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Adapting the values affirmation intervention to a multi-stereotype threat framework for female students in STEM

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Abstract

We examined if an adapted version of a brief social psychological intervention following a multi-threat framework can enhance the mental task performance of female college students under stereotype threat. In experiment 1, under self-as-target stereotype threat, as expected, students who were exposed to the self-affirmation intervention had the highest task performance. However, under group-as-target stereotype threat, we found similar performances of the students in both the self-affirmation and group-affirmation conditions compared to control condition. In experiment 2, we showed that the extent a female student is identified with her gender group moderates the effectiveness of the group-affirmation intervention. The current research encourages researchers to consider different understandings of self while instituting common stereotype threat interventions rather than taking a uniform approach.

Keywords Stereotype threat · Values affirmation · Gender gap · Self-affirmation · Gender identification · STEM

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1 Introduction

Female students in science, technology, engineering, and mathematics (STEM) are more likely to drop out of school compared to male students, get lower exam grades in courses such as physics and perform worse than male students in quantitative tests, especially in settings characterized by gender biases (Strenta et al. 1994; Pollock et al. 2007; Steele et al. 2002; Camp et al. 2019). Even though structural factors contribute to these discrepancies, psychological processes such as stereotype relevant worries have also been suggested as playing a significant role (Walton and Spencer 2009). Stereotype threat research demonstrated that a concern that one's actions can be viewed through the lens of a negative stereotype may undermine performance in a negatively stereotyped domain (Steele and Aronson 1995). In support of the stereotype threat explanation, a large body of studies have demonstrated that the salience of negative stereotypes about one's identity group systematically impact performance on evaluative tasks in a given context (Appel and Kronberger 2012; Steele and Aronson 1995; Steele 1997; Aronson et al. 1999; Scherbaum et al. 2011). For example, experimental studies have shown that even though female and male students had similar performance on an intermediate level math test, in the case of more advanced problems, female students performed worse than their male counterparts (Gallagher et al. 2000; Kimball 1989). Similarly, Spencer et al. (1999) found that women and men performed similarly when the gender differences regarding performance on a challenging math test were not emphasized. However, when women were told that test result had shown gender disparities in the past, they performed worse than men. Good et al. (2008) showed the detrimental effect of stereotype threat even among female students who are highly motivated and proficient in math. They found that female students in the stereotype nullifying condition outperformed the male students in a calculus class. However, when the test was given under a no-threat condition, male and female students performed equally well.

What are the main reasons for the attenuation of performance of the female students in stereotype threatening situations? As described above, stereotype threat is an interruptive concern; however, it does not necessarily reduce motivation in evaluative situations. Instead, it may increase the will to perform well on a given task and confute the negative stereotype about one's ingroup (Steele and Aronson 1995). Moreover, it has been revealed that participants are actually increasing their exert in a situation characterized by stereotype threat (Jamieson and Harkins 2007, 2009, 2011; Moè et al. 2009). Nevertheless, more effort does not necessarily mean better performance. Whenever a negative stereotype becomes salient, the motivation to do well generates distractions in one's thoughts. Students focus on the self-evaluative implication of the task rather than the academic experience. This, in turn, reduces female students' performance results due to the threat of confirming the negative stereotype about their ingroup (see Smith and Hung 2008; Schmader et al. 2008). In further support to this claim, it has been shown that women who were exposed to stereotype threat reported more negative math-related thoughts, compared to women who were not (Cadinu et al. 2005).

Furthermore, the difference between the content of thoughts for stereotyped women has been evaluated as the indication of the lower performance. It has been suggested that in stereotype threatening situations, disruptive thoughts retain the executive resources of female students, which are required to accomplish cognitively demanding tasks and thus undermine their academic outcomes (Beilock et al. 2007; Johns et al. 2008; Rydell et al. 2009; Schmader et al. 2008; Schmader and Johns 2003).

Stereotype threat is situational in nature. Hence, a substantive number of interventions that are believed to be successful in eliminating these situational barriers, thereby buffering against the detrimental effect of stereotype threat (Spitzer and Aronson 2015). *Values affirmation* is one of the well-known brief social psychological interventions which received empirical support for closing achievement gaps (e.g., gender, minority) and yielding large impact as a stereotype threat intervention (Cohen et al. 2006, 2009; Martens et al. 2006; Miyake et al. 2010). This paper, using a multi-threat framework, aims to test whether (1) the values affirmation intervention works under different stereotype threats (i.e., self-as-target threat and group-as-target threat); (2) a modified version of the values affirmation intervention is better in protecting the participants against the group-as-target threat; and (3) these different versions of the values affirmation intervention are differentially effective for female participants who have high or low gender identification.

1.1 Values affirmation as a stereotype threat intervention

Self-affirmation theory posits that people are driven to preserve the perceived self-worth and self-integrity, and a global sense of adequacy (Steele 1988). Central to affirmation theory is that self-system is dynamic, and people can mobilize the psychological resources when the global adequacy and self-integrity is in the question. Values affirmation, through affirming important values unrelated to the provoking threat, invites individuals to reflect upon and express main aspects of the self and can restore their global self-view in response to a threat (see Croizet et al. 2001).

In a standard induction of affirmation, people write about important values (e.g., religion, creativity, and relationship with family and friends etc.) in which they engage in an activity that distinguishes these crucial values from the threatening domain (Steele 1988). In practice, students in the values affirmation condition are presented with a list of values, asked to select the most important value for themselves, and write about why this value is important to them by providing examples. In the control condition, they are presented with the same list of value but asked to select the least important value for themselves and write about why this value might be important to someone else (Cohen et al. 2006; Covarrubias et al. 2016; Martens et al. 2006; Miyake et al. 2010). Variations have shown that interdependent framing of these values affirmations (e.g., values important to me and my family) are beneficial for students from traditionally interdependent cultural contexts (Cai et al. 2012; Covarrubias et al. 2016). Key to these manipulations is that they are self-generated and allow individuals to reflect the standards they use to evaluate their global self-view, resulting in more adaptive reactions to threats (Sherman 2013).

As previously mentioned, stereotype threat is a steady source of academic underperformance when one's social group—such as a gender group—is devalued. Values affirmation interventions can make threats, such as concerns about being intellectually inferior, less psychologically disruptive by expanding the bases of self-worth prominent at times of these threats (Steele 1988). This, in turn, enables underrepresented students to focus on the academic tasks, rather than self-evaluative implications of the tasks at hand.

Studies using values-affirmation intervention have found that these brief but substantive acts of writing about one's important values protect against psychological stress of stereotype threat (Sherman et al. 2009) and in turn improve academic performance of female students (Martens et al. 2006; Miyake et al. 2010; Shapiro et al. 2013). For example, Martens et al. (2006) investigated the effects of self-affirmation on the task performance of women under stereotype threat. Women college students were first randomly assigned to one of two stereotype threat conditions in which a difficult math test was described as either diagnostic (stereotype threat) or non-diagnostic (no threat control condition) of math intelligence. Furthermore, women were randomly assigned either to self-affirmation condition or control condition. They found that women performed more poorly on a difficult math test when it was described as diagnostic of math intelligence compared to when it was described as non-diagnostic. However, when women under stereotype threat affirmed a value (different from math), they performed at levels comparable to women in no threat control condition. Research on women in a college-level introductory class also showed that values affirmation significantly reduced the gender performance gap and elevated women's grades from the C to B range (Miyake et al. 2010). These findings suggest that engaging in a values affirmation task protected female students' outcomes against the detrimental effects of negative stereotype threats.

1.2 Adapting the values affirmation intervention to different stereotype threats

The studies reviewed above demonstrate that stereotype threat has been conceptualized and mostly treated as a single construct by many researchers, such that it is believed that stereotype threat is experienced similarly across individuals, groups, and situations. However, the *Multi-Threat Framework* (Shapiro and Neuberg 2007; Shapiro 2011; Shapiro et al. 2013) emphasized the importance of multiple and qualitatively distinct stereotype threats and outlined six different stereotype threats that arise from an evaluation of two dimensions: (1) the target of the stereotype threat (i.e., the self or the group) and (2) the source of the stereotype threat (i.e., the self, outgroup others or ingroup others). From the perspective of the target of stereotype threat dimension, in a typical stereotype relevant situations one can either worry about the way the performance will reflect upon the abilities of one's group (i.e., group-as-target stereotype threats) or one's personal ability and capacity (i.e., self-as-target stereotype threats; Shapiro and Neuberg 2007; Shapiro 2011; Shapiro and Williams 2011; Shapiro et al. 2013). Indeed, *the group* can be targeted by the stereotype threat, in which concern centers on whether one's performance reflects on the abilities of one's group, thereby expressing whether the stereotype about that

particular group is true either in one's own eyes or in the eyes of others. *Self* also can be targeted by the stereotype threat. That is, when the stereotypical situations become salient, one may also fear to be a stereotypic member of the particular group (e.g., either in one's own eyes or in the eyes of others) with performance as the potential representation of one's own personal abilities (Shapiro et al. 2013). In many studies, stereotype threat is conceptualized either as a concern reflecting on group abilities, in which the stereotyped group's members feel more anxiety that they will prove the negative stereotype about their group (i.e., group-as-target stereotype threat; Aronson and Lustina et al. 1999). Consistent with that conceptualization, participants are told that their performance on a particular task will be evaluated as a measure of their group's capabilities (Cohen and Garcia 2005; Steele et al. 2002; Schmader and Johns 2003; Marx et al. 2005). Alternately, threat is framed in terms of how performance on a particular task might represent one's personal lack of abilities and the pressure of being judged in the case of performing poorly (i.e., self-as-target stereotype threat; Steele et al. 2002). Consistent with this explanation, participants are told that their performance in a particular task will be evaluated as a measure of their personal capabilities (Steele and Aronson 1995).

Shapiro et al. (2013) propose that Multi-Threat Framework helps to make predictions regarding the specific type of interventions that should be effective or ineffective in reducing the disruptive effect of group- or self-as-target stereotype threats. It has been theorized that self-as-target stereotype threats are rooted in concerns about one's personal abilities and capabilities, which raises a threat to a global self-integrity. Therefore, values affirmation is anticipated to diminish the self-evaluative implications of a poor performance by increasing the self-integrity and self-worth. However, values affirmation is not expected to be successful in the case of group-as-target stereotype threats because it has been argued that values affirmation is a strategy to sustain one's self-integrity and self-worth and would be useless when one's concern centers on the reputation of one's group. Hence, values affirmation interventions have been thought not to yield a successful result in the case of group-as-target stereotype threats. In the research reported here, we suggest a new intervention strategy regarding the specific type of stereotype threats. Although previous studies demonstrate that values-affirmation intervention protected only against self-as-target stereotype threats (Shapiro et al. 2013), we propose that an affirmation intervention will also protect against group-as-target-stereotype threats and improve performance when it involves the affirmation of values important to the group rather than the self.

1.3 Group values affirmation

There may be some differences between the members of a particular social group, however, they may still share common social identification (Sherman et al. 2007). Individuals are more prone to protect and support their group when they developed identification with their group (Tajfel and Turner 1979). People act according to and support their groups because groups (which are important to individuals) are seen as a part of their self, as well (Tropp and Wright 2001; Sherman et al. 2007). In other

words, people may define their selves based on their valued groups, which suggests that self and valued groups are highly aliasing constructs (Smith et al. 1999). Not only can being a member of a group lead to defensive and supportive acts on behalf of that group, but also one's group can serve as a psychological resource when one needs to confront the situations threatening their group identity (Sherman et al. 2007). Thus, in the face of a group threat, values important to the group may similarly function as values important to the self (Sherman et al. 2007). With this reasoning, using values affirmation as a framework (Sherman and Cohen 2006; Steele 1988), we proposed that a modified version of self-affirmation which we called "group-affirmation" (affirming values central to the group) increases the task performance in the case of group-as-target stereotype threat.

Moreover, previous studies have demonstrated that strategies that are developed through the modification of values affirmation intervention may have beneficial results for members of certain groups (Stephens et al. 2012a; Covarrubias et al. 2016). For example, research on cultural reframing showed that cultural pairs boost identity protection for students who endorse mismatching cultural models of education, and in turn increase their performance (Covarrubias et al. 2016; Stephens et al. 2012a, b). More specifically, culture-specific affirmations, also known as interdependent affirmations, enhanced the performance of students from interdependent backgrounds, which enhances connectedness with important others (e.g., family members, close friends; Markus and Kitayama 1991).

In the current research, we suggest that self-affirmation and group-affirmation should enhance the task performance of female college students following the stereotype threat. Specifically, group-affirmation is likely to decrease the compulsion of positively reflecting the group, we expected that group-affirmation intervention would decrease the potential negative effects of group-as-target stereotype threat. In contrast, self-affirmations are considered to protect against the evaluative implications of self-related threats (Shapiro et al. 2013), we expect that self-affirmation intervention would decrease self-as-target stereotype threat.

While all female students may recognize their membership in the social category as female students, there is presumably variation in the extent to which they appraise this category membership to be a central or important part of their social identity. *Social identity theory* suggests that group identity is one of the most crucial part of the self-concept. When group identities are threatened by unpleasant comparisons, individuals are more prone to keep positive social identities (Tajfel 1981). Since negative stereotypes characterize particular groups as inferior to others in terms of specific dimensions, members who feel themselves to belong to these groups are presumably to experience a threat to their social identity. Under these circumstances, individuals who have high identification with their social groups are more inclined to strive psychological and behavioral methods to preserve and sustain their social identity than who have low identification with their social groups (Schmader 2002). In fact, research investigating stereotype threat in females (Brown and Pinel 2003; Eriksson and Lindholm 2007; Keller and Molix 2008; Schmader 2002) showed that more identified women are more sensitive and vulnerable to stereotype threat. Thus, making gender identity more salient may undermine female students' performance. For example, Danaher and Crandall (2008) found female students' performance on

the test was lower when they were asked to state their gender at the beginning of the exam compared to female students who were asked to indicate their gender after completing exam. Thus, how female students define the characteristics of their gender group as identifying themselves is critical to understanding the consequences of group-affirmation in an educational context. In the present study, we anticipate that group identification with the gender group will moderate the effect of group-affirmation. Specifically, female students who have a high identification with their gender group are expected to perform better when they affirm values central to their group compared to female students who have low identification.

In the current experiments, we build and extend prior research on stereotype threat and values-affirmation intervention in three ways. First, some studies showed that modification (i.e., culture-matching, or cultural reframing) of interventions has beneficial results for certain groups. Through cultural reframing, cultural pairs boost identity protection for students who endorse incompatible cultural models of education, and in turn increase performance (Covarrubias et al. 2016; Stephens and Fryberg et al. 2012a; Stephens and Townsend et al. 2012b;). For example, Covarrubias et al. (2016) found that Latino college students who completed an interdependent self-affirmation outperformed Latino students who completed an independent self-affirmation intervention, and outperformed European American students regardless of affirmation condition. Second, although the self-affirmation intervention has proven effective in increasing motivation and performance in the case of self-as-target stereotype threat, it has not previously been modified and implemented to boost motivation and performance in the case of group-as-target stereotype threat. Indeed, there is a reason to investigate the modified version of self-affirmation; namely, group-affirmation against the group-as-target stereotype threat. Third, values affirmation interventions that target the gender achievement gap regarding academic performance mostly have been designed and tested in Western cultures, especially in the United States. Despite their increasing popularity, we have limited knowledge about their effectiveness when transported to countries different from where they originated. Cultural norms and values related to gender practices are considered to affect acceptability, adaptability, and effectiveness of this brief evidence-based intervention. Therefore, testing the self-affirmation and group-affirmation interventions in a sample different than the Western samples will contribute to the generalizability of the findings to the other populations, as well.

1.4 The present study

The current paper tests whether self- and group-affirmations are differentially effective in increasing performance under specific forms of stereotype threat. We address three primary questions about these values affirmation interventions: (a) Can the *self-affirmation* intervention enhance female college students' performance when the stereotype threat targets their self? (b) Can the *group-affirmation* intervention enhance female college students' performance when the stereotype threat targets their gender group? and (c) Is the effect of the group-affirmation intervention moderated by identification with the gender group? We tested our specific hypotheses

across two experimental studies in which they explored female college students' performance on a challenging mental rotation task.

All procedures performed in the following two studies involving human participants have been thoroughly examined and approved by the Ethics Committee for Social Sciences of Koc University. Informed consent was obtained from all participants before inclusion in the study. Additionally, the authors declare that they have no conflict of interest.

2 Study 1

The first study investigated whether different forms of the values affirmation intervention (i.e., self-affirmation, group-affirmation) would impact female college students' task performance following relevant stereotype threats. Female students were first exposed to a self-as-target stereotype threat, group-as-target stereotype threat, or no threat condition and then to self-affirmation, group-affirmation, or control exercise. We predict that affirming values that are important to their gender group is likely to enhance female students' performance when their gender group is under threat (Sherman et al. 2007), while self-affirmation intervention will protect students against evaluative implications of threats to self-integrity (Sherman and Cohen 2006). Therefore, we hypothesize that students under the group-as-target stereotype threat condition will perform better in the mental rotation task when receiving the group-affirmation intervention, but not the self-affirmation intervention, as compared to the students in the control group. Similarly, we propose that students in the self-as-target stereotype threat condition will perform better in the mental rotation task when receiving the self-affirmation intervention, but not the group-affirmation intervention, as compared to the control condition. Additionally, since values affirmation intervention is designed to alleviate the perceived stereotype threat, we hypothesize that there will be no intervention effect under the no-stereotype threat condition.

2.1 Method

2.1.1 Participants and design

Ninety undergraduate female students (M age = 21.88, SD = 1.34) from a small research university participated for extra course credit. Sample size was calculated using g-power software with 0.80 statistical power using large effect size that has been reported in the similar studies of value affirmation (Covarrubias et al. 2016; Miyake et al. 2010; Shapiro et al. 2013).

Students were first randomly assigned to one of the two types of the stereotype threat or no-stereotype threat conditions, and then to one of the three intervention conditions. Thus, the experiment was a 3 (stereotype threat: self-as-target, group-as-target, no-threat) × 3 (intervention: self-affirmation, group-affirmation, control) between-subjects design with a total of 9 conditions.

2.1.2 Materials and procedure

Students were recruited into a computer lab and received an overview of the study, which actually induced the stereotype threat manipulation before receiving the intervention. The stereotype threat manipulation was adapted from Shapiro et al. (2013). The group-as-target stereotype threat framed the mental performance test to be taken as a measure of women's abilities, whereas the self-as-target stereotype threat framed the same test as a measure of the test taker's personal abilities. Students assigned to a group-as-target stereotype threat condition read the following instructions:

> In today's session, we would like to get a measure of intellectual ability for male and female students by having you take an intellectual ability test … Your performance on this test will be used to help us establish intellectual performance norms for female and male students. After the test, we will provide you with feedback about females' performance relative to males' performance and ask you some questions about test taking.

Students assigned to a self-as-target stereotype threat condition read the following instructions:

> In today's session, we would like to get a measure of your intellectual ability by having you take an intellectual ability test … Your performance on this test will be used to help us establish your personal intellectual ability. After the test, we will provide you with feedback about your performance relative to other students and ask you some questions about test taking.

Students were informed that they would work on two ostensibly unrelated tasks. The first task was the values affirmation intervention. Students were given the same list of values (e.g., athletic ability, being good at art, creativity, living at the moment, membership in a club, music, politics, relationships with family and friends, religious values, sense of humor) used in the previous values affirmation studies (Cohen et al. 2006, 2009; Covarrubias et al. 2016). Students were then asked to choose one value that was "most important to you" (self-affirmation), "most important to your gender group" (group-affirmation), or that was "least important to you" (control condition). Students in the self-affirmation and group-affirmation conditions were also asked to give a written explanation of why this value was important to them or to their gender group by providing real life examples. Students in the control condition were asked to write about why the value they have chosen might be important to someone else.

Students then completed the mental performance task. Performance was measured using the Vandenberg and Kuse's (1978) Mental Rotation Test, updated under the guidance of M. Peters (Peters et al. 1995). The task consists of 24 items. Each item had a target image and four comparing images. Within four comparing images, two of them were always the rotated versions of the target image, and the remained two were always distinct than the target image (Martens et al. 2006). Students were given an instruction to rotate the images in their

mind to tick the two comparison images that they believe match the target image. Additionally, students were informed that both correct comparison images needed to be marked in order to answer the question correctly. All students were guided through a practice page before the actual testing phase. Students had 12 min to work on the test and try to be accurate at the same time as quickly as possible (Martens et al. 2006).

Students were then asked demographic questions (e.g., age, gender, major, seniority, parents' education). After the completion of all tasks, students were fully debriefed and given course credits. Participation in the study took approximately 45 min.

2.2 Results

A 3 (stereotype threat: self-as-target, group-as-target, no-threat) × 3 (intervention: self-affirmation, group values-affirmation, control) between-subjects analysis of variance (ANOVA) was conducted, with students' score on the mental rotation task (number correct) serving as the dependent variable. Results showed a main effect of stereotype threat, F (2, 81) = 6.43, $p = 0.003$, $\eta^2 = 0.16$, and a main effect of intervention F (2, 81) = 5.03, $p = 0.009$, $\eta^2 = 0.12$. However, this was not qualified by a significant interaction between stereotype threat and intervention condition, F (4, 81) = 0.40, $p = 0.80$, $\eta^2 = 0.02$.

The mean mental rotation task score for the entire group was 12.81 ($SD = 5.09$, $N = 90$), with scores ranging 3–22. As anticipated, a main effect was observed for the stereotype threat. Independent from intervention conditions, the number of questions answered correctly by the students in the no-threat condition ($M = 14.93$, $SD = 4.05$, $N = 30$) was significantly higher than the students in self-as-target stereotype threat ($M = 10.60$, $SD = 4.76$, $N = 30$), $p = 0.001$, ($d = 0.97$). The number of questions answered by the students in the self-as-target stereotype threat was marginally higher than the students in the group-as-target stereotype threat ($M = 12.90$, $SD = 5.56$, $N = 30$), $p = 0.069$, ($d = 0.44$). A significant main effect was observed for the intervention condition as well. Independent from stereotype threat condition, students in the self-affirmation condition ($M = 14.70$, $SD = 4.74$, $N = 30$) answered significantly larger number of questions correctly than the students in the control condition ($M = 10.86$, $SD = 5.33$, $N = 30$), $p = 0.002$, ($d = 0.76$). Students in the self-affirmation condition answered more questions correctly than the students in the group- affirmation condition ($M = 12.86$, $SD = 4.60$, $N = 30$), but this difference was not statistically significant, $p = 0.151$, ($d = 0.44$).

As shown in Fig. 1, the results for the simple effect of the type of intervention within the level of stereotype threat type showed that under the no-threat condition, students in the self-affirmation condition had higher scores than students in the control condition, $p = 0.130$, whereas students in the group-affirmation had similar scores relative to those in the control group, $p = 0.812$. Within the self-as-target stereotype threat condition, students in the self-affirmation condition ($M = 12.40$, $SD = 5.14$, $N = 10$) had higher scores on the mental rotation task compared to students in the control condition ($M = 9.00$, $SD = 4.13$, $N = 10$), but this difference was

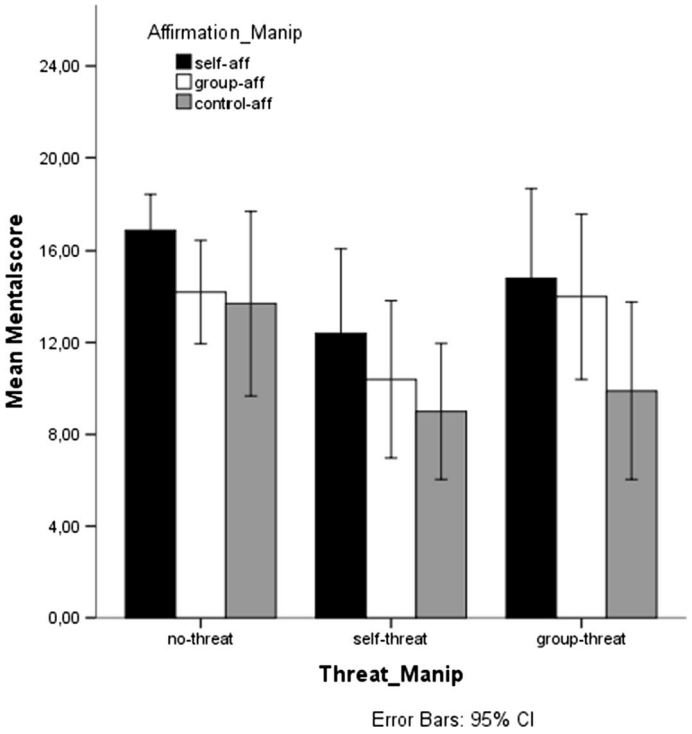

Fig. 1 Female students' performance on a mental rotation task as a function of the type of the stereotype threat and the type of intervention

not statistically significant, $p = 0.108$. The difference in mean scores was smaller but non-significant between students in the group-affirmation ($M = 10.40$, $SD = 4.78$, $N = 10$) and control conditions, $p = 0.506$. Under the group-as-target stereotype threat, students both in the self-affirmation ($M = 14.80$, $SD = 5.47$, $N = 10$) and group-affirmation ($M = 14.00$, $SD = 5.03$, $N = 10$) conditions had higher scores compared to students in the control condition ($M = 9.90$, $SD = 5.40$, $N = 10$), $p = 0.022$, ($d = 0.98$) and $p = 0.054$, ($d = 0.78$) respectively.

2.3 Discussion

Inconsistent with the previous research (Shapiro et al. 2013; Martens et al. 2006), exposure to a self-affirmation intervention did not buffer against the negative effects of (self-as-target) stereotype threat. However, when students were exposed to group-as-target stereotype threat, we found increased performances of the students in both the self-affirmation and group-affirmation compared to the control condition. That is, both self-affirmation and group-affirmation buffered against the negative effects of group-as-target stereotype threat and led to increased performance on the mental rotation task. Study 1 further revealed that the self-affirmation intervention was also effective when

participants were not exposed to stereotype threat. The reason that we observe an intervention effect under the no stereotype threat condition may be that the female students may still be experiencing stereotype threat, even though we did not tell them that their performance would be evaluated, by just being engaged in a performance task (Steele and Aronson 1995; Brown and Pinel 2003).

3 Study 2

Study 1 provided initial evidence that the group-affirmation intervention was marginally effective under the group-as-target stereotype threat, yet, contrary to our expectation the effect size of the group-affirmation was smaller than the self-affirmation intervention. We argue that this may occur because of the moderation effect of the identification with the gender group. That is, group affirmation may be effective especially for female students who are identified with their gender group. Hence, study 2 examined the moderating role of gender identification. Female students were randomly assigned to a gender identification manipulation (i.e., low, and high gender identification) and then were randomly assigned to one of the three intervention conditions (i.e., self-affirmation, group-affirmation, control). We anticipated that group-affirmation intervention would lead to better performance on the mental rotation task for female students who were manipulated to have higher identification with their gender group as compared to students who were manipulated to have lower identification with their gender group. We hypothesize that students in the high group identification condition would perform better on the mental rotation task under the group-affirmation intervention as compared to the self-affirmation intervention or control conditions, and students in the low group identification condition will perform better on the mental rotation task under the self-affirmation intervention as compared to the group-affirmation intervention or control conditions.

3.1 Method

3.1.1 Participants and design

Sixty-six undergraduate female students (M age = 21.56, SD = 1.98) participated for extra course credit. Sample size was calculated using g-power software with 0.80 statistical power in terms of large effect size that has been reported in the similar studies (Shapiro et al. 2013).

Students first were randomly assigned to one of the two gender identification conditions and then to one of the three intervention conditions. Thus, the experiment was a 2 (gender identification: low-identification, high identification) × 3 (intervention: self-affirmation, group-affirmation, control) between-subjects design.

3.1.2 Materials and procedure

Students were recruited into a computer lab and received gender identification manipulation before receiving the intervention. The identification manipulations used in the current study adapted from existing research (Miron et al. 2010). Students read the following instruction for the high identification condition.

> Please describe to what extent you feel similar to female students in your college by providing an example. Please describe if there are any other similarities that you share with female college students.

For the low identification condition students read the following instruction.

> Please describe to what extent you feel dissimilar to female students in your college with providing an example. Also, please describe if there are any other differences that you share with female college students.

After the gender identification manipulation, Study 2 utilized the same procedure as in Study 1. Students were assigned to one of the three conditions of the values affirmation (i.e., self-affirmation, group-affirmation, control condition) and then completed the same mental performance task as in Study 1 and the demographics questionnaire.

3.2 Results

A 2 (gender identification: low, high) × 3 (intervention: self-affirmation, group values-affirmation, control) analysis of variance (ANOVA) was conducted, with students' scores on the mental rotation task (number correct) serving as the dependent variable. There was no main effect of gender identification, F (1, 60) = 1.14, $p = 0.29$, $\eta^2 = 0.02$ (low gender identification condition $M = 13.66$, $SD = 4.80$, $N = 33$ and high gender identification condition $M = 12.39$, $SD = 5.70$, $N = 33$), and no main effect of intervention condition, F (2, 60) = 2.37, $p = 0.10$, $\eta^2 = 0.08$ (group-affirmation $M = 14.86$, $SD = 5.69$, $N = 22$; self-affirmation $M = 12.00$, $SD = 5.18$, $N = 22$; control condition $M = 12.22$, $SD = 4.61$, $N = 22$).

These main effects were qualified by the anticipated interaction between gender identification and intervention condition though, F (2, 60) = 5.51, $p = 0.006$, $\eta^{22} = 0.18$. As shown in Fig. 2, under the high identification condition, students in the group-affirmation intervention condition ($M = 16.36$, $SD = 4.47$, $N = 11$) performed significantly better than students in the self-affirmation ($M = 8.72$, $SD = 4.79$, $N = 11$), $p = 0.000$, ($d = 1.64$) and control conditions ($M = 12.09$, $SD = 5.35$, $N = 11$), $p = 0.043$, ($d = 0.86$). Students in the control condition performed better than students in the self-affirmation condition, but this difference was not statistically significant, $p = 0.109$. Under the low identification condition, the difference in mean scores was smaller but non-significant between students in the self-affirmation intervention condition ($M = 15.27$, $SD = 3.13$, $N = 11$) and group-affirmation ($M = 13.36$, $SD = 6.5$, $N = 11$), $p = 0.359$ ($d = 0.37$)

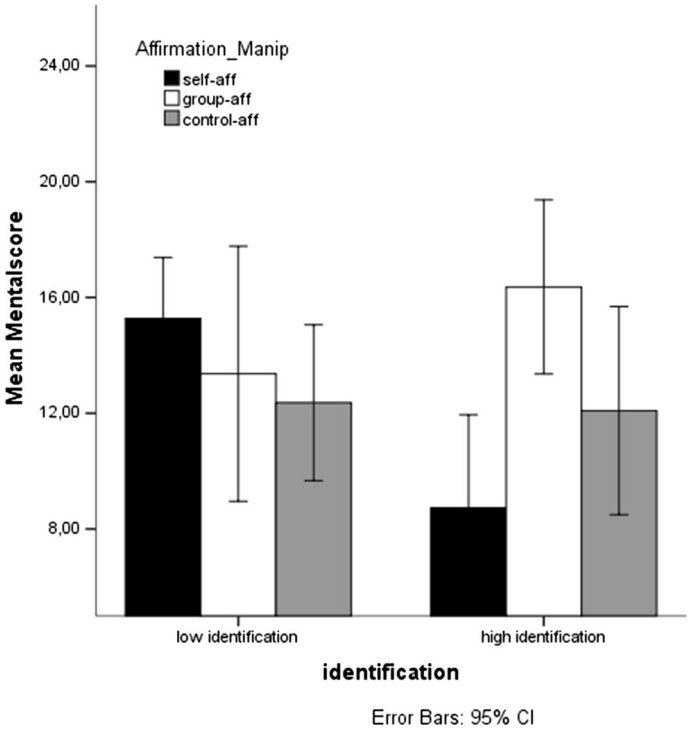

Fig. 2 Female students' performance on a mental rotation task as a function of identification with the gender group and the type of intervention

and control condition ($M = 12.36$, $SD = 4.00$, $N = 11$), $p = 0.164$ ($d = 0.81$). Also, under the low identification condition, students in the group-affirmation had similar scores relative to those in the control group, $p = 0.630$ ($d = 0.18$).

3.3 Discussion

Experiment 2 provided evidence that the group-affirmation intervention increased the scores of the female students who were highly identified with their gender group. This suggests that a group-affirmation does not simply improve the scores of female students, but that the effect of this type of affirmation may be more specific for students who are highly identified with their gender group than for students who are less identified with their gender group. Furthermore, the results indicate that for female students who are highly identified with their gender group, the self-affirmation intervention may even be risky and produce an adverse effect. These results are critical in terms of designing interventions to improve the performance of specific groups (Cohen and Garcia 2014).

4 General discussion

The purpose of the present research was to test the performance of a modified version of a values affirmation intervention; namely, a group-affirmation intervention in the case of group-as-target stereotype threat. Study 1 revealed that group-affirmation protected female college students against group-as-target stereotype threat. Self-affirmation interventions, which are believed to effectively reduce stereotype threat, has been proposed to work only in the context of self-as-target stereotype threat. However, in the current study, we demonstrated that a modified version of values affirmation (i.e., group-affirmation) protected against group-as-target stereotype threat, as well.

Although we did not anticipate it, in Study 1 we observed that self-affirmation also protected female students against group-as-target stereotype threat, inconsistent with previous studies (Shapiro et al. 2013). Although self-affirmation and group-affirmation interventions were similarly effective against group-as-target stereotype threat, the processes underlying self-as-target or group-as-target stereotype threats may not be the same and therefore these interventions targeting those threats are not interchangeable. We argue that these results can be explained best in terms of a connectionist model of self-ingroup overlap in which people may define their self in terms of their valued groups (Tropp and Wright 2001). For instance, Aron et al. (1991) found that participants were faster on self-descriptive judgments for traits on which participants match with their ingroups, rather than mismatched. This basic pattern of reaction time facilitation was also replicated for other types of groups, such as university affiliation (Smith et al. 1997). These findings suggest that ingroups become a part of the self in which group features affect self-reports. Self can also become part of a mental representation of the ingroup (Smith et al. 1999). More specifically, self-characteristics may influence people's judgments about their ingroup. Studies that have tested the model of self-ingroup overlap argue that the view of self and group representations is linked. Individuals sometimes see or describe themselves in terms of varied personal identities, and other times as group members that are essentially interchangeable (Smith et al. 1999). The connectionist model of representation offers convincing explanations of context sensitivity (Smith 1998). In one situation, for example, individuating characteristics may be most salient; however, in another situation, group characteristics may be most salient. In terms of the fundamental idea that group membership includes some sort of self and vice versa, it is very possible that in our results, self can become a part of one's ingroup. Although self-affirmation was tested as an intervention against group-as-target stereotype threat, group characteristics may implicitly get accessed and self-affirmation may increase participants' performance in the case of group-as-target stereotype threat, as well.

In addition, in Study 1, which included no-stereotype threat-intervention condition, we offered a more detailed model of stereotype threat and specific intervention strategies targeted to those threats and found that there was no intervention effect when participants were not exposed to any kind of threat. This finding

is important for the implications of stereotype threat research. Namely, in stereotype threat research, it has been widely shown that salience of negative stereotype threat about one's identity or identity group in a given context systematically reduces one's performance (Schmader et al. 2008; Spencer et al. 1999; Good et al. 2008; Dahaner and Crandall 2008; Beilock et al. 2007; Schmader and Johns 2003). Previous research has also revealed that self-affirmation intervention is effective at eliminating negative effects of stereotype threat and preserving performance without the availability of a stereotype threat induction (Cohen et al. 2006, 2009; Miyake et al. 2010). These studies tested the intervention effect in terms of the assumption that negatively stereotyped groups' members are likely to worry about confirming the negative stereotypes about their ingroups. However, our results suggest that group-affirmation interventions were only effective when the specific threat was salient for the specific stereotyped groups. It seems that individuals who are members of a negatively stereotyped group were unaffected by the negative stereotypes about their ingroups until these negative stereotypes became salient.

In the second study, we tested the moderation effect of gender identification. We demonstrated that group-affirmation increased the performance of the female college students when they were highly identified with their gender group. This finding highlights that the targets of the adapted version of the self-affirmation intervention matter; namely, in this case, the group-affirmation worked best. The practical implication in here is clear: A failure to consider whom an intervention is designed for can lead to ineffective intervention for certain groups. We also found that under the high identification condition, students in the self-affirmation condition performed worse than the students in the control condition. This result is particularly important because it shows that self-affirmation intervention even may have a detrimental effect on students' performances who were highly identified with their gender group. As ingroup identification may be higher in collectivistic countries (Triandis 1990), this finding further emphasizes the need for culture-specific adaptations for the value-affirmation intervention.

The present set of studies advances the stereotype threat and values-affirmation intervention literature in a number of ways. First, previous research has continued to overlook the distinction between self and group as the potential target of stereotype threat. Present research provides more support for the experimental evidence of the Multi-Threat Framework (Shapiro and Neuberg 2007; Shapiro et al. 2013), showing multiple stereotype threats rather than one single threat, in which individuals can be targeted in terms of different abilities, such as group abilities (i.e., group-as-target stereotype threat) or personal abilities (i.e., self-as-target stereotype threat). Second, the present research provides evidence that group-as-target stereotype threat can be reduced using values affirmation techniques. Prior studies demonstrated that self-affirmation works only in the context of self-as-target stereotype threat. We provide evidence that modified version self-affirmation (i.e., group-affirmation) works in the context of group-as-target stereotype threat. Specifically, participants in the group-affirmation condition were instructed to reflect on why a value may be important to their gender group instead of themselves. Although participants were given the same list of values, when the instruction refers to "their gender group," values

affirmation technique also reduced the negative effects of group-as-target stereotype threat. Third, although these studies are the first to test group-affirmation for female college students, they also provide evidence about for whom the group-affirmation would work best. Namely, Study 2 revealed that a group-affirmation increased the performance of female college students when they were highly identified with their gender group.

4.1 Limitations and future directions

The current research reinforces the importance of considering "context-specific purposes" for affirming female college students' sense of self or group and, subsequently, for enhancing their performance. Yet, there are limitations to the current studies. First, our main concern was to reduce the gender achievement gap, so we tested the effectiveness of group-affirmation in female college students. Future research should test whether group-affirmation would work to reduce other achievement gaps (e.g., ethnicity, socioeconomic status). Prior studies demonstrated that culture-specific affirmations (e.g., interdependent self-affirmation) those that highlights one's family increased performance of students from interdependent cultural background compared to a self-affirmation (i.e., Latino students; Covarrubias et al. 2016). Thus, group-affirmation may increase students' performance from specific ethnicities among highly identified group members (e.g., Latino or Black students). Second, we used a mental rotation task in order to measure students' immediate performance. Previous studies found long-term positive effects of self-affirmation (Cohen et al. 2006, 2009). Future research is needed to investigate whether group-affirmation also yield positive long-term effects for female college students. Thus, it would be important to determine the effect of this affirmation on students' grades or other measures of performance for female college students.

One critical issue not examined in the current research is that although the present studies provided some insight into why self-affirmation and group-affirmation interventions reduced the detrimental effect of stereotype threats, we did not test the mechanism explicitly. However, for the current research, we assumed that group-affirmation would be more effective when the participants' concern centers on their performance would represent their group abilities (i.e., group-as-target stereotype threat), and self-affirmation would be more effective when the participants' concern centers on their performance would represent their personal stereotypic abilities (i.e., self-as-target stereotype threat; Shapiro et al. 2013). Thus, to what extent an intervention is effective in a particular situation can give clues for the processes underlying each of these interventions. However, future research should examine a more direct test of these processes, considering the connectionist model of self-group overlap.

4.2 Conclusion

In the present research, we assessed the efficacy of two stereotype threat interventions (i.e., self-affirmation and group-affirmation) based on Multi-Threat Framework

(Shapiro et al. 2013). With this research, we hoped to facilitate a complete understanding of stereotype threats and to develop more effective interventions to mitigate the detrimental effect of stereotype threat for stigmatized groups. Furthermore, through the modification of the interventions, we hope to contribute the transportability and the adaptability of the original interventions to different groups and cultures. Thus, the current research suggests taking caution using a uniform approach to the application of psychological interventions and instead encourages researchers to consider different understandings of self while instituting common stereotype threat interventions. Taking into account students' different cultural and background contexts and modifying interventions to reflect these differences would ultimately be more beneficial, enabling researchers to develop the most effective interventions, thereby reducing the pernicious effect of stereotype threat and closing achievement gaps.

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