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RESEARCH

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The effect of questioning gender stereotype threat on girl's standing long jump performance

Elahe Naderi Dehkordi¹, Ebrahim Moteshareie^{1*}, Behrooz Abdoli¹, Esmaeel Saemi² and Maxime Deshayes³

Abstract

Background Over the past few years, the sport psychology literature has established that gender stereotype threat (ST) is one of the factors that can impair girls' performance. However, few studies have attempted to annihilate these negative effects. The purpose of the current study was to investigate whether questioning gender ST can mitigate the classical decline in girls' standing long jump (SLJ) performance.

Methods The participants were 120 girls (Mage = 10.74 ± 0.85 years), selected through convenience sampling and randomly assigned to three groups: the gender ST group ($n=40$), the questioning group ($n=40$), and the control group ($n=40$). For all groups, baseline performance (i.e., SLJ) was measured by a female researcher following a warm-up period. In the experimental phase, the control group repeated the baseline conditions; the gender ST group completed the same test but was evaluated by a male examiner (i.e., implicit stereotype induction), while participants in the questioning group were assessed after receiving questioning statements while performing the task in front of a male examiner.

Results The results of the present study showed that the induction of a gender ST leads to a decrease in SLJ in girls. Additionally, if these inducing conditions of gender ST are accompanied by a questioning condition, the negative effects of gender ST can be reduced, and SLJ in girls does not decline.

Conclusion Based on our findings, this intervention is recommended as a simple, inexpensive, and quick solution for mitigating the negative effects of gender ST on girl's motor performance.

Keywords Gender stereotype, Implicit stereotype, Questioning stereotype, Girls, Jump performance

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Introduction

A characteristic of complex human social environments is that certain groups are often regarded as dominant. Stereotypes, defined as beliefs or associations that link a group of individuals to specific attributes or traits, are common in various functional contexts, including education and sports [1, 2]. Stereotype threat (ST) refers to the negative impact that stereotypes can have on the performance of group members in situations where their abilities are evaluated through attributes typically associated with their group [3]. In such cases, the more important a performance is to an individual, the more likely it is to be unfavorably influenced by ST [4].

Research on ST has examined a wide range of stereotypes, including those related to race [5], overweight [6, 7], age [8], and gender [9–14]. Many early studies focused on the cognitive domain [15–18], such as math tests [19] and spatial tasks [20], before expanding to the motor domain [21–26], including tasks such as driving performance [27] and various sports [28].

In the motor domain, one of the most prominent stereotypes studied in recent years is the gender stereotype [10–14, 28]. Numerous researchers have focused on how ST affects women's sports performance, using tasks across different sports, such as golf [13], soccer [12], basketball, and tennis [11], among others [14]. For example, Chalabaev, Sarrazin, and Fontayne (2008) showed that women under ST conditions exhibited poorer performance on a soccer-dribbling task in comparison to participants not under threat [10]. Similarly, Cardozo et al. (2021) found that women experiencing ST may experience reduced motor learning and performance in soccer tasks [24]. Although a few studies indicate that men are also influenced by gender-related ST [29–31], sports are commonly viewed as a masculine domain, where women are often more negatively affected by such threats [10, 14, 16]. Therefore, it is especially important to examine women's experiences in situations that may trigger ST.

Recently, researchers have found that the negative effects of gender ST observed in women also extend to young girls [25, 26]. For example, Mousavi et al. (2021) demonstrated that when a negative stereotype was induced, girls assigned to stereotype-threat conditions underperformed compared to those in control conditions [25]. Similar findings were reported in studies by Saemi et al. (2023) and Mousavi et al. (2023), showing that gender stereotypes present in childhood and adolescence can negatively impact girl's motor learning and performance [25–27, 32]. Various motor tasks have been investigated, with the negative effects of gender ST on these tasks being widely reported [25, 26, 32]. In one study, Saemi et al. [26] found that the induction of gender ST adversely affected young girls' performance in the standing long jump (SLJ). Considering the importance of

the long jump as a fundamental skill in childhood and its role in the development of various advanced sports skills [33], further investigation into this task in children under ST conditions is warranted. Additionally, since the SLJ is commonly used in schools and physical education as an indicator of physical fitness [34], its significance in childhood development is essential.

Research also distinguishes between two types of ST activation: explicit and implicit activation [24, 26]. However, much of the existing literature has focused on explicit stereotypes when examining the impact of gender stereotypes on motor performance [10, 25, 28, 32, 35]. In these cases, stereotypes are explicitly communicated by the examiners. For instance, Heidrich and Chiviacowsky (2015) used pre-task instructions such as “women often underperform compared to men” to induce negative stereotypes [28]. Some studies, however, have used implicit stereotype inductions [24, 26, 36, 37, 39], where participants receive no explicit instructions. In implicit ST activation, participants may, for instance, perform cognitive or motor tasks in front of an experimenter of a different gender [24, 26, 36, 37, 39]. For example, Nahidi et al. (2023) demonstrated that the activation of implicit ST could degrade women's soccer dribbling performance when conducted in front of a male experimenter [39]. Generally, studies show that both implicit and explicit stereotype manipulations can impair the performance of those at risk [10, 24, 26]. Notably, in a recent study, Saemi et al. (2023) examined the effects of both explicit and implicit stereotype inductions on the SLJ and found that children in the implicit stereotype group experienced a more significant drop in performance [26]. Given that most teachers and coaches in schools or sports settings are male [40], the potential for implicit negative stereotype induction is high, increasing the likelihood of performance impairment. Therefore, this study focuses on using implicit methods to induce gender ST.

Given that the effects of ST have been shown to extend to young girls [25, 26, 32], it is necessary to identify strategies to mitigate this negative impact. To address this, several studies have explored interventions to neutralize or reduce ST, including introducing a dual-task [41, 42], fostering a malleable mindset [40], informing participants about similar performance levels [28], promoting a positive social identity [43], providing positive feedback through social comparison [44], emphasizing that no skill differences exist between groups [45], and suggesting that the task is unaffected by individual differences [6]. Additionally, stereotype lift—boosting ingroup value by downplaying outgroup members—has been employed to counteract ST's negative effects on performance [27]. While some of these strategies have shown positive outcomes [6], others have reported limited or no effect [42, 46]. Furthermore, most of these studies focused on

adults, with only a few examining ways to counter ST in young girls' motor performance. Notably, one recent study was unsuccessful in mitigating the effect through a cognitive task intervention [42]. Therefore, given the significant impact of gender ST on young girls' motor performance, it is essential to investigate more effective methods for neutralizing these negative effects.

In this context, another method that has recently been investigated and shown to reduce the negative effects of ST is questioning ST. This approach encourages individuals to resist and challenge the validity and legitimacy of stereotypes [47]. For example, Rees and Salvatore (2021) conducted the first study of its kind to create and test a novel, realistic, direct, and quick stereotype-questioning intervention among several samples of athletes facing stereotypes about their athletic competence. Women in this study received statements like, "As you know, it's completely unfounded to believe that men are better than women at playing football or even taking penalties. Women can be amazing athletes and are at least as skilled as men. It's shocking how often they are denied respect." The findings showed that when participants were encouraged to question stereotypes, they experienced statistically significant performance improvements, effectively countering the negative effects of ST. Overall, these findings suggest that adopting a questioning stance can protect against performance impairments typically experienced under ST [47].

To the best of our knowledge, however, the study by Rees and Salvatore [47] is the only one that has examined the questioning approach as a method of neutralizing the negative effects of gender ST. Therefore, further research is needed to clarify its effectiveness. Additionally, Rees and Salvatore (2021) conducted their experiments with adults using explicit ST activation, and there may be differences in how children respond compared to adults [25, 26, 32]. Differences in the effects of implicit versus explicit ST activation on motor performance have also been observed [24, 26]. Thus, this research is the first to investigate the questioning intervention for mitigating implicit gender ST in girls' motor tasks. Specifically, it seeks to answer the following questions: Does implicit gender ST significantly affect children's SLJ? Can questioning a gender ST mitigate the unfavorable impacts of implicit ST?

Aims and hypotheses

The purpose of the current study is to examine the effects of gender ST and the neutralizing role of questioning on SLJ in girls. To address these research questions, we will test the following hypotheses:

- **H1:** The induction of a gender ST will lead to a decrease in SLJ performance in girls.

- **H2:** When gender ST is induced in conjunction with a questioning intervention, the negative effects of the ST will be mitigated.

Method

Participants

A total of 120 female elementary students, aged 9 to 11 years ($M_{age}=10.74\pm 0.85$ years), were selected from girls' elementary schools through convenience sampling during their physical education classes. The participants came from single-sex classes (six classes across two schools), with approximately 20 students from each class. The experiments were conducted individually in a quiet room. Using a within-subject design and assuming a statistical power of 0.80 and $\alpha=0.05$, a sensitivity power analysis conducted in G*Power 3.1 confirmed that the sample size was adequate to detect small effect sizes ($f=0.15$)¹. The inclusion criteria were: (1) no history of motor or cognitive impairment, (2) age between 9 and 11 years, and (3) being a novice in the long jump task. Informed consent was obtained from all participants' parents. The experiment design and procedures adhered to the Declaration of Helsinki's ethical standards and were approved by the Shahid Beheshti University Ethics Committee (IR.SBU.REC.1402.191).

Tasks and measures

SLJ performance

Participants completed a SLJ task in an indoor hall. The task required participants to jump forward using both feet and land on both feet, aiming for maximum jump distance. A strip (20 mm) was placed on the floor to mark the starting line, and a tape measure was used to record the distance jumped, measured in centimeters from the starting line to the participant's heel. The average of the jump distances was used for statistical analysis. Notably, participants were not provided with any feedback on their performance during the test [26].

Procedure

This study used a within-between-subject design comprising three phases: primary measurement, baseline measurement, and experimental measurement. Upon entering the hall, participants were assessed against the inclusion criteria, and parents of eligible participants completed a consent form. Exercise guidelines were then followed according to the National Strength and Conditioning Association (NSCA) standards. The warm-up phase involved 3 min of jogging, followed by 5

¹ Parameters used for the sensitivity analysis: statistical test: analysis of variance, within-between interaction; α : 0.05; power: 0.80; number of groups: 3; number of measurements: 2; correlation among repeated measures: 0.5; nonsphericity correction E: 1.

on-the-spot double-leg jumps, similar to the SLJ but with less intensity. After warming up, participants rested for 2 min while receiving instructions on the task and study stages from the researcher.

Baseline measurement (pretest)

During baseline measurement, each child performed 4 jumps with 30-second rest intervals in the presence of a female examiner, without any specific instructions. After another 2-minute rest period, participants were randomly assigned to one of three groups using Excel's random number generator: the gender ST group ($n=40$), the questioning group ($n=40$), and the control group ($n=40$).

Experimental measurement (posttest)

Each group received different instructions and conditions for the experimental phase:

Control group Participants received no specific instructions and performed 4 jumps with maximum effort, taking 30-second intervals between jumps, in the presence of a female examiner.

Implicit ST group Participants were asked to perform 4 jumps with maximum effort in the presence of a male examiner, without any instructions [26].

Questioning ST group Participants performed 4 jumps with maximum effort in the presence of a male examiner, but before each jump, they received stereotype-challenging messages from the same male examiner. The messages, adapted from previous studies [47], included: "Who said that only boys excel in the long jump? Girls can also perform exceptionally in this activity. In many cases, girls have shown high-quality performance and even set unique personal records. Show us how great your long jump performance can be in this test." To prevent interactions between groups, each participant completed the test individually and was escorted back to class immediately after.

Table 1 Descriptive statistics results (Mean \pm SD) for three experimental groups in two stages of baseline (pretest) and experimental (post-test) phases as well as the manipulation check scores

Dependent variables	SLJ		Manipulation check Scores
	Pre test scores	Post test scores	
Questioning	88.55 \pm 12.61	98.73 \pm 13.54	4.17 \pm 0.74
stereotype-threatened	93.65 \pm 15.35	85.76 \pm 14.76	1.40 \pm 0.59
control	93.20 \pm 13.68	93.65 \pm 14.36	4.20 \pm 0.75

Post-experiment assessment

To assess the effectiveness of the stereotype manipulations, participants answered the following question at the end of the experiment [26]: "Who do you think performs better on this task?" Responses were recorded on a 7-point Likert scale, where (1) indicated "boys perform better" and (7) indicated "girls perform better." This question gauged the children's conformity to the ST conditions they experienced.

Data analysis

A mixed analysis of variance (ANOVA) with Bonferroni post hoc tests was used to compare within-group and between-group mean differences. Specifically, within-group analysis was conducted to observe pre- and post-performance changes in each group, while between-group analysis was performed to confirm no baseline differences and to identify potential differences in the experimental conditions. The significance level was set at $\alpha \leq 0.05$.

Results

Table 1 displays the mean and standard deviation values for the target variables across the groups. The mean and standard deviation values suggest a performance decrease in the ST group but not in the questioning group. No violations of the assumptions for within-group and between-group mixed ANOVA were detected during data analysis.

Manipulation check

One-way ANOVA results indicated that children in the ST group, compared to those in the control and questioning groups, perceived boys as significantly better than girls ($F(2, 117)=209.81, p<0.001, \eta^2 = 0.78$). No significant difference was observed between the control and questioning groups ($p>0.05$; see Table 1). These findings suggest that the ST induction was effective.

Performance (SLJ)

A significant time-group interaction was observed for the SLJ scores, $F(2, 117)=105.63, p=0.001, \eta^2 = 0.64$, as indicated by mixed ANOVA results. Bonferroni-adjusted pairwise comparisons showed that the SLJ scores for the questioning group significantly improved from pretest to posttest ($p=0.001$). In contrast, the scores for the ST group significantly decreased ($p=0.001$) from pretest to posttest, while the control group showed no significant change ($p>0.05$). The post-test Bonferroni adjustment also revealed a significant difference between the questioning group and the ST group ($p=0.001$) and a significant difference between the ST group and the control group ($p=0.04$). However, there was no significant

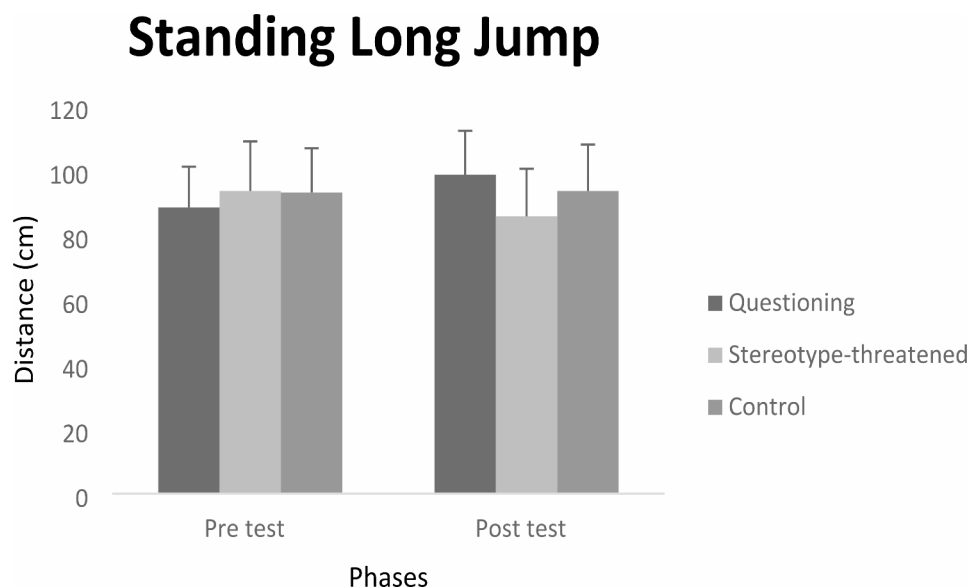


Fig. 1 The SLJ performance for all experimental groups in pretest as well as posttest phases. Error bars represent standard deviation

difference between the questioning group and the control group in the posttest ($p > 0.05$; see Table 1; Fig. 1).

Discussion

The present study aimed to examine the influence of implicit gender ST and the effectiveness of questioning this threat on SLJ performance in girls. Our findings suggest that implicit gender ST negatively impacted the performance of girls in SLJ, while questioning gender stereotypes effectively neutralized these unfavorable effects, preserving their motor performance.

The first part of our findings aligns with previous research indicating that implicit gender ST adversely affects motor performance [13, 24, 26]. Prior studies have demonstrated that implicit stereotypes can exert negative influences even when individuals are not consciously aware of them, leading to behaviors that may be deemed racist or sexist, depending on context [24, 36–38]. For example, Stone and McWhinnie (2008) reported impaired performance accuracy among female golfers in the presence of a male examiner [13], a finding echoed by Cardozo et al. (2021) in a soccer context [24]. More recently, Saemi et al. (2023) explored this phenomenon in children, showing that implicit ST is even more detrimental than explicit ST to motor performance [26]. Our study corroborates these findings by demonstrating that the mere presence of a male examiner negatively impacted the girls' performance, as it activated harmful stereotypes that engaged their attention and working memory [13, 24, 26].

These results can be interpreted through Schmader et al.'s (2008) integrated process model of ST effects, which posits that limited cognitive resources may be diverted

toward performance anxiety and pressure, resulting in poorer performance. This model identifies three primary mechanisms—motivational, affective, and attentional—that help explain the observed patterns [48]. Specifically, ST can impair performance and working memory by increasing arousal and self-consciousness about one's performance while increasing negative feelings and thoughts such as anxiety [41]. Therefore, the presence of a male examiner likely induced excessive arousal and cognitive anxiety among the girls, leading to a decline in their performance. The explicit monitoring hypothesis [48, 49] further suggests that individuals under ST may shift their focus to step-by-step process of the task that are typically automatic. This shift can complicate the execution of movements, making a simple action like long jumping feel more challenging due to the implicit ST posed by the male examiner.

Additionally, mechanisms related to motivation indicate that implicit ST can diminish intrinsic motivation and positive affect, leading to reluctance and discouragement, which ultimately result in lower effort and engagement in the task [24, 26]. Research has also shown that ST can impede motor learning by diminishing perceived competence and positive thoughts [28, 29]. An increase in anxiety is another potential explanation for the observed decrease in jumping performance under ST conditions. Previous studies highlight that heightened anxiety is a key mechanism contributing to performance reduction in ST situations [26, 50]. Saemi et al. (2023) found that children experienced increased anxiety under both explicit and implicit ST conditions, ultimately leading to decreased motor performance [26]. Thus, the performance drop in our participants may stem from

decreased perceived competence, motivation, and effort, as well as increased anxiety levels.

Furthermore, research indicates that both positive and negative stereotype endorsement can influence cognitive and motor performance [51, 52]. For example, Wang et al. (2021) demonstrated that endorsing negative racial stereotypes negatively impacted cognitive performance among adolescents [51]. In the motor domain, Chala-baev et al. (2013) found that girls who endorsed the stereotype of being weaker than boys in soccer exhibited lower performance [52]. In our study, children subjected to implicit ST endorsed negative stereotypes, which likely contributed to their diminished long jump performance.

The second part of our findings indicated that questioning implicit ST mitigated its negative effects on the girls' long jump performance. Specifically, girls who challenged the common stereotype regarding boys' superiority in long jump performed better than those in the ST condition. This aligns with Rees and Salvatore (2021), who reported positive outcomes from questioning stereotypes [47]. This straightforward intervention could be beneficial for coaches, as a brief reminder to question stereotypes (e.g., "Who said that only boys can do well in long jump?") can effectively counteract the negative impacts of ST on performance. Theoretically, this approach suggests that resistance to stereotypes does not necessitate extensive discussions, indicating that a simple reminder can significantly reduce anxiety and improve attentional capacity [47]. Consequently, participants may feel less pressured to demonstrate their abilities, resulting in optimal arousal levels and attentional resources.

The practical implications of this study are noteworthy. Given the ease of administering the questioning intervention, it could be utilized by coaches to remind female athletes of their positive attributes (e.g., ranking high in their league) [20]. Since questioning stereotypes is both simple and effective, it should be considered as a viable intervention strategy. Our findings also highlight those girls exhibited poorer performance in the presence of a male examiner, raising concerns about potential negative impacts on their academic and athletic achievements in educational settings. Addressing and questioning stereotypes in these environments may help prevent such adverse effects.

Strengths and limitations

A significant strength of our study is the relatively large sample size, which enhances the generalizability of our findings. Many studies examining ST in the motor domain have utilized small samples [24, 25, 28]. Another important advantage is that the experimenters were unaware of the study's objectives and hypotheses, minimizing potential bias in our results. However, there are several limitations to acknowledge. Our study exclusively

recruited girls, and due to possible gender differences [53], future research should include both genders to compare responses to ST. Additionally, we focused solely on children; future studies should examine various age groups, including adolescents and older adults, to gain a broader understanding of ST. Our investigation was limited to the SLJ task; thus, we recommend that future research explore a wider range of motor tasks within the context of ST, particularly focusing on the neutralizing role of questioning. Further, future studies should consider moderating psychological variables such as motivation, anxiety, and individual attitudes, as well as account for personality factors (e.g., perfectionism, narcissism) that may influence responses to ST. Finally, the lack of examination of participant identities in the motor domain represents a significant gap that future research should address.

Conclusions

In summary, our study concluded that girls exhibited poor performance when evaluated by a male experimenter, highlighting the destructive impact of implicit ST. However, the questioning approach effectively mitigated the negative effects of this threat on the girls' performance. To date, only one study has explored how questioning approaches influence performance in adults, primarily focusing on explicit ST [47]. Our study's exploration of implicit ST and its questioning represents a unique contribution to the literature, differentiating it from prior research on ST.

Abbreviations

ST	Stereotype Threat
SLJ	Standing Long Jump

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Author contributions

Conceptualization, E.M. and E.S.; methodology, E.M, E.S. software, E.M.; validation, E.M. and E.N.; formal analysis, E.M.; investigation, E.N.; resources, E.M, E. N.; data curation, E.N; writing—original draft preparation, E.N, E.M; writing—review and editing, , E.N, E.M, E.S and M.D. visualization, E.M, E.S; supervision, E.M. E.S; project administration. All authors have read and agreed to the published version of the manuscript.

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Data availability

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study design was developed based on the Declaration of Helsinki and approved by Shahid Beheshti University's Ethics Committee (Approval Code: IR.SBU.REC.1402.191; Approval Date:15/07/2023). Informed consent was obtained from all subjects involved in the study.

Consent for publication

Not Applicable.

Competing interests

The authors declare no competing interests.

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