy mediated the positive relationship between malleable creative mindsets and originality of solutions. Malleable mindset was positively related to solution originality ( $b=.35$ ,  $SE=.15$ ,  $p=.02$ ) and creative self-efficacy ( $b=.44$ ,  $SE=.10$ ,  $p<.01$ ). Creative self-efficacy was also positively related to solution originality ( $b=.26$ ,  $SE=.12$ ,  $p<.01$ ). After controlling for creative self-efficacy as a mediator, the relationship between malleable creative mindset and solution originality became nonsignificant ( $b=.23$ ,  $SE=.15$ ,  $p=.13$ ). Bootstrapping showed that the unstandardized indirect effect of malleable mindset on solution originality was significant at .11 with 95% confidence intervals ranging from 0.02 to 0.26, providing support that malleable mindsets exert an indirect effect on solution originality through creative self-efficacy. Therefore, the mediation analysis showed that creative self-efficacy mediated the relationship between malleable mindsets and originality of solutions. Consequently, the results of these two mediation analyses provide support for hypothesis 4 (see Figure 2).

TABLE 1. Correlation Matrix of Creativity Measures

	<i>M</i>	<i>SD</i>	SK	KU	Malleable creative mindset	Fixed creative mindset	Creative self-efficacy	Solution quality	Solution originality
Malleable creative mindset	4.17	0.47	-0.64	0.89	.50				
Fixed creative mindset	2.61	0.76	0.21	-0.28	-.41**	.74			
Creative self-efficacy	3.82	0.59	-0.19	-0.02	.33**	-.24**	.77		
Solution quality	2.44	0.91	0.49	-0.09	.16*	-.19**	.22**	.88	
Solution originality	2.63	0.87	0.11	-0.13	.19**	-.15*	.22**	.77**	.88

One-tailed tests. Cronbach's alpha for creative mindsets and creative self-efficacy, ICCs for solution quality and originality displayed on diagonal. \* $p < .05$ . \*\* $p < .01$ .

To test hypothesis 5, whether creative self-efficacy also mediated the relationship between fixed mindsets and the quality and originality of creative problem-solving solutions, we used Preacher and Hayes' (2004) SPSS macro to estimate indirect effects within each mediation model, based on 5,000 randomly selected sub-samples for each model and with 95% bias-corrected confidence intervals. Fixed mindset was negatively related to solution quality ( $b=.23$ ,  $SE=.10$ ,  $p=.02$ ) and creative self-efficacy ( $b=.20$ ,  $SE=.06$ ,  $p<.01$ ). Creative self-efficacy was positively related to solution quality ( $b=.27$ ,  $SE=.12$ ,  $p=.03$ ). After controlling for creative self-efficacy as a mediator, the relationship between fixed creative mindset and solution quality became nonsignificant ( $b=.18$ ,  $SE=.10$ ,  $p=.08$ ). Bootstrapping showed that the unstandardized indirect effect of fixed creative mindset on solution quality was significant at .05 with 95% confidence intervals ranging from 0.13 to 0.01, providing support that fixed mindsets exert an indirect effect on

solution quality through creative self-efficacy. Thus, the first mediation analysis indicated that the effect of fixed creative mindsets on quality of solutions was mediated by creative self-efficacy (see Figure 3).

Similarly, using Preacher and Hayes' (2004) SPSS macro, the second mediation analysis also showed that the relationship between fixed creative mindsets and solution originality was mediated by creative self-efficacy. Fixed mindset was negatively related to solution originality ( $b=.17$ ,  $SE=.10$ ,  $p=.05$ ) and creative self-efficacy ( $b=.20$ ,  $SE=.06$ ,  $p<.01$ ). Creative self-efficacy was positively related to solution originality ( $b=.28$ ,  $SE=.12$ ,  $p=.02$ ). After controlling for creative self-efficacy as a mediator, the relationship between fixed creative mindset and solution originality became nonsignificant ( $b=.12$ ,  $SE=.10$ ,  $p=.20$ ). Bootstrapping showed that the unstandardized indirect effect of fixed mindsets on solution originality was significant at .06 with 95% confidence intervals ranging from 0.14 to 0.01, providing support that fixed mindsets exert an indirect effect on solution originality through creative self-efficacy. Overall, the results of the mediation analyses using fixed creative mindsets provide support for hypothesis 5 (see Figure 4).

## **DISCUSSION**

As the relationship between creative mindsets and creativity has only recently been investigated, the purpose of this study was to investigate creative self-efficacy as a potential mechanism through which creative mindsets influence creative problem-solving. Additionally, while creative mindsets have been studied in their relation to insight problem-solving and creative achievement, no other study has investigated the relationship between creative mindsets and creative problem-solving. As creative problem-solving is frequently important to both organizational and educational settings (Shalley & Perry-Smith, 2001), this study provides insight into the importance of how creative self-efficacy and creative mindsets are related to creative performance. This study indicates that malleable creative mindsets are indeed positively related to feelings of creative self-efficacy as well as the originality and quality of solutions to creative problem-solving tasks. However, it appears that creative self-efficacy mediates the relationship between malleable creative mindsets and creativity, such that malleable mindsets are positively related to creative self-efficacy, which in turn is related to quality and originality of solutions to ill-defined problems. Similarly, we found that fixed creative mindsets are negatively related to the quality and originality of solutions, but that this relationship is mediated by creative self-efficacy. These findings have expanded our theoretical knowledge that creative self-efficacy is one mechanism through which creative mindsets relate to creative performance.

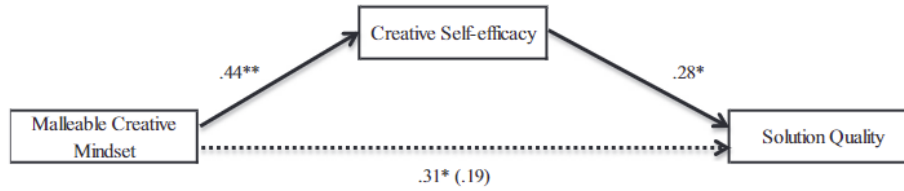


FIGURE 1. Mediation model for malleable creative mindset, creative self-efficacy, and solution quality.  $N = 152$ . \* $p < .05$ , \*\* $p < .01$ . Figure displays bootstrapped estimates.

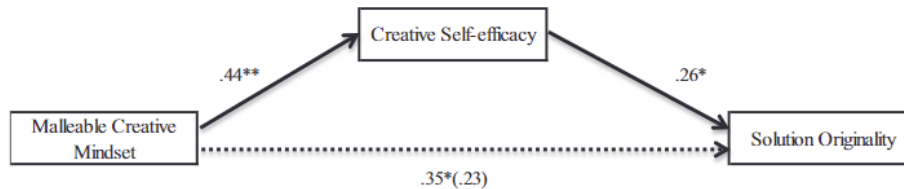


FIGURE 2. Mediation model for malleable creative mindset, creative self-efficacy, and solution originality.  $N = 152$ . \* $p < .05$ , \*\* $p < .01$ . Figure displays bootstrapped estimates.

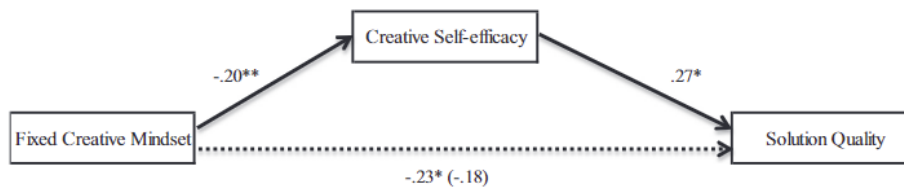


FIGURE 3. Mediation model for fixed creative mindset, creative self-efficacy, and solution quality.  $N = 152$ . \* $p < .05$ , \*\* $p < .01$ . Figure displays bootstrapped estimates.

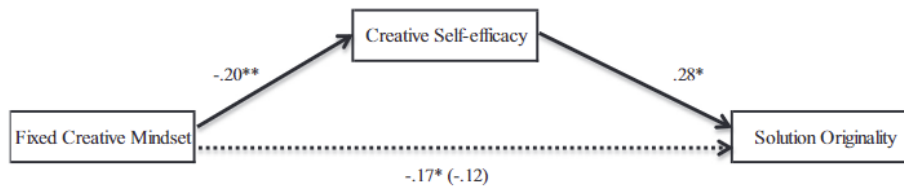


FIGURE 4. Mediation model for fixed creative mindset, creative self-efficacy, and solution originality.  $N = 152$ . \* $p < .05$ , \*\* $p < .01$ . Figure displays bootstrapped estimates.

## THEORETICAL CONTRIBUTIONS

The results of this study add to our understanding of how creative mindsets relate to creative problem-solving. Previous studies found that malleable creative mindsets were positively related to insight problem-solving while fixed mindsets were negatively related to insight problem-solving (Karwowski, 2014; Makel, 2009) as well as creative lifetime achievements (O'Connor et al., 2013). While insight problem-solving tasks have been used as a measure of creativity (e.g., Karwowski, 2014), a limitation of using these measures is that they may not be effective measures of real-world creativity as insight problem-solving tends to be more reflective of intelligence than creative behavior (Beaty et al., 2014). In contrast, creative problem-solving is a more applicable real-world measure of creativity as it has shown to be important in a variety of settings

such as education, the workplace, and in interpersonal relationships (Puente-Díaz, 2016; Reiter-Palmon & Illies, 2004; Shalley & Perry-Smith, 2001).

Another important theoretical contribution of this study is a better understanding of the mechanisms through which creative mindsets may influence creativity. As creative mindsets are a relatively new area of study, the past studies have focused on assessing the direct relationship between creative mindsets and creativity (e.g., Karwowski, 2014; O'Connor et al., 2013). Prior to this study, we knew little of the potential mechanisms through which creative mindsets may be related to creative performance. As the past studies suggested that creative self-efficacy mediated the relationship between creative potential and creativity (e.g., Karwowski, 2016), we sought to determine whether creative self-efficacy mediated the effect of creative mindsets on individual creativity. From the results of this study, it appears that one's perception of the malleability of creative ability is associated with perceptions of their creative self-efficacy, which is positively related to their creative problem-solving ability. Conversely, fixed mindsets tend to negatively relate to creative self-efficacy, which is associated with lower performance on creative problem-solving tasks.

## **LIMITATIONS**

One of the most evident limitations of this study is in regard to the low-internal consistency shown in the malleable mindset scale ( $\alpha=.50$ ). While we were able to find the hypothesized relations in this study, the low-internal consistency of this scale may decrease the chances of finding other relationships that exist between malleable creative mindsets and other measures of creative performance. During the scale's development, Karwowski (2014) also reported the internal consistency to be somewhat low ( $\alpha=.65$ ). However, while the internal consistency of the scale is somewhat low, we were still able to find significant results regarding creative mindsets, suggesting that this is not a major concern.

In addition, this study was limited by a cross-sectional design. Consequently, it is not possible to determine the time precedence of creative mindsets to creative self-efficacy or whether creative mindsets are a cause of creative self-efficacy. Future research may address this limitation by introducing an intervention to determine whether influencing one's malleable mindset consequently increases creative self-efficacy. Longitudinal research on creative mindsets can also determine the stability of these implicit theories. Additionally, common method bias is a potential problem in cross-sectional research, in which correlations may be inflated due to method variance. The creative mindset and creative self-efficacy measures use both Likert-type response scales, which may have increased the strength of correlations between these scales as a function of measurement. However, as a procedural remedy, questions were counterbalanced in this study, which may alleviate some of the method biases that are due to retrieval cues prompted by question contexts (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). In addition, common method variance may have been reduced in this study due to using different methods of measurement and responses. The creative

problem-solving task required individuals to provide a creative solution to a problem rather than a response on a Likert-type scale, after which these responses were rated by trained judges. These different forms of measures may have reduced the chances of relationships noted in this study being due to common method variance (Lindell & Whitney, 2001).

A final limitation is that this sample was not large enough to conduct structural equation modeling, in which fixed and malleable creative mindsets could be placed in the same model. While this study showed that creative self-efficacy mediates the relation between each creative mindset and creative problem-solving quality and originality, there is still a great deal of variance that remains unexplained. However, recognition of this limitation may guide future research endeavors on investigating other factors that influence creative performance.

## **FUTURE RESEARCH DIRECTIONS**

Many avenues of research remain unexplored in the study of creative mindsets. As previously mentioned, we know little about how creative mindsets may differ according to various domains of creativity as well as whether people hold differing creative mindsets according to varying levels of creativity. Future research can determine whether creative mindsets differ by creative domains such as scientific discovery, art, or performance, in which case it would be most appropriate to devise creative mindset measures that reflect various domains. Similarly, if people hold different creative mindsets according to various levels of creative performance or creative achievement as suggested by Karwowski (2014), then the creative mindset scale should be revised to reflect these differing levels of creativity.

In addition, we know little about how creative self-efficacy may be related to creative mindsets at higher levels of creativity as the current studies on creative mindsets and creative self-efficacy have been limited to insight problem-solving (Karwowski, 2014) or creative problem-solving, as in the current study. Kaufman and Beghetto's (2009) Four C model provides a useful framework for determining what measures may reflect differing levels of creativity. We can, therefore, test whether creative self-efficacy still mediates the effects of creative mindsets on creative outcomes at varying levels in this model.

Another area for future research is the effect of creativity training on one's creative mindset. Mathisen and Bronnick (2009) found that creativity training significantly increased creative self-efficacy in both student and employee samples. Similarly, recent studies by Byrge and Tang (2015) and Tang and Werner (2017) demonstrated that creative self-efficacy can be increased with training. Therefore, it may also be possible that creative mindsets are influenced by exposure to training on growing one's creative ability. Creativity training would be particularly useful in organizational settings when employers seek to increase creativity among employees. A study on creativity training could then determine whether increasing employee

perceptions of the malleability of creative ability actually lead to higher levels of creative performance. In addition, longitudinal studies on the effects of training on creative mindsets may determine whether training has a lasting effect on mindsets.

Another consideration for future research is that creative mindsets refer to general perspectives of how creativity is malleable or fixed. In contrast, creative self-efficacy specifically regards how one feels about their own creative capacity and ability to be creative. It may be useful to determine whether individuals see the malleability and fixedness of their own creative ability as differing from their perspectives of the malleability of the general population's creative ability. As individuals hold both creative mindsets simultaneously (e.g., Karwowski, 2014), they may hold differing views of the malleability of their own creative ability as compared to the general population, which may then influence their creative self-efficacy. Understanding this relationship may yield insight into how creative self-efficacy can be influenced by antecedent individual differences. Furthermore, it may be valuable to assess the perceived level of effort that one puts into creative tasks and determine whether one's perceived creative effort influences the relationship between creative mindsets and creativity. It is possible that those holding strong fixed creative mindsets may be less willing to exert effort on creative tasks if they feel their abilities cannot be further developed.

## **CONCLUSION**

Studies have shown malleable creative mindsets to be positively related to creativity, while fixed mindsets are negatively related. Rather than focus on the direct relationship between mindsets and creativity, this study is the first to investigate creative self-efficacy as a mechanism through which creative mindsets influence creative problem-solving ability. The results of this study show that creative self-efficacy mediates the relationship between creative mindsets and creative problem-solving quality and originality, expanding our understanding of how creative mindsets operate through other self-concepts of creativity. This finding has application in both educational and organizational settings in which we can better understand how increasing the malleability of one's creative mindset may also increase their perceptions of their capability to be creative, which in turn increases their actual creativity.

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