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Influences of stereotype threat on the mathematics performance of high school athletes

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Abstract
The negative effects of stereotype threat on one's behavior and performance have been proved in stereotype research that adopted experimental manipulation. Focusing on the academic performance of student athletes, this research mainly examined the stereotype effects triggered by positive and negative impressions on high school athletes' mathematics performance, and the mediating role of self-handicapping between stereotypes and one's performance. A total of 197 high school student athletes (M = 16.55 years, SD = 0.56) who consistently joined competitive athletics training and competitions above the interschool level were collected, positive and negative conditions were simulated by the reading of short texts, and instructions were given to categorize mathematics tests as difficult or easy (the tests' content being in fact identical). Four conditions were distinguished, namely positive-easy (PE), negative-easy (NE), positive-difficult (PD), and negative-difficult (ND) conditions. A mathematics test comprising 12 questions was used as academic performance indicator. The accuracy of the answers and the participants' attempts to answer were calculated. The research results indicate that, in terms of accuracy, the interaction between stereotypes and difficulty level was nonsignificant, but the mathematical accuracy of the students who received positive conditions was significantly better than that of those who received negative conditions. In terms of the number of questions answered, the interaction between stereotypes and difficulty level was significant. The participants in the ND condition performed the worst in terms of the number of questions answered. In addition, the latter partially mediated between stereotype and mathematical accuracy. The research results confirm that student athletes are indeed affected by stereotype threat and might resort to behavioral self-handicapping by making less effort, which further affects their performance.

Keywords Student athletes · Dumb jock · Identity threat · Self-handicapping · Academic stereotypes

Introduction

Student athletes represent a special group in schools in general. They spend much of their time and energy in athletic training and competitions and at the same time, they have to face other challenges such as academia, relationship, and daily life issues. Training conflict with their studies often imposes great pressure on them in their academic adaptation. Two particular causes of their academic difficulties is the negative stereotypes held by teachers, peers, and administration personnel toward student athletes, and the overall social ambiance (Stone et al. 2012). In the United States, such negative stereotypes include the appellation "dumb jock" (Edwards 1984; Harrison 2002) or the phrase "all brawn and no brains", and in Chinese culture, one often hears negative expressions such as "strong physique and simple mind" (Li and Hsu 2018). This indicates that the pervasive student athlete stereotypes remain in the society and categorize these students as less smart than general students, not studious, and inferior in their academic performance (Moskowitz and Carter 2018; Stone et al. 2012).

Stereotype and Stereotype Threat

A stereotype designates fixed and rigid beliefs about the qualities of the members of a certain social group. Such recognitions and beliefs about particular groups might be positive or negative and are universal to some extent among people in a society (Aronson and Steele 2005; Wininger and White 2015). Several studies have proved that stereotypes affect one's perception toward oneself and others, as well as the expectations toward stereotyped group members and might also affect one's own and others' behaviors through self-fulfilling

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prophecy or other paths (Wininger and White 2015). Moreover, fearing that one's behavior or performance will confirm others' perception (stereotype confirmation) can harm one's behavior with those holding stereotypes or performance indirectly, which is called "stereotype threat" or "identity threat" (Harrison et al. 2009; Shapiro and Neuberg 2007; Steele 1997; Steele et al. 2002).

The research on stereotypes about athletes mainly focuses on elements such as gender (Hively and El-Alayli 2014) and ethnicity (Moskowitz and Carter 2018; Steele and Aronson 1995; Stone 2002). The present research addressed specifically the negative descriptions conveyed about student athletes' academic achievement or learning aptitude, that is, stereotypes such as the aforementioned "dumb jock". Some early studies have already pointed out the pervasiveness of such attitudes in the society. For example, Devine and Baker (1991) examined the different types of stereotypes and revealed that physical and athletic features were the elements most commonly commented on in general descriptions about athletes, in addition to qualities such as "unintelligent", "ostentatious", and "ambitious". Engstrom and Sedlacek (1991) also reported that students felt uncomfortable around student athletes in certain situations such as being teamed up with athletes in group study. The aforementioned results all indicate the generally negative perceptions or expectations held toward student athletes. Even trainers and instructors in immediate contact with student athletes might hold such ideas, which in turn affects their learning attitude and ambitions in their future careers (Moskowitz and Carter 2018). Griffin (2017) conducted a qualitative study that interviewing 10 Division I Black male football student-athletes about their experience and respond to negative stereotypes. The qualitative results further confirmed the impact of negative stereotypes on student-athlete academic performance.

Experimental Design Paradigm

Manipulation in experimental settings has been a specific research paradigm in stereotype research, and its viability has been proved by numerous empirical studies (Steele et al. 2002; Frantz et al. 2004; Gonzales et al. 2002; Spencer et al. 1999). Steele and Aronson (1995) were the first to investigate the effects of stereotypes such as "Black people have lower intelligence". In their research, one group of participants was told "to take a test to evaluate their abilities", a manipulation technique to activate stereotype threat. Such activation of stereotype threat through situational cues or messages has become an experimental design paradigm and research reference to understand the effects stereotype threat might have under diverse circumstances (Steele et al. 2002; Frantz et al. 2004; Gonzales et al. 2002; Spencer et al. 1999).

Although experiments and studies on stereotype threat in athletes are rare, the existing research results all demonstrate negative effects caused by such threat (Harrison et al. 2009; Jameson et al. 2007; Yopyk and Prentice 2005). Stone et al. (1999) first examined the effects of stereotypes about black and white people's performance. Different stereotype threats (ethnicity: black or white; test frame: natural athletic ability, sports intelligence) were activated through reading instructions. The research results demonstrated that when the golf task performance was framed as diagnostic of "sports intelligence", the black participants performed more poorly than the black participants in the control group. When the same golf task was described as "natural athletic ability", the white athletes' performance proved inferior to that of the white athletes in the control group.

Yopyk and Prentice (2005) first inspected the salience of competing identities in the academic context through samples of student athletes. Thirty-seven student athletes were randomly divided into groups, and different types of threat were activated through writing down experiences related to their athlete identity, student identity, or no identity. The research results were consistent with those of previous stereotype threat research. In comparison with the student identity group, the participants primed with athlete identity held lower self-esteem and performed worse in challenging mathematics tests. This is mainly due to the athlete stereotype associated with academic maladaptation. Similarly, Jameson et al. (2007) examined the negative stereotypes' effects on college athletes' academic performance by priming with different identities. The research results revealed that the participants primed with athlete identity performed worse and answered less questions correctly in the mathematics test, indicating a lower accuracy. The participants in a research by Harrison et al. (2009) comprised eighty-eight college athletes. Their identities were activated through three different questionnaire covers namely athlete-only prime condition, scholar-athlete prime condition, and neutral identity prime condition, followed by a mathematics test. The results indicated that stereotype threat had greater negative effects on female student athletes than on male ones. Similar results also revealed in Stone et al. (2012) and Riciputi and Erdal (2017), indicating the negative effects caused by stereotypes.

Although studies on the academic performance of student athletes as aforementioned consistently pointed to negative effects of stereotypes, most of these studies have mainly addressed college athletes unfortunately. Because student athletes often begin to invest much time and energy in athletic training early in their adolescence, and added systems in Taiwan such as athlete class and recommendation of admission for student athletes, local student athletes begin to face academic deficits during their junior and senior high school years. Therefore, high school athletes in Taiwan were selected as the research objects in the present study. In addition, some studies have mentioned that an individual may have several identities at the same time, and these diverse impressions can

be positive or negative (Cheryan and Bodenhausen 2000; Shih et al. 1999). For example, Asian women might be the target of two stereotyped perceptions—"women are not good in mathematics" and "Asians are good in mathematics" —leading to different effects consequently. Other studies have suggested that positive activations by stereotypes should be examined (Harrison et al. 2009), but relevant empirical data are still lacking. Further research is needed to identify the effect of positive identity activation on student athletes.

In addition, this research examines the paths through which stereotypes affect one's performance. Research has already proved that, under certain circumstances, individuals affected by stereotype threat make less effort, complain about stress, or reduce their attempts to protect their self-worth (Davies et al. 2005; Keller 2002; Stone 2002). Such effect can be explained through self-handicapping (Harrison et al. 2009). Self-handicapping (Jones and Berglas 1978) means for an individual to find excuses in advance for failing at something in the future (claimed handicap) or make less effort (behavioral handicap) in anticipation of a possible failure in the upcoming task. When one's performance result is poor, self-worth is affected. Therefore, the main purpose of self-handicapping is to reduce one's responsibility in the case of failure. A research by Yopyk and Prentice (2005) indicated that students primed with athlete identity not only answered questions less accurately but also tried to answer fewer questions. In other words, they made less effort. In addition, research has indicated that the people subject to stereotype threat might lower their self-expectancy, which further affects their effort (Cadinu et al. 2003).

Based on the above literature review, this study first examined the stereotype effects triggered by positive/negative impressions as well as by easy/difficult instruction of the math test on high school athletes' mathematics performance. We hypothesized that participants who received the positive impression will perform significantly better than that of those who received the negative impression. Furthermore, participants will perform better if they receive the mathematics test instruction as easy. Furthermore, the second objective of this research was to examine possible the mediation role of self-handicapping. The number of questions answered in the mathematics test served as indicator for behavioral self-handicapping in this research. We hypothesized that self-handicap will serve as mediator between stereotype threats and math performance.

Method

Participants

The participants in this research comprised students from the athlete class of four high schools by purposive sampling in southern Taiwan. Student athletes in second and third grades ($M = 16.55$ years, $SD = 0.56$, age range 16–19 years) who consistently joined competitive athletics training and competitions above the interschool level were recruited. Two hundred and nine participants ($n = 209$) in total were recruited and randomly assigned to one of the four different questionnaires. One hundred and ninety-seven valid samples ($n = 197$) were obtained ultimately, including 47 in the positive-easy (PE) condition, 53 in the negative-easy (NE) condition, 50 in the positive-difficult (PD) condition, and 47 in the negative-difficult (ND) condition. Descriptive statistics for the sample was informed in Table 1.

Instruments

Stereotype Threat

Positive and negative stereotype manipulations were conducted by the reading of short texts (Davies et al. 2005). Students in the negative condition had to read a short Chinese text of approximately 500 characters about the often inferior academic level of student athletes because of the long time spent in training and competitions and greater energy consumed, leading to their description as "dumb jock". The students assigned to the positive condition group were asked to read that research demonstrated the better brain functioning and cognitive development of athletes undergoing long-term athletic training. For example, they respond faster and process messages better than their general peers thanks to their strong brains. Both texts' relevance to positive and negative impressions of student athletes were reviewed by two senior sport

Table 1 Descriptive statistics for the sample

		n	%
Grade	Second	102	51.78%
	Third	95	48.22%
Gender	Male	103	52.28%
	Female	94	47.72%
Groups	Positive-easy (PE)	47	23.86%
	Negative-easy (NE)	53	26.90%
	Positive-difficult (PD)	50	25.38%
	Negative-difficult (ND)	47	23.86%
Sport expertise	Track and field	20	10.15%
	Baseball	36	18.27%
	Basketball	26	13.20%
	Combat sports	62	31.47%
	Badminton	24	12.18%
	Others	29	14.72%
	Total	197	

Note: Combat sports included taekwondo, wrestling, and kabaddi; Others included dance, volleyball, swimming, and so on

psychology researchers and two coaches of high school teams. Modification of the words and readability of the content were made accordingly.

Math Test

Math performance was identified using a test comprised 12 mathematics questions target for students under the sixth grade. 25 items were selected first by two junior high school mathematics teachers ignorant of the research objectives. After pilot study, 12 items were reserved as formal version according to participants' responses and teachers' suggestion. Based on the literature (Harrison et al. 2009; Stone 2002), two types of instructions regarding the tests were distributed, "easy" and "difficult". The "easy" instruction stated: the following mathematics test only contains additions, subtractions, multiplications, and divisions with ample time for answering so that most of the students can complete it. The "difficult" instruction stated: the following mathematics test involves complicated calculations with limited time for answering, it is therefore unlikely all students will finish. In fact, the mathematical questions of the two versions were identical and comprised 12 items as forward mentioned.

After the manipulation process and test content were established, 15 senior high school athletes were recruited for pilot testing to verify the testing process and time provided for answering were appropriate before the testing was formally conducted.

Experimental Procedures

This study was approved by a formal research ethics committee in Taiwan (REC: CCUREC106122702). All procedures were in accordance with the ethical standards of the 1964 Helsinki declaration and its later amendments (Carlson et al. 2004). First, the teachers or trainers of the high school athlete classes were contacted. The researchers explained the research process and methods of data collection to the students and their rights as participants (such as voluntary participation, confidentiality, anonymity and so on) during the class. In compliance with the regulations of the research ethics committee, the experiment was formally conducted after the students and their parents signed informed consent forms.

The formal testing was performed by class. The participants were randomly assigned a test brochure out of the four conditions. Moreover, to ensure the students appropriately completed the content of the experimental manipulation, the questions in each part had to be filled in order, and the tester controlled the overall answering process and time. Positive and negative stereotype manipulations were first conducted after the participants filled in their background information. Students in the positive and negative conditions received different kinds of short texts as mentioned. Having read the short text, each participant was asked to write down a summary of two or three lines about the short text, which then underwent manipulation validation. Once they completed the first part, all participants took the mathematics test together. Two types of instructions regarding the tests (easy and difficult) were distributed as mentioned. The complete testing required approximately 25 min. Each of the participants having finished the test was offered a coupon worth approximately US$3.5. Professional sports psychologists debriefed all participants, explaining the research objectives and the meanings of the short texts, as well as the possible stereotype effects on one's cognition and behavior before finally giving the floor to students to ask questions and debate.

Research Quality Control and Manipulation Validation

To verify the participants appropriately read the short positive and negative descriptions as well as the instruction about the mathematics test and thus ensure the experiment result validity, the participants were asked to answer the questions in order for each part of the test in this research, and the tester controlled the time and the overall process. Regarding the stereotype manipulation validation, the participants were asked to write two to three lines to summarize what they had read after reading the short texts. A high school teacher ignorant of the research objective checked the returned questionnaires and assessed whether the answerers' summaries corresponded to the manipulation group they belonged to. If not, the answerers' questionnaires were considered invalid.

Among all participants, twelve papers were eliminated for the following reasons: five participants did not follow the indicated process for answering during the testing; the stereotype manipulation validation part was left unfilled in five questionnaires; the summaries made by two participants did not match the manipulation criteria.

Data Processing and Statistic Analysis

In this research, a mathematics test served as indicator of academic performance. Two scoring methods were used. (1) "Accuracy" was evaluated based on the number of correct responses to the 12 questions of the mathematics test; 1 point was attributed for one correct answer and the total score was 12. (2) "The number of questions answered" served as indicator of behavioral self-handicapping for this research (0 to 4 points were attributed for each question depending on the quality of the response; 0 point was given for an absence of response or a response completely irrelevant with the question; 4 points were given for complete accuracy; 1 to 3 points were granted for other types of response depending on the calculation process and logic). Two junior high school mathematics teachers ignorant of the research objectives scored the tests. The outcomes were compared. A discussion was

conducted, and adjustments were made regarding inconsistent parts. The number of questions answered in this research was the average of the points for all 12 questions obtained.

The collected data first underwent manipulation validation, and invalid samples were eliminated. Subsequently, a two-way analysis of variance was performed to examine the interaction between positive stereotypes, negative stereotypes, and the difficulty level of the test (the first aim of the study). The simple main effect was analyzed if the interaction was significant. Cohen's *d* was used as estimator of effect size and can be interpreted with the following classifications: small (0.20–0.49), medium (0.50–0.79), large (> 0.80) (Cohen 1992). In addition, based on the recommendations of baron & Baron and Kenny (1986), the mediating role of the number of questions answered between stereotype manipulation and mathematical accuracy (the second aim of the study) was validated using hierarchical regression analysis. The significance level of all statistic validations was set at $\alpha = .05$.

Research Results

Validation using the t-test revealed that the difference in terms of gender did not reach a significance level either in mathematical accuracy ($t = -.042$, $p = .967$) or the number of questions answered ($t = .752$; $p = .453$). Therefore, gender was not included as a distinction in the analyses that followed.

Test of Variance between Positive Stereotypes, Negative Stereotypes, and Mathematical Difficulty Regarding Accuracy and the Number of Questions Answered

Two-way analysis of variance was first performed to examine whether an interaction between stereotype manipulation and difficulty level manipulation existed. As presented in Table 2, in terms of accuracy in the mathematics test, the interaction between stereotypes and difficulty level was nonsignificant ($F = .312$, $p = .577$). The main effect analysis demonstrated that the difference between accuracy when answering in the positive condition and that in the negative condition reached the significance level. The mathematical accuracy of students who received the positive condition was significantly better than that of students who received the negative condition (positive: $M = 5.25$, $SD = 1.58$; negative: $M = 4.52$, $SD = 1.39$; $t = 3.417$, $p = .001$; Cohen's $d = 0.49$, medium effect size). However, in the manipulation of the difficulty level, the difference in terms of mathematical accuracy did not reach the significance level ($t = 1.414$, $p = .159$).

In terms of the number of questions answered (Tables 3 and 4), the interaction between stereotypes and difficulty level reached the significance level ($F = .6.785$, $p = .010$). A simple main effect analysis was further performed subsequently. Figure 1 indicates that, when the instruction about the mathematics test was "easy", no significant difference between the positive and negative conditions manipulations appeared ($t = .294$, $p = .770$). However, when the instruction about the mathematics test was "difficult", the number of questions answered by the students who received the positive condition was significantly better than that of those who received the negative condition (positive: $M = 2.46$, $SD = 0.66$; negative: $M = 1.86$, $SD = 0.75$; $t = 4.175$, $p < .000$; Cohen's $d = 0.85$, large effect size). In addition, in the positive condition, the manipulation of the mathematics difficulty level did not reveal significant difference ($t = 1.169$, $p = .245$). However, for the students in the negative condition group who received the mathematics test instruction as difficult, the number of questions answered was significantly inferior to that of the group who received the test instruction as being easy ($t = 4.355$, $p < .000$; Cohen's $d = 1.04$, large effect size).

Validation of the Mediating Role of the Number of Questions Answered

The last part of the study validated whether the number of questions answered served as mediator between the positive conditions, negative conditions, and mathematical accuracy. After subjecting the positive and negative conditions to dummy coding (positive: 0, negative: 1), the positive and negative conditions, mathematical accuracy, and number of questions answered were significantly correlated, which was consistent with the basic assumption of the mediation model (Baron &

Table 2 Summary of the two-way analysis of variance (dependent variable: accuracy)

Source	*SS*	*MS*	*F*	*p*
Stereotype manipulation	27.240	27.240	12.267*	.001
Difficulty level manipulation	5.695	5.695	2.565	.111
Stereotype * Difficulty level	.693	.693	.312	.577
Deviation	428.577	2.221		
Total	5149.000			

*$p < .05$; *SS*: sum-of-squares; *MS*: mean squares

Table 3 Summary of the two-way analysis of variance (dependent variable: the number of questions answered)

Source	*SS*	*MS*	*F*	*p*
Stereotype manipulation	5.187	5.187	9.221*	.003
Difficulty level manipulation	9.408	9.408	16.725*	.000
Stereotype * Difficulty level	3.816	3.816	6.785*	.010
Deviation	108.564	.563		
Total	1255.099			

*$p < .05$; *SS*: sum-of-squares; *MS*: mean squares

Table 4 Summary of the average of the number of questions answered from different groups and the standard deviation

Condition	Number of valid samples	*M*	*SD*
Positive-Easy	47	2.62	0.67
Negative-Easy	53	2.58	0.87
Positive-Difficult	50	2.46	0.66
Negative-Difficult	47	1.86	0.75

**M*: mean; *SD*: standard deviation

Baron and Kenny 1986). Hierarchical regression analysis was subsequently used to verify the mediational paths (Fig. 2). The results demonstrated that positive and negative conditions (independent variable) was negatively associated with the number of questions answered (mediators), whereas the number of questions answered was positively associated with accuracy (dependent variable). And for the mediating effect, the original predictability of accuracy (β value) of the positive and negative conditions was −.238. The β value dropped to −.125 after the mediator variable (the number of questions answered) was added in. The Sobel test was used to verify whether the decrease reached the significance level, revealing that the number of questions answered partially mediated it.

Discussion

The first aim of the present examined effects of positive stereotypes, negative stereotypes, and mathematics difficulty level on high school athletes' mathematics performance. When testing mathematics accuracy, although no interaction between stereotype manipulation and difficulty level manipulation was observed, the main effect analysis indicated effects from the positive and negative conditions. In line with the hypothesis, when the participants received negative stereotype descriptions, their mathematics performance was significantly worse than that of participants who received a positive

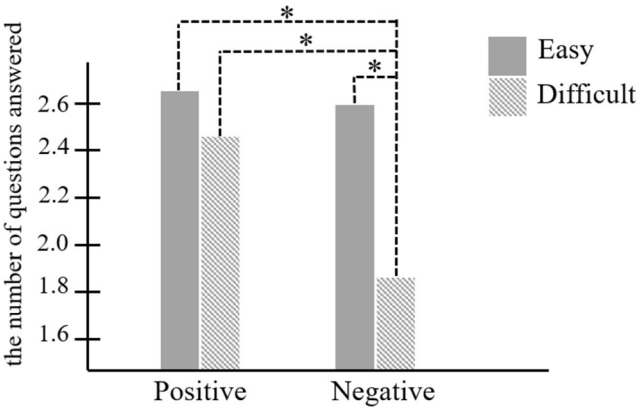

Fig. 1 Interaction between stereotypes and the mathematics difficulty level

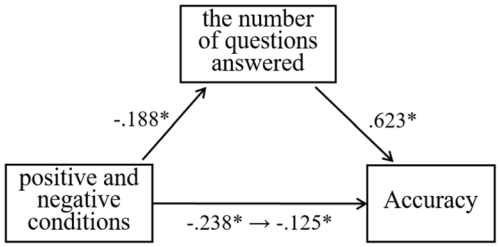

Fig. 2 Mediation model of the number of questions answered

condition, which was consistent with past research results. Since the pioneering research conducted by Steele & Aronson, which examined the effects of stereotype threat through experimental manipulation, subsequent studies in diverse domains have proven the negative effects of negative stereotype threat on one's performance, for examples in cases of African and Latin students' academic performance, athletic abilities of black and white people, or women's mathematics or science performance (Frantz et al. 2004; Gonzales et al. 2002; Spencer et al. 1999; Steele et al. 2002; Stone et al. 1999). Moreover, the correlation level of stereotype threat effect on one's performance was examined in a meta-analysis (Shapiro and Neuberg 2007), further indicating that stereotype threat casts effects on all groups. The effect size ranged from $d = 0.17$ to $d = 0.52$. The present research selected high school athletes as study targets and found the effect size ranged from 0.49 to 1.04, supplementing the type of samples that lacked in previous studies and proving once again the negative effects of negative stereotypes.

Because a person can hold several positive and negative identities at the same time, the literature has indicated that activation through positive stereotypes (e.g., "Asian are good in mathematics") may enhance one's performance. This phenomenon is called "stereotype boost" (Cheryan and Bodenhausen 2000; Shih et al. 1999). In past research, manipulation was mostly performed on the positive and negative roles of a same person, such as the Asian identity and female identity of Asian women (Shih et al. 1999). By contrast, in the present research, the positive and negative descriptions of a same role were compared. The short positive description conveyed that athletes have a better cognitive development and stronger brains than their peers, and the research results similarly demonstrated that the participants under positive condition performed better in the test, which may be similar to the effect of stereotype boost.

Furthermore, no significant difference was observed in terms of accuracy when answering question between the manipulations of difficult and easy conditions in this research. This might result from the actual identical nature of the questions in the two conditions: the manipulations made on the instructions did not directly affect the accuracy. However, interactions between positive stereotypes, negative stereotypes and difficulty levels were noted when the number of questions answered was added

as result indicator. This is a major finding of this research. When the instruction framed the mathematics test as easy, no significant difference was noted between the participants reading the positive or negative descriptions, but when the participants received the description framing the mathematics test as difficult, the negative stereotype group's responses in the mathematics test were significantly inferior to those of the positive stereotype group, indicating that the aforementioned negative stereotype threat might easily become more salient in the face of difficult tasks. Past research has indicated that, although not all roles are subject to the negative effects of stereotype threat, in certain circumstances, the most salient social identities are often the most stigmatized ones (Davies et al. 2005; Steele et al. 2002). For student athletes in the classroom context, because schools, trainers, teachers, peers, media, and even society as a whole have been holding deeply rooted negative stereotypes toward their academic performance and attitude, a mathematics test perceived as difficult might activate in them a reaction to face the academic context with their most negative identity. Such situation often gives rise to maladaptive results, which most likely leads to abandonment in the end (Woodcock et al. 2012).

Another objective of this research was to examine self-handicapping, one of the mechanisms of stereotype that affects performance. According to the literature, individuals might protect their self-esteem by reducing efforts in the face of negative stereotype threat (Davies et al. 2005; Keller 2002; Stone 2002). Therefore, in this research, scores were given according to the numbers of questions attempted as indicators of behavioral self-handicapping. The participants having received the negative description were assumed to attempt fewer calculations or simply give up. As hypotheses and consistent with literature (Cadinu et al. 2003; Yopyk and Prentice 2005), the research results demonstrated that the number of questions answered partially mediated between stereotype manipulation and mathematical accuracy. The reason might be that threatened individuals lower their self-expectancy, which further affects their efforts (Cadinu et al. 2003). In practice, stereotype threat decreases an individual's expectation of success and self-efficacy (Davies et al. 2005; Shapiro and Neuberg 2007), leading to reactions such as slacking, evasion, and even withdrawal as observed in the present research. On the long term, these conditional obstacles might affect one's interest and choice of goal with regard to future development (Deemer et al. 2014). In recent years, research on gender role stereotypes has clearly proven that gender stereotypes affect women's performance on subjects such as mathematics and science and lessen their professional options and career ambition in domains such as science, engineering, and mathematics (Cundiff et al. 2013; Deemer et al. 2014; Sinclair and Carlsson 2013). The academic stereotypes and career development of the student athletes population have not been studied yet. However, student athletes generally and quite clearly feel that their teachers, trainers, and peers categorize them into the group of student athletes, attaching negative tags to them, and holding lower expectations of their academic performance (Riciputi and Erdal 2017; Wininger and White 2015), which generates stereotype threat directly or indirectly affecting student athletes' careers. Variables such as stereotypes, athletes' career development, ambition, and choice could be examined in future research. It could provide ampler information for student athletes in terms of career consultation.

Limitations and Future Directions

Stereotype threat effects on student athletes' mathematics performance were examined in this research through experimental manipulation. Some research limitations and suggestions for future research are particularly worthy of note. One of the limitations of this research is that no control group having received a neutral description was included in this research given that there were already four condition groups and in consideration of the number of participants. Neutral condition manipulation can be included in future research for comparison, and positive role descriptions can be used to activate other positive characteristics of student athletes for further comparison. Second, a mathematics test was selected as indicator of academic performance in this research, which does not necessarily reflect the participants' overall academic abilities and performance. Therefore, the results should be interpreted with caution. In addition, regarding the mechanism through which stereotypes affect performance, this research examined the mediation role of self-handicapping. Past studies have also mentioned other possible affecting paths, such as extra stress due to stereotypes, loss of cognitive resources, and decrease in working memory, which remain to be explored in future research (Chalabaev et al. 2012; Schmader 2010; Shapiro and Neuberg 2007). The clarification of various mediating and moderating factors is required to propose effective ways to curtail or prevent stereotype threat. Future research could take as reference interventions that have proven effective in other fields, such as self-affirmation interventions or role model interventions (Shapiro et al. 2013; Stout et al. 2011). Educational courses can be conceived as a way of intervention, helping student athletes resist the stereotype threat they are confronted to in the contexts of school and class and in turn further transforming such situations into adaptive results and positive challenges.

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Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

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