



Lay beliefs about competition: Scale development and gender differences

Selin Kesebir¹ · Sun Young Lee² · Andrew J. Elliot³ · Madan M. Pillutla¹

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Abstract

Women are less competitive than men in most contexts studied. This difference has been linked to the gender gap in socio-economic outcomes. To examine whether this gender difference is linked to differential beliefs about competition, we developed a scale measuring lay beliefs about competition and tested whether these beliefs account for gender differences in competitive attitudes and behaviors. A mini meta-analysis ($N = 2331$) of responses to this scale shows that men attribute more positive outcomes to competition than women. In particular, men are more likely to believe that competition improves performance, builds character, and leads to creative problem-solving. In contrast, the gender differences are smaller, less robust, and inconsistent for the different negative outcomes attributed to competition, such as encouraging unethical behavior, hurting self-esteem, and damaging relationships. We also show in two studies that only positive lay beliefs about competition predict competitive attitudes and behaviors, and account for (some of) the gender difference in competitiveness. We discuss possible reasons that women and men hold different beliefs about competition and the implications of these differences for the optimal design of social and organizational structures.

Keywords Competitiveness · Gender · Lay theories · Gender gap

The Concise Oxford English Dictionary defines competitive as “strongly desiring to be more successful than others” (Stevenson and White 2011, p. 292). This definition is consistent with characterizations of competitiveness in the academic literature as “the enjoyment of interpersonal competition and the desire to win and be better than others”

(Spence and Helmreich 1983, p. 41; see also Johnson and Norem-Hebeisen 1979; Smither and Houston 1992). Competitiveness is one mode of striving toward competence and achievement (Elliot et al. 2002; Smither and Houston 1992). It involves a tendency to define and seek achievement in comparison to other people, rather than one’s past levels of competence, ideals of excellence, or absolute task standards (Garcia et al. 2013; Spence and Helmreich 1983).

Competitive motivation is on average stronger in men than in women in most contexts studied, as suggested by both behavioral and self-report data, across the life-span and across cultures (Ahlgren and Johnson 1979; Datta Gupta et al. 2013; Flory et al. 2014; Lever 1978; Lynn 1993; Mayr et al. 2012; Niederle and Vesterlund 2011; Schneider et al. 2005; Spence and Helmreich 1983; Sutter and Glätzle-Rützler 2014). Recent findings in labor economics suggest that this gender difference in competitiveness may partly explain the gender gap in socio-economic outcomes, because competitiveness is linked with favorable socio-economic outcomes (e.g., Buser et al. 2014; Kanthak and Woon 2015; Kleinjans 2009; Preece and Stoddard 2015). For example, gender differences in competitiveness explained 10% of the gender gap in earnings 9 years later among graduates of a

✉ Selin Kesebir
skesebir@london.edu

Sun Young Lee
sunny.lee@ucl.ac.uk

Andrew J. Elliot
andrew.elliott@rochester.edu

Madan M. Pillutla
mpillutla@london.edu

¹ Organisational Behaviour Subject Area, London Business School, Sussex Place, Regent’s Park, London NW1 4SA, UK

² UCL School of Management, University College London (UCL), Level 38 One Canada Square, Canary Wharf, London E14 5AA, UK

³ Department of Clinical and Social Psychology, University of Rochester, RC Box 270266, Rochester, NY 14627-0266, USA

top MBA program (Reuben et al. 2015), and 50% of the promotion gap between female and male economists in France (Bosquet et al. 2017).

In light of these findings linking competitive motivation to the gender gap in socio-economic outcomes, we believe it is important to better understand the psychology of the motivation to compete, particularly with respect to gender. To this purpose, we have studied the beliefs people hold about interpersonal competition, how the genders differ in the beliefs they endorse, and how these beliefs are associated with competitiveness.

Lay beliefs and competitiveness

Lay beliefs are systems of interconnected beliefs that people hold about a domain (Lickel et al. 2001). Such belief systems have been called by various labels such as *lay theories*, *implicit theories*, *mindsets*, *naïve theories*, *folk theories*, or *mental models*. Despite the terminological profusion, these constructs all capture the cognitions by which people understand the workings of the social and natural world (Wegener and Petty 1998). Following the cognitive revolution in psychology, researchers have become increasingly interested in studying belief systems about diverse domains such as achievement motivation (Dweck 1999), causes of human action (Malle and Knobe 1997; Morris and Peng 1994), causes of achievement (Weiner 1985), self-control (Job et al. 2010), emotions (Tamir et al. 2007), and justice (Lerner 1980), among others. Together, these diverse lines of research have shown that people organize meaning around belief systems, which then guide cognition, affect, motivation, and action (Molden and Dweck 2006). Consequently, lay beliefs have been linked to expectations, perceptions, information processing, judgments, decisions, self-regulation, and behavior (e.g., Ajzen 2012; Burnette et al. 2013; Eccles and Wigfield 2002).

In line with the evidence linking lay beliefs to various psychological and behavioral outcomes, we propose that reactions to competitive situations are a function of people's *lay beliefs about competition*, which we define as their beliefs on the potentially positive or negative outcomes of competing with other people.

Lay beliefs about competition may capture how competition is good and useful (e.g., “Competition makes you work harder and improve your performance”), or why it is bad and potentially destructive (e.g., “Competition makes people lie, cheat, and trample on others to get ahead”). We posit that lay beliefs about competition organize the meanings people assign to competition, their willingness to compete, and how they process information and regulate themselves under competition. On this basis, we expect that the gender difference in competitiveness would be accompanied by a

gender difference in lay beliefs about competition that are differentially available and accessible to the two genders.

How can studying lay beliefs further our understanding of competitiveness?

To date, various disciplines have contributed to the study of the gender difference in competitiveness. These include evolutionary perspectives linking it to the distinct selective pressures faced by the two sexes (Geary 2010), anthropological perspectives linking it to patriarchal social order (Andersen et al. 2013; Gneezy et al. 2009), and sociological perspectives linking it to family socio-economic status (Almás et al. 2016) or the gender composition of the socializing environment (Booth and Nolen 2012, cf. Lee et al. 2014). Behavioral economists have focused on psychological factors, showing that men's greater confidence partly explains their greater willingness to enter competitions, but risk preferences or other-regarding preferences do not (for a review, see Niederle and Vesterlund 2011). In social psychology, Role Congruity Theory has suggested that the gender differences in competition-related traits, such as assertiveness and dominance, are due to the economic and domestic roles that the two sexes are typically asked to play, and the power differences they entail (Eagly and Wood 1999).

We believe that a study of lay beliefs would add to and complement these perspectives by revealing the underlying cognitive structures accompanying competitiveness, and advancing new research directions. First, if we find gender differences in lay beliefs about competition, we can next ask whether they partly cause the gender difference in competitiveness. Previous research has established a causal role for some lay beliefs by manipulating them and producing behavioral change, in domains including academic performance (Aronson et al. 2002; Blackwell et al. 2007), negotiation outcomes (Kray and Haselhuhn 2007), dieting success (Burnette and Finkel 2012), and physical endurance (Weinberg et al. 1981). Studying lay beliefs can thus help uncover one source of the gender difference in competitiveness.

Second, exploring lay beliefs about competition could help us understand why women and men prefer different types of organizations and socio-economic institutions. Belief systems are at the foundation of worldviews that shape social institutions (Jost et al. 2008), and people defend existing political and social orders by holding on to the beliefs that justify them (Hafer and Bègue 2005; Jost and Banaji 1994; Kay et al. 2009; Lerner 1980). Beliefs about the merits and demerits of competition may similarly be used to justify pedagogical choices at home and in educational settings, organizational designs, and economic systems (Hayward and Kemmelmeier 2007; Kohn 1992). By studying lay beliefs about competition, we could thus move

toward a deeper understanding of ideological and institutional choices, and their variation by gender.

Third, knowledge of the gender differences in lay beliefs about competition would generate novel questions and testable hypotheses about the gendered experience of competition. If we grant that beliefs are partly shaped by prior experiences, we would be justified in asking whether gender differences in competition-related beliefs correspond to actual gender differences in the experience of competition or differences in the socialization experiences of girls and boys. This would allow us to develop better targeted hypotheses regarding the sources of the gender difference in the desire to compete.

Measuring lay beliefs about competition

In sum, studying lay beliefs about competition promises a richer understanding of the gender difference in competitiveness, and novel fronts for future exploration. Toward this purpose, the initial requirement is measuring people's lay beliefs about competition reliably and validly. We thus first searched the literature for a suitable instrument.

Competition-related instruments in the extant literature typically assess people's competitiveness with items such as "I enjoy competing against an opponent" or "I feel that winning is important in both work and games" (Gill and Deeter 1988; Helmreich and Spence 1978; Johnson and Norem-Hebeisen 1979; Smither and Houston 1992). While such instruments typically do not probe into underlying beliefs, one exception is the Personal Development Competitive Attitude Scale (Ryckman et al. 1996), which was developed to distinguish between hypercompetitiveness and healthier forms of competitiveness that might serve personal development. Even though some items on this scale assess competition-related beliefs, the scale is not adequate for our purposes because it does not capture the full range of lay beliefs about competition. A second difficulty it poses is that many items on the scale are double-barreled, such that they simultaneously ask about evaluations of competition and endorsement of a specific belief (e.g., "I like competition because it teaches me a lot about myself"). For these items, it is unclear whether respondents are rating their liking of competition, their endorsement of the specific belief, or some combination of the two.

Other research has used single-item measures such as the one included in the World Values Survey from 1990 onward. This item asked respondents to locate their position between two ends of a continuum, with one end labeled "Competition is good. It stimulates people to work hard and develop new ideas," and the other end labeled "Competition is bad. It brings out the worst in people." Even though this item has been fruitfully used to study the individual

and country-level factors predicting positive evaluations of competition (Gorodnichenko and Roland 2011; Hayward and Kimmelmeier 2007), it is not adequate for our purposes because the scale anchors are again double-barreled, and the item does not necessarily cover the full range of beliefs people may hold about competition. This item also places positive and negative beliefs (and evaluations) onto a single dimension. In fact, positive and negative beliefs about competition are likely to have some degree of independence, as attitudes often derive from separate positive and negative components (Cacioppo et al. 1997). In other words, people may simultaneously maintain positive *and* negative beliefs about competition.

Our review of the literature thus led us to conclude that we could not systematically, validly, and reliably measure lay beliefs about competition with existing measures, and a novel instrument was necessary. Our first task thus was to develop an instrument that would (1) capture the full variety of beliefs people hold about competition, (2) disentangle beliefs about competition from evaluations of competition, and (3) allow for independence between positive and negative beliefs about competition.

Overview

The remainder of this paper is structured as follows: first, in Study 1, we describe the development and validation of a scale measuring lay beliefs about competition which we call the *Lay Beliefs about Competition Scale*. In Studies 2 and 3, we use this scale to test for gender differences in lay beliefs about competition and examine whether these beliefs account for gender differences in competitive attitudes and behaviors. Finally, we conduct a mini meta-analysis on the gender differences in lay beliefs about competition, as measured by the scale we developed.

Study 1

We developed and validated the scale in three steps. First, we mapped the content domain. Then, we generated items based on the mapping and selected the best items. Finally, we tested the internal reliability of the scale.

Step 1: content domain mapping

To capture the range of beliefs about competition held by lay people, we recruited 230 participants on Amazon's Mechanical Turk (MTurk) (52% female, $M_{\text{age}} = 35.8$, $SD_{\text{age}} = 11.8$, range 19–82), who were paid \$0.80. Participants responded to two open-ended questions probing their beliefs about competition, presented in random order. One question was

“Please think about competition among individuals. What is good and positive about it? Please list all of your ideas, and why you think as you do.” The other question replaced “What is good and positive about it?” with “What is bad and negative about it?”

To analyze the content domain, participants’ responses were broken down into 957 separate idea units. An attempt to categorize these units by two of the authors led to three conceptually coherent subcategories of positive beliefs and three conceptually coherent subcategories of negative beliefs about competition. The three categories about positive aspects of competition were as follows:

- (1) *Competition boosts motivation and performance.* This category included beliefs about competition’s role in motivating people to succeed, pushing them to try hard and achieve more. Sample participant statements falling in this category include “Competition creates an urge to succeed,” it “makes people set higher goals,” “helps individuals to reach their potential,” and “brings out the best results and best efforts among the individuals who participate.”
- (2) *Competition builds character and raises self-esteem.* This category captured beliefs about competition’s potential role in developing character, imparting values, and allowing people to build up self-esteem. Sample statements include “Competition teaches you how to gracefully handle a win,” it “helps build personality and determination,” and it “can help grow confidence and self-esteem.”
- (3) *Competition spurs innovative solutions.* This category included beliefs about competition’s role in driving people to innovate and be creative in order to win. Sample statements include “Competition fosters creative thought, ingenuity, and progress,” it “can create new ideas or ways of doing things as people look for new ways to win,” and it “can help come up with many different and new ideas.”

Beliefs about negative aspects of competition were categorized into the following three categories:

- (1) *Competition may encourage unethical behavior.* This category included beliefs about competition’s potential role in leading people to act unethically, cheat, and deceive in order to win. Sample participant statements include, “Competition can bring out the worst in people. People get so tied up in winning sometimes that they don’t care how they win, or who they hurt,” “[Competition] causes people to be ruthless and do things without considering the outcome for others,” and “If push comes to shove, people involved may even be

forced to engage in illegal, immoral, or unethical acts in order for them to get ahead.”

- (2) *Competition may hurt self-esteem.* This category included beliefs about competition’s potential role in hurting people’s self-esteem, creating self-doubt, and discouraging them from trying again. Sample statements include “Competition can be very negative because many people can become really depressed as they compare themselves to others,” “For some people with low self-esteem, competition and losing may even further hurt their self-esteem,” and “Never winning can make you not want to do better but make you give up.”
- (3) *Competition may damage relationships.* This category included beliefs about the potentially negative interpersonal consequences of competition. Sample statements include “Competition can lead to jealousy and hatred,” “Taken to extremes, [competition] can poison relationships, in that one begins to regard others as obstacles and enemies,” and “[Competition] can cloud any idea of shared or collaborative goals.”

Step 2: item generation and reduction

For each of the six belief categories listed above, we next created 5 to 11 items, totalling 50 items, by taking participants’ exact statements from Step 1 or paraphrasing them for clarity and concision.

This initial set of 50 items was reduced to 18 items over two iterations of testing and elimination. In the first iteration, 535 US citizens recruited on MTurk (41% female; $M_{age} = 32.6$, $SD_{age} = 10.5$, range 18–75) indicated their agreement with each of the 50 items in exchange for \$0.70. Out of this set, we selected 24 items that correlated highly with other items in the same subcategory but were not conceptually redundant with them, and correlated less strongly with items from other subcategories of the same valence. Using these 24 items, we ran a second iteration with 302 US citizens recruited on MTurk (39% female; $M_{age} = 34.6$, $SD_{age} = 11.5$, range 18–73), and paid them \$0.70. Following the same procedure as before, we reduced the final number of items to 18, with 3 items for each subcategory. The 18 items comprising the final scale are presented in Table 1.

Step 3: testing the internal reliability of the scale

We next tested the factor structure of the scale for internal reliability. Specifically, we asked whether positive belief items separate from the negative belief items, whether the three subcategories of positive and negative belief subscales each constitute distinct factors from one another, and whether the factor structure of the scale is gender invariant. We ran these tests on four samples to increase the generalizability of the results with respect to age, nationality,

Table 1 List of items in the Lay Beliefs about Competition Scale

Positive beliefs about competition

Performance Increase

- (1) Competition makes people work harder (*Perf1*)
- (2) Competition makes people perform better (*Perf2*)
- (3) Competition helps people set goals (*Perf3*)

Personal Growth

- (4) Competition makes people stronger (*Grow1*)
- (5) Competition builds character (*Grow2*)
- (6) Competition develops self-confidence (*Grow3*)

Innovation

- (7) Competition prompts people to seek new solutions (*Inno1*)
- (8) Competition encourages innovation (*Inno2*)
- (9) Competition breeds imagination (*Inno3*)

Negative beliefs about competition

Unethical Behavior

- (1) Competition leads to cheating (*Ethic1*)
- (2) Competition encourages people to violate rules (*Ethic2*)
- (3) Competition encourages unethical behavior (*Ethic3*)

Self-Damage

- (4) Competition damages self-confidence (*Self1*)
- (5) Competition hurts self-esteem (*Self2*)
- (6) Competition creates self-doubt (*Self3*)

Relational Damage

- (7) Competition creates negative feelings about others (*Rela1*)
- (8) Competition creates enemies (*Rela2*)
- (9) Competition divides people (*Rela3*)

socio-economic background, and work experience. The samples also differed in whether participants responded to both subscales for positive and negative beliefs about competition, or only to one of them.

Methods

In this and all subsequent studies in this research, all sample sizes were pre-determined, aiming for the highest sample sizes given our resource constraints, no manipulations were used, no data exclusions were used beyond those specified, all analyzed variables are reported, and no analyses were conducted before the data collection was completed. For all MTurk studies, we took steps to prevent participation by individuals who had taken part in a prior study.

Participants

Sample 1

The survey was completed by 758 adults recruited on MTurk (45% female; $M_{age} = 33.3$, $SD_{age} = 11.1$, range 18–74; 76% White, 9% Asian, 7% African, 5% Hispanic, and 3% other;

all US citizens) for \$1.00. Seventy-six percent of participants were employed, and 98% had previous work experience.

Sample 2

Participants were recruited on Prolific, a crowdsourcing platform located in the UK that had over 30,000 online workers across the world at the time of data collection. A total of 441 adults ($M_{age} = 30.9$, $SD_{age} = 11.2$, range 17–72; 48% female; 80% White, 10% Asian, 3% African, 2% Hispanic, and 5% other) participated in the survey for £0.35. Seventy-two percent of participants were employed, and 94% had previous work experience. Fifty percent of participants had British nationality, 33% US or Canadian nationality, 6% European nationalities, 5% South Asian nationalities, 3% South American nationalities, 2% African nationalities, and 1% East Asian nationalities.

Sample 3

A total of 132 adults recruited on MTurk ($M_{age} = 33.6$, $SD_{age} = 11.2$, range 18–64; 46% female; 73% White, 11% Asian, 8% African, 7% Hispanic, and 1% other; all US citizens) participated in the survey for \$1.00. Seventy-six percent of participants were employed, and 97% had previous work experience.

Sample 4

Participants were recruited through a marketing intelligence agency located in the US that has contacts in multiple companies across industries. A total of 502 adults ($M_{age} = 44.2$, $SD_{age} = 13.2$, range 20–78; 48% female; 82% White, 9% African, 4% Hispanic, 3% Asian, and 2% other) participated in the survey for \$2.25. All participants resided in the US, and 89% were employed. All participants had previous work experience (99% as full-time employees). The median annual household income was between \$25,000 and \$100,000 for 66% of the sample, below \$25,000 for 12% of the sample, and above \$100,000 for 22% of the sample.

Measures

Lay beliefs about competition

We measured participants' lay beliefs about competition with the final 18 item measure comprised of 9 items representing 3 subcategories for positive beliefs, and 9 items representing 3 subcategories for negative beliefs. We henceforth call the subcategories of positive beliefs about competition *performance increase*, *personal growth*, and *innovation*. The three subcategories of negative beliefs about competition we

henceforth call *unethical behavior*, *self-damage*, and *relational damage*.

Participants in Samples 1 and 2 were randomly assigned to respond to *either* the positive beliefs *or* negative beliefs subscale (1 = *strongly disagree* to 7 = *strongly agree*). Participants in Samples 3 and 4 responded to both the positive *and* negative beliefs subscales. Item order was randomized in all samples. We included either the positive or the negative beliefs subscale in Samples 1 and 2 because we worried about potential carry-over effects from one subscale to the other. In the latter two samples (Samples 3 and 4), we included both subscales because we wanted to know how they relate to each other.

Results and discussion

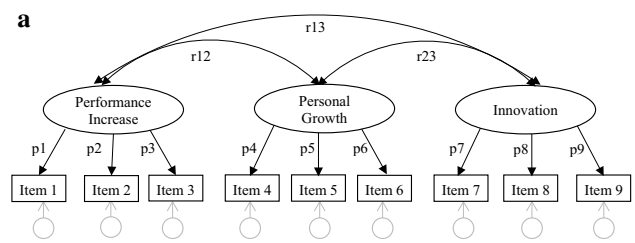
We tested the factor structure of the scale in three ways. We first report tests for a separation between the positive and negative belief subscales. We then report goodness of fit tests for the proposed 3-factor structures. Finally, we report tests examining the scale's factor structure invariance across gender.

Testing for separation between the positive and negative belief subscales

The average correlation between the positive and negative belief subscales was $-.51$ for Sample 3 and $-.44$ for Sample 4 ($ps < .001$), indicating that positive and negative beliefs share common variance, but are still distinct. To formally test for a separation between the positive and negative subscales, we ran two separate confirmatory factor analysis (CFA) models, one with a single factor for all items, and one with two factors for positive and negative subscales each, using an oblique rotation. The model with two factors provided a substantially better fit to the data than the model with a single factor across both samples; Sample 3: $\Delta\chi^2(1) = 407.95$, $p < .01$; Sample 4: $\Delta\chi^2(1) = 1576.39$, $p < .01$. These results show that the positive and negative beliefs about competition are empirically separate.

Testing for factor structures of the positive and negative subscales

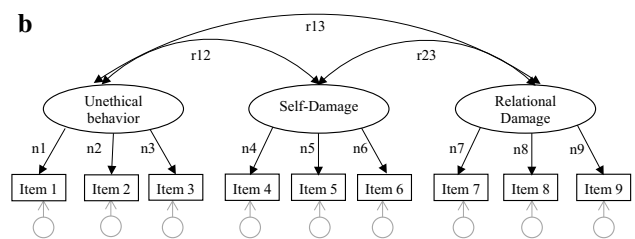
We next tested whether the three categories under the positive and negative belief subscales can each be treated as distinct content domains. To this purpose, we set up oblique 3-factor models for positive and negative beliefs about competition, respectively. We posited three latent factors under positive beliefs (*performance increase*, *personal growth*, and *innovation*), and three latent factors under negative beliefs (*unethical behavior*, *self-damage*, and *relational damage*). See Fig. 1a, b.



	Sample 1	Sample 2	Sample 3	Sample 4
(1) <i>Performance Increase</i>				
Item 1 (p1)	.81	.76	.87	.78
Item 2 (p2)	.84	.70	.89	.81
Item 3 (p3)	.73	.65	.67	.76
(2) <i>Personal Growth</i>				
Item 4 (p4)	.85	.83	.90	.82
Item 5 (p5)	.84	.78	.80	.86
Item 6 (p6)	.68	.75	.81	.82
(3) <i>Innovation</i>				
Item 7 (p7)	.79	.77	.81	.82
Item 8 (p8)	.84	.73	.95	.84
Item 9 (p9)	.79	.73	.75	.84
<i>Factor correlations</i>				
r12	.92	.89	.90	.94
r13	.83	.81	.76	.83
r23	.77	.69	.72	.80

Note. p values for all estimates are smaller than 0.001

Fig. 1 a Diagram and results for CFA of positive beliefs about competition. **b** Diagram and results of CFA for negative beliefs about competition



	Sample 1	Sample 2	Sample 3	Sample 4
(1) <i>Unethical Behavior</i>				
Item 1 (n1)	.89	.78	.88	.67
Item 2 (n2)	.86	.86	.81	.84
Item 3 (n3)	.86	.85	.85	.88
(2) <i>Self-Damage</i>				
Item 4 (n4)	.87	.86	.89	.80
Item 5 (n5)	.89	.76	.85	.87
Item 6 (n6)	.80	.78	.85	.80
(3) <i>Relational Damage</i>				
Item 7 (n7)	.84	.79	.85	.78
Item 8 (n8)	.83	.80	.85	.79
Item 9 (n9)	.73	.74	.83	.73
<i>Factor correlations</i>				
r12	.67	.70	.69	.78
r13	.82	.77	.78	.88
r23	.76	.74	.81	.81

Note. p values for all estimates are smaller than 0.001

Fig. 1 (continued)

We performed a CFA with maximum likelihood estimation using AMOS 23.0 (Arbuckle 2014). To evaluate the model fit, we used normed Chi square (χ^2/df), the standardized root-mean-square residual (SRMR), the

Table 2 Study 1: results from the CFA for positive beliefs about competition

	<i>df</i>	χ^2	χ^2/df	SRMR	CFI	RMSEA (90% CI)	$\Delta\chi^2$
Sample 1 (<i>n</i> = 379)							
3-Factor model	24	53.15**	2.2	.023	.99	.057 (.04, .08)	
2-Factors: <i>Performance Increase</i> versus rest	26	178.59**	6.9	.050	.93	.125 (.11, .14)	125.44**
2-Factors: <i>Personal Growth</i> versus rest	26	150.79**	5.8	.045	.94	.113 (.10, .13)	97.64**
2-Factors: <i>Innovation</i> versus rest	26	76.787**	3.0	.029	.98	.072 (.05, .09)	23.64**
1-Factor model	27	192.30**	8.0	.051	.92	.127 (.11, .14)	139.15**
Sample 2 (<i>n</i> = 219)							
3-Factor model	24	58.16**	2.4	.042	.96	.081 (.06, .11)	
2-Factors: <i>Performance Increase</i> versus rest	26	124.52**	4.8	.064	.89	.132 (.11, .16)	66.35**
2-Factors: <i>Personal Growth</i> versus rest	26	94.87**	3.6	.057	.92	.110 (.09, .13)	36.70**
2-Factors: <i>Innovation</i> versus rest	26	75.42**	2.9	.048	.94	.093 (.07, .12)	17.26**
1-Factor model	27	127.91**	5.3	.065	.89	.131 (.11, .15)	69.75**
Sample 3 (<i>N</i> = 132)							
3-Factor model	24	35.03	1.5	.038	.99	.059 (.00, .10)	
2-Factors: <i>Performance Increase</i> versus rest	26	125.94**	4.8	.069	.88	.171 (.14, .20)	90.91**
2-Factors: <i>Personal Growth</i> versus rest	26	115.22**	4.4	.065	.89	.162 (.13, .19)	80.19**
2-Factors: <i>Innovation</i> versus rest	26	54.10**	2.1	.045	.97	.091 (.06, .12)	19.08**
1-Factor model	27	141.13**	5.9	.074	.86	.180 (.15, .21)	106.10**
Sample 4 (<i>N</i> = 502)							
3-Factor model	24	115.53**	4.8	.029	.97	.087 (.07, .10)	
2-Factors: <i>Performance Increase</i> versus rest	26	300.60**	11.6	.050	.91	.145 (.13, .16)	185.07**
2-Factors: <i>Personal Growth</i> versus rest	26	261.76**	10.1	.049	.92	.135 (.12, .15)	146.23**
2-Factors: <i>Innovation</i> versus rest	26	135.61	5.2	.031	.96	.092 (.08, .11)	20.08**
1-Factor model	27	316.68**	13.2	.052	.91	.146 (.13, .16)	201.15**

Comparisons are made to the 3-factor model

SRMR standardized root-mean-square residual, CFI comparative fit index, RMSEA root-mean-square error of approximation, CI confidence interval

***p* < .01

root-mean-square error of approximation (RMSEA), and comparative fit index (CFI). Models with good fit satisfy all or most of the following criteria: a normed Chi square value (χ^2/df) less than 5.0 (Wheaton et al. 1977), SRMR < .08, RMSEA < .06, and CFI > .95 (Hu and Bentler 1999).

As indicated in Tables 2 and 3, the 3-factor models for both positive and negative beliefs had good fit across all four samples. We next tested whether the 3-factor models provided better fit to the data than a single-factor model or two-factor models in which two subcategories load on one factor and the remaining subcategory is a factor on its own. The 3-factor model fit the data significantly better than the competing single- or two-factor models across all four samples (see Tables 2, 3). This indicates that people hold partly independent beliefs about various positive aspects and various negative aspects of competition.

Because the analyses showed the 3-factor models to have good fit to the data, we examined factor loadings for each subcategory of positive and negative beliefs. For all items,

factor loadings were significant and relatively high (all standardized estimates above .67, *ps* < .001). Loadings for each item across the four samples are available in Fig. 1a, b. Table 4 presents means and standard deviations for scales and subscales across all three our studies, Table 5 presents correlations among subscales, and Table 6 presents inter-item correlations.

Testing for gender invariance in factor structure

Given our objective of studying gender differences in beliefs about competition, we sought to determine whether the scale captured similar belief structures in women and men. To this purpose, we conducted a multi-group structural equation modeling analysis in AMOS, with gender as our grouping variable. We tested whether allowing differential factor loadings for the two genders (the unconstrained model) would lead to a better model fit than setting factor loadings to be equal across the two genders (the constrained model).

Table 3 Study 1: results from the CFA for negative beliefs about competition

	<i>df</i>	χ^2	χ^2/df	SRMR	CFI	RMSEA (90% CI)	$\Delta\chi^2$
Sample 1 (<i>n</i> = 378)							
3-Factor model	24	59.71**	2.5	.031	.99	.063 (.04, .08)	
2-Factors: <i>Unethical Behavior</i> versus rest	26	239.92**	9.2	.060	.91	.148 (.13, .17)	180.21**
2-Factors: <i>Self-Damage</i> versus rest	26	182.35**	7.0	.057	.93	.126 (.11, .14)	122.64**
2-Factors: <i>Relational Damage</i> versus rest	26	387.59**	14.9	.075	.85	.192 (.18, .21)	327.88**
1-Factor model	27	442.12**	18.4	.077	.83	.202 (.19, .22)	382.41**
Sample 2 (<i>n</i> = 222)							
3-Factor model	24	40.07**	1.7	.033	.99	.055 (.02, .08)	
2-Factors: <i>Unethical Behavior</i> versus rest	26	114.17**	4.4	.058	.92	.124 (.10, .15)	74.10**
2-Factors: <i>Self-Damage</i> versus rest	26	108.94**	4.2	.055	.92	.120 (.10, .14)	68.88**
2-Factors: <i>Relational Damage</i> versus rest	26	143.63**	5.5	.063	.89	.143 (.12, .17)	103.57**
1-Factor model	27	190.10**	7.9	.072	.85	.165 (.14, .19)	150.03**
Sample 3 (<i>N</i> = 132)							
3-Factor model	24	47.24**	2.0	.035	.97	.086 (.05, .12)	
2-Factors: <i>Unethical Behavior</i> versus rest	26	102.03**	3.9	.055	.91	.149 (.12, .18)	54.79**
2-Factors: <i>Self-Damage</i> versus rest	26	109.14**	4.2	.059	.90	.156 (.13, .19)	61.90**
2-Factors: <i>Relational Damage</i> versus rest	26	150.68**	5.8	.073	.86	.191 (.16, .22)	103.44**
1-Factor model	27	176.56**	7.4	.078	.83	.206 (.18, .24)	129.32**
Sample 4 (<i>N</i> = 502)							
3-Factor model	24	60.93**	2.5	.026	.99	.055 (.04, .07)	
2-Factors: <i>Unethical Behavior</i> versus rest	26	188.69**	7.3	.046	.94	.112 (.10, .13)	127.76**
2-Factors: <i>Self-Damage</i> versus rest	26	113.90**	4.4	.035	.97	.082 (.07, .10)	52.97**
2-Factors: <i>Relational Damage</i> versus rest	26	244.80**	9.4	.050	.92	.130 (.12, .14)	183.87**
1-Factor model	27	280.18**	11.7	.054	.90	.137 (.12, .15)	219.25**

Comparisons are made to the 3-factor model

SRMR standardized root-mean-square residual, CFI comparative fit index, RMSEA root-mean-square error of approximation, CI confidence interval

***p* < .01

Table 4 Summary table for means and standard deviations across all samples

	Study 1 Sample 1 <i>n</i> = 380	Study 1 Sample 2 <i>n</i> = 219	Study 1 Sample 3 <i>N</i> = 132	Study 1 Sample 4 <i>N</i> = 502	Study 2 <i>N</i> = 340	Study 3 <i>N</i> = 758
Positive Beliefs Subscale	5.55 (0.87)	5.40 (0.84)	5.48 (0.98)	5.54 (0.91)	5.27 (0.80)	5.50 (0.88)
Performance Increase	5.66 (0.94)	5.65 (0.86)	5.62 (1.01)	5.48 (1.05)	5.05 (0.98)	5.32 (1.04)
Personal Growth	5.36 (1.01)	5.04 (1.10)	5.39 (1.13)	5.66 (0.95)	5.42 (0.90)	5.60 (0.90)
Innovation	5.63 (0.94)	5.51 (0.93)	5.43 (1.18)	5.48 (1.02)	5.35 (0.94)	5.57 (0.90)
	Study 1 Sample 1 <i>n</i> = 378	Study 1 Sample 2 <i>n</i> = 222	Study 1 Sample 3 <i>N</i> = 132	Study 1 Sample 4 <i>N</i> = 502	Study 2 <i>N</i> = 340	Study 3 <i>N</i> = 758
Negative Beliefs Subscale	3.93 (1.20)	4.15 (1.13)	3.94 (1.29)	3.42 (1.12)	4.10 (1.01)	3.96 (1.14)
Unethical Behavior	3.78 (1.42)	4.04 (1.40)	3.79 (1.51)	3.35 (1.29)	3.62 (1.29)	3.84 (1.34)
Self-Damage	3.61 (1.37)	3.83 (1.25)	3.65 (1.43)	3.02 (1.22)	4.07 (1.19)	3.72 (1.19)
Relational Damage	4.40 (1.28)	4.57 (1.26)	4.37 (1.41)	3.90 (1.28)	4.62 (1.08)	4.32 (1.20)

The possible range for the items is 1–7. Standard deviations are indicated in parentheses. Sample sizes for Samples 1 and 2 differ from those in Table 2 because of missing data

Table 5 Summary table of average correlations among scales and subscales across all samples

	(PB)	(NB)	(PB-1)	(PB-2)	(PB-3)	(NB-1)	(NB-2)	(NB-3)
(PB) Positive Beliefs Subscale	.91 [.87, .93]							
(NB) Negative Beliefs Subscale	-.42 [-.51, -.27]	.91 [.88, .93]						
(PB-1) Performance Increase	.90 [.85, .92]	-.42 [-.47, -.29]	.80 [.71, .85]					
(PB-2) Personal Growth	.90 [.86, .92]	-.39 [-.51, -.24]	.75 [.62, .80]	.84 [.77, .87]				
(PB-3) Innovation	.86 [.83, .89]	-.30 [-.38, -.15]	.66 [.54, .71]	.64 [.57, .72]	.83 [.78, .87]			
(NB-1) Unethical Behavior	-.31 [-.39, -.18]	.88 [.86, .89]	-.33 [-.40, -.18]	-.30 [-.39, -.17]	-.21 [-.29, -.10]	.87 [.81, .90]		
(NB-2) Self-Damage	-.47 [-.56, -.32]	.86 [.84, .88]	-.47 [-.52, -.34]	-.44 [-.55, -.29]	-.35 [-.43, -.19]	.62 [.55, .66]	.87 [.84, .90]	
(NB-3) Relational Damage	-.32 [-.42, -.17]	.89 [.84, .91]	-.33 [-.40, -.21]	-.29 [-.41, -.15]	-.23 [-.35, -.08]	.68 [.59, .72]	.67 [.59, .72]	.82 [.74, .88]

Average correlations across six samples. Correlations were averaged by first transforming them to z-scores. Numbers on the diagonal are the average Cronbach’s alphas across the six samples, with minimum and maximum values in brackets

Table 6 Summary table of average inter-item correlations across all samples

	Perf1	Perf2	Perf3	Grow1	Grow2	Grow3	Inno1	Inno2	Inno3	Ethic1	Ethic2	Ethic3	Self1	Self2	Self3	Rela1	Rela2	Rela3
Positive Beliefs																		
Perf1	1.00																	
Perf2	0.66	1.00																
Perf3	0.58	0.55	1.00															
Grow1	0.62	0.67	0.53	1.00														
Grow2	0.57	0.60	0.55	0.70	1.00													
Grow3	0.51	0.57	0.55	0.62	0.65	1.00												
Inno1	0.54	0.51	0.49	0.50	0.47	0.47	1.00											
Inno2	0.54	0.55	0.50	0.55	0.53	0.51	0.66	1.00										
Inno3	0.48	0.49	0.47	0.48	0.49	0.49	0.61	0.65	1.00									
Negative Beliefs																		
Ethic1	-0.11	-0.16	-0.15	-0.16	-0.16	-0.17	-0.09	-0.10	-0.11	1.00								
Ethic2	-0.17	-0.20	-0.21	-0.20	-0.21	-0.22	-0.13	-0.15	-0.13	0.70	1.00							
Ethic3	-0.18	-0.20	-0.21	-0.20	-0.22	-0.22	-0.12	-0.15	-0.13	0.69	0.75	1.00						
Self1	-0.24	-0.30	-0.25	-0.31	-0.29	-0.29	-0.22	-0.24	-0.21	0.49	0.50	0.51	1.00					
Self2	-0.23	-0.30	-0.24	-0.31	-0.30	-0.29	-0.23	-0.22	-0.22	0.49	0.50	0.51	0.75	1.00				
Self3	-0.19	-0.25	-0.19	-0.25	-0.25	-0.23	-0.15	-0.17	-0.16	0.48	0.50	0.52	0.67	0.67	1.00			
Rela1	-0.17	-0.22	-0.19	-0.24	-0.24	-0.23	-0.14	-0.17	-0.17	0.54	0.57	0.58	0.57	0.58	0.58	1.00		
Rela2	-0.11	-0.15	-0.14	-0.15	-0.17	-0.19	-0.11	-0.13	-0.13	0.55	0.57	0.58	0.49	0.50	0.51	0.65	1.00	
Rela3	-0.12	-0.18	-0.14	-0.21	-0.21	-0.22	-0.10	-0.13	-0.12	0.48	0.49	0.52	0.51	0.51	0.53	0.60	0.64	1.00

Average inter-item correlations across six samples. Correlations were averaged by first transforming them to z-scores. Items are listed in Table 1

The results of the multi-group analysis are presented in Table 7. For negative beliefs, the unconstrained model did not fit the data significantly better in any of the four samples (see Table 7 for details). For positive beliefs, the unconstrained model, which allowed for different loadings for the two genders, did not provide a significantly better fit to the data in three out of the four samples, suggesting that the positive beliefs scale has satisfactory structural invariance for gender. However, the unconstrained model provided a better fit in Sample 1. This was a sample in which participants

responded only to the positive beliefs subscale or only to the negative beliefs subscale.

Overall, these analyses suggest that the scale has satisfactory structural invariance for the two genders and is a suitable instrument for measuring gender differences when the two scales are presented together. This is what we did in Studies 2 and 3.

Table 7 Results of the tests for gender invariance of the scale's factor structure

	Unconstrained model $\chi^2(48)$	Constrained model $\chi^2(54)$	Model comparison	
			$\Delta\chi^2(6)$	<i>p</i>
Positive Beliefs				
Sample 1	98.30	116.76	18.46	.01
Sample 2	101.04	113.26	12.22	.06
Sample 3	70.40	73.93	3.53	.74
Sample 4	162.88	168.03	5.15	.52
Negative Beliefs				
Sample 1	102.47	104.15	1.68	.95
Sample 2	78.08	78.96	0.88	.99
Sample 3	115.15	117.24	2.09	.91
Sample 4	77.29	87.17	9.87	.13

In the constrained model, the factor loadings for all factors are constrained to be the same for both genders, whereas in the unconstrained model they are allowed to differ

Study 2

Having developed a scale to measure lay beliefs about competition, we turned to examining gender differences in the endorsement of these beliefs. Study 2 tested whether women and men differ in their lay beliefs about competition, and if so, whether the difference would account for the gender difference in competitiveness.

Study 2 also provided an opportunity to obtain evidence of the scale's convergent and discriminant validity, i.e., whether it is more strongly related to measures of theoretically relevant constructs than to theoretically distant constructs (Campbell and Fiske 1959). To this purpose, participants responded to two measures of *domain-general competitiveness* (Johnson and Norem-Hebeisen 1979; Helmreich and Spence 1978), a measure of *preference for competitive work environments* (Fletcher and Nusbaum 2010), and a measure of *hypercompetitiveness* (Ryckman et al. 1990). Because all three constructs entail competitive attitudes, and because attitudes are partly based on beliefs (Fishbein and Ajzen 1974), we expected all constructs to be empirically related to lay beliefs about competition. We expected the strongest association for domain-general competitiveness, and we expected descriptively weaker relationships for hypercompetitiveness and preference for competitive work environments, which have additional conceptual components beyond domain-general competitiveness.

Methods

Participants

A total of 340 undergraduates ($M_{\text{age}} = 19.7$, $SD_{\text{age}} = 1.7$, range 18–35; 63% female; 44% White, 34% Asian, 10% Hispanic, and 7% African) in an introductory-level psychology course at a US university participated in the survey for extra course credit.¹ Eighty-three percent of participants had full- or part-time work experience.

Procedure and measures

The study was conducted in three sessions over the course of 12 days. In the first session, participants completed our scale assessing lay beliefs about competition. In the second session 1 week later, they completed the two scales measuring *domain-general competitiveness* and the scale measuring *hypercompetitiveness* described below. At the third session 5 days later, they completed the scale measuring *preference for competitive work environments*.

Lay Beliefs about Competition Scale We used the 18 items of the Lay Beliefs about Competition scale to measure participants' *positive beliefs about competition* (Cronbach's alpha = .86) and *negative beliefs about competition* (Cronbach's alpha = .88).

Domain-general competitiveness To measure participants' domain-general competitiveness, we used two scales. The first was Johnson and Norem-Hebeisen's (1979) 8-item competitive interdependence scale (Cronbach's alpha = .87; 7-point scale: 1 = *strongly disagree* to 7 = *strongly agree*) which measures the extent to which individuals enjoy and value competition (e.g., "Competing with others is a good way to work") and winning in competition (e.g., "I like to be the best in the group I am in"). The second measure of competitiveness was the 5-item competitiveness subscale of Helmreich and Spence's (1978) Work and Family Orientation Questionnaire (Cronbach's alpha = .79; 5-point scale: 1 = *strongly disagree* to 5 = *strongly agree*). These items similarly measure the extent to which individuals enjoy competitive situations (e.g., "I enjoy working in situations involving competition with others") and value winning in competition (e.g., "I feel that winning is important in both work and games").

After standardizing the scores, we combined these scales into a single composite measure of domain-general

¹ The data for this study were collected in the context of a larger project (Jury et al. 2019; Korn et al. 2019). None of the findings from the research herein have been presented in any prior work.

Table 8 Study 2—means and correlations among variables

Variables (<i>scale item range</i>)	<i>M</i>	<i>SD</i>	1	2	3	4	5
(1) Positive beliefs (<i>1–7</i>)	5.27	0.80	(.86)				
(2) Negative beliefs (<i>1–7</i>)	4.10	1.01	–.27**	(.88)			
(3) Competitiveness (<i>combined z-scores</i>)	0.00	0.69	.42**	.15**	(.91)		
(4) Hypercompetitiveness (<i>1–5</i>)	2.81	0.51	.22**	.06	.66**	(.84)	
(5) Preference for competitive workplaces (<i>1–7</i>)	3.51	1.25	.18**	–.06	.52**	.51**	(.96)

N = 327–340 due to missing data for some variables. Possible ranges for each variable are listed next to variable names. Coefficients in parentheses are Cronbach’s alpha values

***p* < .01

Table 9 Means and effect sizes for the gender difference in positive beliefs about competition across all samples

Study	Gender	Positive Beliefs (Full Scale)		Performance Increase		Personal Growth		Innovation	
		<i>M (SD)</i>	Cohen’s <i>d</i> <i>p</i>	<i>M (SD)</i>	Cohen’s <i>d</i> <i>p</i>	<i>M (SD)</i>	Cohen’s <i>d</i> <i>p</i>	<i>M (SD)</i>	Cohen’s <i>d</i> <i>p</i>
Study 1 (Sample 1)	Female (<i>n</i> = 164)	5.42 (0.90)	<i>d</i> = 0.27	5.62 (0.95)	<i>d</i> = 0.08	5.18 (1.08)	<i>d</i> = 0.31	5.45 (0.96)	<i>d</i> = 0.34
	Male (<i>n</i> = 216)	5.65 (0.83)	<i>p</i> = .01	5.69 (0.94)		5.49 (0.93)		5.76 (0.90)	
Study 1 (Sample 2)	Female (<i>n</i> = 105)	5.28 (0.81)	<i>d</i> = 0.27	5.61 (0.87)	<i>d</i> = 0.09	4.86 (1.09)	<i>d</i> = 0.30	5.37 (0.84)	<i>d</i> = 0.30
	Male (<i>n</i> = 114)	5.51 (0.86)	<i>p</i> = .05	5.69 (0.85)		5.19 (1.09)		5.64 (1.00)	
Study 1 (Sample 3)	Female (<i>n</i> = 60)	5.31 (1.12)	<i>d</i> = 0.33	5.41 (1.15)	<i>d</i> = 0.39	5.15 (1.32)	<i>d</i> = 0.39	5.37 (1.22)	<i>d</i> = 0.11
	Male (<i>n</i> = 72)	5.62 (0.83)	<i>p</i> = .07	5.80 (0.84)		5.58 (0.91)		5.49 (1.15)	
Study 1 (Sample 4)	Female (<i>n</i> = 242)	5.35 (0.91)	<i>d</i> = 0.41	5.29 (1.02)	<i>d</i> = 0.36	5.50 (0.96)	<i>d</i> = 0.33	5.26 (1.02)	<i>d</i> = 0.43
	Male (<i>n</i> = 260)	5.72 (0.88)	<i>p</i> < .01	5.66 (1.04)		5.81 (0.92)		5.69 (0.97)	
Study 2	Female (<i>n</i> = 214)	5.18 (0.81)	<i>d</i> = 0.31	4.95 (0.96)	<i>d</i> = 0.29	5.36 (0.92)	<i>d</i> = 0.18	5.24 (0.96)	<i>d</i> = 0.31
	Male (<i>n</i> = 126)	5.43 (0.76)	<i>p</i> < .01	5.23 (0.98)		5.52 (0.86)		5.53 (0.88)	
Study 3	Female (<i>n</i> = 360)	5.35 (0.94)	<i>d</i> = 0.33	5.15 (1.10)	<i>d</i> = 0.32	5.49 (0.97)	<i>d</i> = 0.25	5.41 (0.94)	<i>d</i> = 0.35
	Male (<i>n</i> = 398)	5.64 (0.81)	<i>p</i> < .01	5.48 (0.95)		5.71 (0.83)		5.72 (0.82)	

The possible range for the items is 1–7

competitiveness, because they cover the same conceptual ground and their items are correlated moderately to strongly, with a median inter-item correlation coefficient of .41. The combined scale had a Cronbach’s alpha of .91.

Hypercompetitiveness Hypercompetitiveness is defined as an indiscriminate need to compete and win by any means, including manipulation, aggression and exploitation (Horney 1937; Ryckman et al. 1990). To measure hypercompetitiveness, we used the 26-item Hypercompetitive Attitude Scale (Cronbach’s alpha = .84; 5-point scale: 1 = *strongly disagree* to 5 = *strongly agree*) developed by Ryckman et al. (1990). This scale measures the extent to which individuals have extremely competitive attitudes (e.g., “I compete with others even if they are not competing with me”) and may be willing to impose costs on others to win (e.g., “If I can disturb my opponent in some way in order to get the edge in competition, I will do so”).

Preference for competitive work environments To measure participants’ preference for working in competitive workplaces, we adapted Fletcher and Nusbaum’s (2010) 20-item Competitive Work Environment scale (Cronbach’s alpha = .96; 7-point scale, 1 = *not at all true of me* to 7 = *extremely true of me*). This scale captures a preference for workplaces in which rewards, recognition and status are allocated based on competition among coworkers, with items such as “In the future, I would like to work in environments in which my coworkers and I would be compensated (e.g., pay, bonuses) based on our performance relative to others” and “In the future, I would like to work in environments in which I would be acknowledged for my accomplishments only when I outperform my coworkers.”

Results

Table 8 presents descriptive statistics and zero-order correlations among variables, and Tables 9 and 10 present descriptive and inferential statistics on gender differences

Table 10 Means and effect sizes for the gender difference in negative beliefs about competition across all samples

Study	Gender	Negative Beliefs (Full Scale)		Unethical Behavior		Self-Damage		Relational Damage	
		<i>M</i> (<i>SD</i>)	Cohen's <i>d</i> <i>p</i>	<i>M</i> (<i>SD</i>)	Cohen's <i>d</i> <i>p</i>	<i>M</i> (<i>SD</i>)	Cohen's <i>d</i> <i>p</i>	<i>M</i> (<i>SD</i>)	Cohen's <i>d</i> <i>p</i>
Study 1 (Sample 1)	Female (<i>n</i> = 176)	3.91 (1.22)	<i>d</i> = 0.04	3.60 (1.42)	<i>d</i> = 0.24	3.74 (1.37)	<i>d</i> = -0.18	4.38 (1.28)	<i>d</i> = 0.03
	Male (<i>n</i> = 202)	3.95 (1.18)	<i>p</i> = .73	3.93 (1.41)		3.49 (1.37)		4.42 (1.28)	
Study 1 (Sample 2)	Female (<i>n</i> = 107)	4.05 (1.13)	<i>d</i> = 0.16	3.85 (1.38)	<i>d</i> = 0.27	3.82 (1.30)	<i>d</i> = 0.02	4.49 (1.23)	<i>d</i> = 0.13
	Male (<i>n</i> = 115)	4.24 (1.12)	<i>p</i> = .22	4.22 (1.41)		3.84 (1.21)		4.65 (1.29)	
Study 1 (Sample 3)	Female (<i>n</i> = 60)	4.12 (1.47)	<i>d</i> = -0.26	3.92 (1.61)	<i>d</i> = -0.16	3.92 (1.60)	<i>d</i> = -0.36	4.51 (1.54)	<i>d</i> = -0.18
	Male (<i>n</i> = 72)	3.79 (1.10)	<i>p</i> = .14	3.68 (1.43)		3.42 (1.24)		4.25 (1.30)	
Study 1 (Sample 4)	Female (<i>n</i> = 242)	3.44 (1.08)	<i>d</i> = -0.03	3.26 (1.21)	<i>d</i> = 0.14	3.14 (1.17)	<i>d</i> = -0.20	3.91 (1.23)	<i>d</i> = -0.02
	Male (<i>n</i> = 260)	3.41 (1.16)	<i>p</i> = .75	3.44 (1.35)		2.90 (1.25)		3.88 (1.32)	
Study 2	Female (<i>n</i> = 214)	4.05 (1.01)	<i>d</i> = 0.16	3.48 (1.25)	<i>d</i> = 0.31	4.09 (1.21)	<i>d</i> = -0.05	4.57 (1.10)	<i>d</i> = 0.13
	Male (<i>n</i> = 126)	4.21 (0.99)	<i>p</i> = .16	3.87 (1.32)		4.04 (1.17)		4.71 (1.04)	
Study 3	Female (<i>n</i> = 360)	3.95 (1.11)	<i>d</i> ~ 0	3.91 (1.33)	<i>d</i> = -0.12	3.65 (1.13)	<i>d</i> = 0.13	4.32 (1.15)	<i>d</i> ~ 0
	Male (<i>n</i> = 398)	3.96 (1.19)	<i>p</i> = .93	3.75 (1.35)		3.80 (1.25)		4.32 (1.26)	

The possible range for the items is 1–7

for all samples. In order to avoid alpha error inflation, in the remainder of the paper, we report *p*-values only for tests which are grounded in our theoretical framework or previous empirical research. These include tests of gender differences in competitiveness, tests of gender differences in the positive and negative beliefs about competition, and mediational tests for the gender effects on competitiveness via positive and negative beliefs about competition.

Gender differences in lay beliefs about competition

We first tested for gender differences in lay beliefs about competition. Gender predicted the endorsement of positive beliefs about competition, such that men endorsed significantly more positive beliefs ($M = 5.43$, $SD = 0.76$) than did women ($M = 5.18$, $SD = 0.81$); $t(338) = 2.74$, $p = .01$, Cohen's $d = 0.31$. In contrast, gender did not significantly predict the endorsement of negative beliefs about competition by men ($M = 4.21$, $SD = 0.99$) versus women ($M = 4.05$, $SD = 1.01$); $t(338) = 1.42$, $p = .16$, Cohen's $d = 0.16$.

Mediation of the gender difference in domain-general competitiveness by lay beliefs

We next tested whether competition-related beliefs would account for the gender difference in domain-general competitiveness. Consistent with prior research, women in our sample reported significantly lower levels of competitiveness ($M = -0.82$, $SD = 0.71$) than did men ($M = 0.14$, $SD = 0.65$); $t(328) = 2.79$, $p = .01$, Cohen's $d = 0.32$. To test the mediating role of positive beliefs about competition in

this gender difference, we used the PROCESS macro (Hayes 2013, Model 4) and calculated bootstrapped 95% confidence intervals (CIs) with 10,000 resamples for the indirect effect of participant gender on competitiveness via positive beliefs about competition. Supporting the mediating role of positive beliefs, the 95% CI did not include 0 [0.04, 0.16].

We also tested for the mediating effect of negative beliefs about competition. Consistent with the absence of a gender difference in the endorsement of negative beliefs about competition, negative beliefs did not significantly mediate the relationship between gender and competitiveness; 95% CI [-0.06, 0.004].

Mediation of the gender difference in hypercompetitiveness by lay beliefs

The levels of hypercompetitive attitudes reported by women ($M = 2.77$, $SD = 0.53$) did not significantly differ from the levels reported by men ($M = 2.87$, $SD = 0.47$); $t(328) = 1.78$, $p = .08$, Cohen's $d = 0.21$. Using the same method above, we found that positive beliefs mediated the gender difference in hypercompetitive attitudes (95% CI [0.01, 0.07]). No significant mediating effect was observed via the negative beliefs scale.

Mediation of the gender difference in preference for competitive work environments by lay beliefs

Women reported significantly lower levels of preference for competitive work environments ($M = 3.38$, $SD = 1.25$)

than did men ($M = 3.73$, $SD = 1.22$); $t(325) = 2.49$, $p = .01$, Cohen's $d = 0.28$. Using the same method above, we found that positive beliefs mediated the gender difference in preference for competitive work environments (95% CI [0.02, 0.16]). No significant mediating effect was observed via the negative beliefs scale.

Evidence on the scale's convergent and discriminant validity

The results also supported the scale's construct validity by showing that it is empirically related to, and can discriminate between, theoretically more and less distant constructs. As predicted, beliefs about competition were associated with all three constructs, and this relationship was descriptively strongest for domain-general competitiveness. Domain-general competitiveness correlated .42 ($p < .01$) with positive beliefs about competition and $-.15$ ($p = .01$) with negative beliefs about competition. In contrast, hypercompetitiveness significantly correlated only with positive beliefs about competition ($r = .22$, $p < .01$) and had a near-zero correlation with negative beliefs about competition ($r = .06$, $p = .27$). Similarly, preference for competitive workplaces significantly correlated only with positive beliefs about competition ($r = .18$, $p < .01$) and had a near-zero correlation with negative beliefs about competition ($r = -.06$, $p = .32$).

Discussion

Study 2 found that women are less likely than men to believe that competition produces positive outcomes. We did not find evidence supporting that women are more likely to believe than men that competition produced negative outcomes. Moreover, positive but not negative beliefs accounted for the gender difference in competitiveness, as measured by a domain-general competitiveness measure, and two measures that partially tap competitive motivations.

The mediational analyses suggest that positive lay beliefs about competition may play a causal role in competitiveness. At the same time, the correlational nature of the data implies that causality may also run in the opposite direction. To probe this possibility, we conducted reverse mediational analyses, in which the gender difference in positive beliefs about competition was mediated through competitiveness. The results supported the possibility of reverse mediation, with the 95% CI not including 0 for domain-general competitiveness [0.03, 0.19], hypercompetitiveness [0.001, 0.09], and preference for competitive work environments [0.006, 0.09]. We discuss possible causal pathways in the [General Discussion](#).

Study 3

In Study 3, we sought to further examine gender differences in lay beliefs about competition and test whether these differences would account for the gender difference in competitiveness. This time, we used a behavioral measure of competitiveness. We also introduced a 1-month lag between the measurement of beliefs and competitive behaviors. This lag allowed us to test the predictive utility of the scale across a 1-month period, as well as its test–retest reliability. Even though people's beliefs about competition may change over time, the change expected within a month is negligible. Therefore, measurements taken 1 month apart should be highly correlated if the scale satisfactorily captures people's beliefs about competition. In contrast, the measurements should correlate only weakly, or not at all, if the scale does not capture a meaningful and relatively stable individual difference.

Methods

Participants

In the first round of testing we recruited, on MTurk, 907 native English speakers living in the US. Of these participants, 758 completed the second round as well (retention rate 84%).² We excluded from analyses 4 participants who reported inconsistent gender information across the two rounds, leaving 754 individuals in the final sample (48% female; $M_{\text{age}} = 37.0$, $SD_{\text{age}} = 11.8$, range 18–74; 82% White, 6% Asian, 6% African American, 4% Hispanic, and 2% other). At the initial round, 66% of the participants were employed full-time, 16% were employed part-time, and 18% were unemployed. Only 1% of participants reported not having had any prior work experience.

Participants were paid \$0.75 for the first round of the study. For the second round, they were paid a \$0.80 base rate and a \$0.20 bonus.

Procedure and measures

In the first round, participants responded to the 18 items of the Lay Beliefs about Competition Scale, presented in

² We tested whether participants who participated in the second round were different from those who did not. The two groups did not differ in gender composition [$\chi^2(1) = 0.55$, $p = .47$], average endorsement of positive beliefs about competition [$F(1, 901) = 0.30$, $p = .86$], or average endorsement of negative beliefs about competition [$F(1, 901) < 0.01$, $p = .95$]. However, participants who did participate in the second round were significantly older ($M = 37.0$, $SD = 11.8$) than participants who did not complete the second round ($M = 32.0$, $SD = 10.2$), $F(1, 901) = 23.3$, $p < .01$.

random order. They then reported their gender, age, race, and employment information. A month after the first round, we contacted participants who completed the first round and invited them to participate in a study. The invitation message stated that they qualified for a new study, without making any reference to the initial study. Upon starting the second round, participants were told that they were going to complete a task and would be paid a bonus based on their performance. The instructions did not specify what kind of task was awaiting them. Our behavioral measure of competitiveness was whether participants would choose to have their bonus depend on their competitive or absolute performance. Participants were told:

If you choose the first option, your bonus will depend on how your performance compares with other participants who complete this task (i.e., your competitive performance).

If you choose the second option, your bonus will depend on how you perform on the task in absolute terms, regardless of other participants' performance.

Participants were then asked to make a choice between the two options before proceeding to the task. After participants indicated whether they wanted to compete or not, they were given a short typing task (61 words). This was a filler task to support the cover story and we did not conduct any analyses on it. Finally, participants completed the Lay Beliefs about Competition Scale in random order.

Results

Gender differences in lay beliefs about competition

We first tested for gender differences in beliefs about competition, using scores averaged across the two rounds of measurement. Consistent with Study 2 findings, men reported stronger endorsement of positive beliefs ($M=5.64$, $SD=0.81$) than did women ($M=5.35$, $SD=0.94$); $t(752)=4.48$, $p<.01$, Cohen's $d=0.33$. In contrast, there was no significant gender difference in the endorsement of negative competition-related beliefs reported by men ($M=3.96$, $SD=1.11$) versus women ($M=3.95$, $SD=1.19$); $t(752)=0.09$, $p=.93$, Cohen's $d\sim 0$. Please refer to Tables 9 and 10 for gender differences in belief subcategories, which we will discuss in more detail later.

Predictive utility of lay beliefs

To test the predictive utility of lay beliefs, we examined whether participants' beliefs reported in the first round predicted their choice to enter a competition a month later. We found that positive beliefs about competition at Time 1 predicted willingness to compete a month later. A logistic

regression model with positive beliefs was significantly better at predicting the choice to compete than a constant-only model; $\chi^2(1)=9.95$, $p<.01$. At 1 standard deviation below the mean value of positive beliefs, the odds of choosing to compete was 24%. These odds rose to 35% at 1 standard deviation above the mean value. There was no significant relationship between competition entry and the negative beliefs subscale; $\chi^2(1)=0.069$, $p=.79$.

Mediation of the gender difference in competitive choices by lay beliefs

We next analyzed whether lay beliefs would account for the gender difference in willingness to compete. As expected, women were less likely to choose to compete than men, with 21% of women choosing the competition option, compared to 36% of men, $\chi^2(1)=20.62$, $p<.01$.

To test whether positive beliefs about competition would account for some of this difference, we used responses to the Lay Beliefs about Competition Scale from the first round of the study. Using the PROCESS macro (Hayes 2013, Model 4), we calculated bootstrapped 95% CIs for the indirect effect with 10,000 resamples. We found supporting evidence for the mediating role of positive beliefs measured a month prior to the competition choice, as the 95% CI for the indirect effect did not include 0 [0.01, 0.13]. We found no supporting evidence for a mediating role of negative beliefs in predicting competitive behavior (95% CI [-0.02, 0.01]).

Test–retest reliability

Finally, we obtained the test–retest reliability of the Lay Beliefs about Competition Scale, by computing the correlation coefficients between the responses to the scale across the two rounds. At a 1-month interval, the correlation coefficient for the positive beliefs subscale was $r(752)=.76$, $p<.01$, and for the negative beliefs subscale, it was $r(752)=.73$, $p<.01$. These reliability scores are comparable to the ones reported for other measures of lay theories such as those concerning beliefs about the malleability of personal traits (e.g., 0.71 over a 4-week period reported by Levy et al. 1998). The scale thus has satisfactory test–retest reliability.

Discussion

Study 3 showed that positive beliefs about competition predict competitive behaviors a month after their measurement, and account for the gender difference in competitive behaviors. We did not find evidence supporting the role of negative beliefs about competition in competitive behaviors.

Table 11 Meta-analysed effect sizes for gender differences in positive and negative beliefs about competition across six samples ($N=2331$)

	Fixed effects approach		Random effects approach		
	Effect size	<i>p</i> -value	Effect size	<i>p</i> -value	95% CI
Positive Beliefs	0.33	< .01	0.32	< .01	(0.26, 0.37)
Performance Increase	0.26		0.25		(0.11, 0.40)
Personal Growth	0.28		0.29		(0.22, 0.37)
Innovation	0.34		0.31		(0.19, 0.42)
Negative Beliefs	0.02	.39	0.01	.86	(− 0.15, 0.18)
Unethical Behavior	0.17		0.15		(− 0.03, 0.33)
Self-Damage	− 0.14		− 0.15		(− 0.29, − 0.01)
Relational Damage	0.02		0.01		(− 0.11, 0.13)

We report the confidence interval for the more conservative random effects approach

Mini meta-analysis of gender differences in lay beliefs about competition

In Studies 2 and 3, we found that compared to women, men more strongly endorse beliefs about the positive outcomes of competition, and this difference partially accounts for the gender difference in domain-general competitiveness, preference for competitive work environments, and decisions to compete. The evidence did not support a gender difference in the endorsement of negative beliefs about competition, or the role of negative beliefs in explaining the gender difference in competitive attitudes and behaviors. To obtain a more complete picture and precise numerical estimate of the gender difference in the subcategories of positive and negative beliefs, we conducted a mini meta-analysis across all six samples in which we collected data on the Lay Beliefs about Competition Scale as part of Studies 1–3 ($N=2331$).

Methods and results

We report below meta-analytic analyses assuming both fixed and random effects. We used both approaches because this allowed us to determine which results are robust and which depend on analytical choices.

Fixed effect analyses

We initially adopted a fixed effects approach which assumes a fixed underlying effect size across all samples and thus assigns larger weight to larger samples. This approach is appropriate when identical instruments are used across studies and samples are relatively similar (Borenstein et al. 2009).

To obtain meta-analytic effect sizes under a fixed effects assumption, we first computed Cohen's d (1988) for the gender difference in negative beliefs, positive beliefs, and each of their subcategories, for the five samples from Studies 1 and 2. For Study 3, in which the same participants completed the scale twice, we used only one effect size to ensure

independence across samples included in the meta-analysis (Hunter and Schmidt 2004). This effect size was computed by averaging participant responses across the two measurements, as recommended by Goh et al. (2016) and practiced in prior meta-analyses (e.g., Choi et al. 2015). After computing all Cohen's d s, we converted them into Fisher's z s to carry out the computations, and converted them back to Cohen's d for presentation. Descriptive statistics for each of the studies are presented in Tables 9 and 10.

Table 11 shows the meta-analyzed effect sizes and p values. The meta-analytic effect of gender is significant for positive beliefs, with men endorsing more positive beliefs about competition than do women; Cohen's $d=0.33$, $p < .01$. This effect holds for all subcategories of positive beliefs, with similar effect sizes (see Table 11).

In contrast, the meta-analytic results did not support a gender difference in the endorsement of negative beliefs about competition as a whole; Cohen's $d=0.02$, $p = .39$. A closer look at individual subcategories showed a small gender difference in one subcategory: men are on average more likely than women to believe that competition might encourage unethical behavior; Cohen's $d=0.17$. There also was a small gender difference in beliefs about competition's role in hurting people's self-esteem, with women endorsing this belief slightly more than men; Cohen's $d = -0.14$. There was no gender difference in the endorsement of beliefs about competition's role in damaging relationships; Cohen's $d=0.02$.

Random effects analyses

We next conducted a meta-analysis adopting a fully random effects approach, to test the robustness of the above results. A random effects approach puts equal weight on each sample and is more appropriate when measurement instruments or sample characteristics vary across studies, such that one cannot plausibly assume identical true effect sizes (Borenstein et al. 2009). Although we used the same instrument across studies, participants had responded only to positive or only

to negative subscales in two of the six samples (Samples 1 and 2 in Study 1), and we had found this to be a threat to the structural gender invariance of the positive beliefs subscale. Moreover, our samples varied in terms of participants' average age, work experience, national origin, and geographical location, calling into question the assumption of a fixed effect size across samples.

For the random effects meta-analysis, we averaged Cohen's *ds* across the 6 samples and tested them against 0 in a one-sample *t* test. The analysis led to nearly identical results as the fixed effects approach reported above, with all meta-analytic effect sizes (Cohen's *ds*) falling within less than 0.03 points of the estimates obtained with the fixed-effects approach (see Table 11).

Together, these analyses document a robust gender difference for all categories of positive beliefs about competition. Within negative beliefs, we found a smaller and less robust gender difference on two of the three subcategories that went in opposite directions, and no evidence for a gender difference on the third category regarding damage to relationships.

General discussion

Individual differences matter for occupational choices and career success (Barrick et al. 2003; Judge and Kammerer-Mueller 2007; Woods and Hampson 2010). Rapidly accumulating evidence suggests that competitiveness may pattern career-related choices and behaviors in ways that maintain and exacerbate the gender gap in economic and political outcomes (e.g., Bönnte and Piegeler 2013; Buser et al. 2014; Preece and Stoddard 2015). These findings highlight a need to better understand the gender difference in competitiveness. To that purpose, we created and validated a scale measuring people's lay beliefs about competition. Using this scale, we found that women are less likely than men to believe in the positive outcomes of interpersonal competition. We did not find evidence suggesting that women are more likely to believe in competition's negative outcomes on the whole, even though small meta-analytic effects suggest that women are slightly more likely than men to believe that competition will hurt self-esteem, and men are slightly more likely than women to believe that competition can lead to unethical behavior. We also found that positive, but not negative, beliefs about competition partially accounted for the gender difference in competitiveness, as measured in various ways.

The effect we obtained for the gender difference in positive beliefs was small to medium sized (Cohen 1988). This means that the distributions for women and men

largely overlap, and we should be careful not to overstate the magnitude of the gender difference (cf. Hyde 2005). At the same time, small effects can have large practical consequences if their effects accumulate over time or can produce critical impact (Prentice and Miller 1992). Competition may be one such domain: even if the gender differences in competitiveness or competition-related beliefs are not large, they may play an important role at crucial junctures in people's careers and open up hard-to-close gaps (e.g., Bosquet et al. 2017).

Theoretical and practical implications

Having established that women and men differ in some of the beliefs they hold about competition, we can inquire after the origins of these differences: What makes men see more of an upside to competition than women? One possibility is that the difference is purely driven by the gender difference in competitiveness, and beliefs about competition are simply rationalizations for competitive attitudes. In other words, the causal direction may run entirely from competitiveness to the endorsement of competition-related beliefs. The results of the reverse mediational analyses in Study 2 are consistent with this possibility. In Study 3, we could not run a reverse mediation analysis because the outcome variable is dichotomous, and we again cannot rule out the possibility of the reverse causal direction. We thus acknowledge the possibility that lay beliefs about competition are at least partly rationalizations, consistent with findings that people can shift their lay beliefs strategically in line with their current motivations (Leith et al. 2014; Wilson and English 2017). To address this issue more directly, future research may attempt to manipulate people's lay beliefs about competition and observe its effects on competitiveness.

At the same time, there are reasons to suspect that reverse causation is not the full story, and lay beliefs of competition are more than post hoc justifications. First, if people were simply rationalizing their competitive attitudes, it is not clear why they would do this only by attributing to competition more positive outcomes, but not by attributing it correspondingly fewer negative outcomes. Moreover, we have seen that people discriminate in their endorsement of distinct competition-related beliefs, as evidenced by the structural independence of the different belief subcategories within the same valence, as well as the opposite-signed gender difference in two subcategories of negative beliefs. Thus, while reverse causation likely explains some of the gender difference in competition-related beliefs, it is unlikely to be the entire explanation.

A second reason for the gender difference in lay beliefs about competition may be that women and men experience competition differently, and their beliefs reflect these

different experiences. For example, women may be less convinced that competition improves performance because competition really does not improve their performance as much as it does men's. Some evidence already suggests that female performance does not improve and often suffers under competition, whereas male performance does not deteriorate and seems to improve (Gneezy et al. 2003; Morin 2015; Niederle and Vesterlund 2010; Ors et al. 2013; Price 2008; Weisfeld 1986). Women's performance also seems to deteriorate after losing a round of competition, whereas men's does not (Buser 2016; Gill and Prowse 2014). Women's lower scores on the *Performance Increase* items thus could well be grounded in their actual experiences with competition.

If it is true that the different competition-related beliefs partly emerge from different experiences, our findings raise a number of interesting hypotheses about the gendered psychology of competition. Is competition a more suitable means of character development for males than it is for females? Is it more damaging to women's sense of self than it is to men's? Does competition make men more creative and innovative than it makes women, but also lead them to engage in more unethical behaviors? The gender differences in the endorsement of relevant beliefs give us reason to suppose that the answers to all these questions may be affirmative. At the same time, it is interesting to note that women and men did not differ in their beliefs on the negative effects of competition on relationships, even though research has shown that competition is more damaging to women's same-gender relationships than to men's same-gender relationships (Lee et al. 2016). Overall, the gender differences we established supply some original hypotheses about the gendered experience of competition.

A third potential explanation for the gender difference in competition-related beliefs lies with women and men's differential socialization experiences around competition. Are there differences in how parents, teachers, and peers communicate about competition, winning, and losing? Are girls and boys praised differently when they win a competition, and consoled differently when they lose? Do male characters in children's books display different attitudes toward competition than female characters (if they compete at all)? Attention to lay beliefs of competition could help with identifying the socialization practices that foster and support individual and cultural differences in competitiveness. Assessing at what age girls and boys begin to endorse these lay beliefs also would provide us with better insight into the dynamics which result in differential endorsement of competition-related beliefs.

A fourth potential explanation for the gender difference in lay beliefs involves socialization histories that leave females with fewer first-hand experiences of competition. From an early age, girls are socialized not to compete with each other and to keep the appearance of equality, whereas boys openly

compete and establish ranking hierarchies (Maccoby 1990; Rose and Rudolph 2006; Schneider et al. 2011). These differences in childhood peer culture mean that females accumulate less practice with overt competition—a gender gap that is compounded by their lower participation rates in competitive sports (Eccles and Harold 1991). This lack of practice may prevent women from developing a richer understanding of competition (Dennehy 2012). Instead, women's beliefs, more than men's, may be post hoc rationalizations, or second-hand ideas acquired from same-sex peers and other agents of socialization. If it is true that the gender difference in competition-related beliefs is partly driven by women's lesser familiarity with competition, we would predict that girls who start to play competitive sports, or take on other competitive activities such as chess or debating, would over time develop more positive beliefs about competition compared to their peers who do not. Cross-cultural studies also would be informative in this regard, as some cultures may be more open to engaging girls in competitive interactions than other cultures.

Whatever their origins, differences in lay beliefs matter because expectancies can create their own reality (Kirsch 1999; Olson et al. 1996). For example, people who believe that competition boosts performance may end up performing better under competition via expectancy effects. Similarly, people who believe that competition builds character may be more graceful and resilient after a loss, and be less likely to shy away from another round of competition. Lay beliefs about competition may thus create positive feedback loops, sending people along different developmental pathways (Fischer et al. 1993).

Given their potential consequences, lay beliefs about competition are a plausible locus for interventions, if we grant them at least *some* causal role in driving people to compete, *and* if such an intervention is considered desirable. We have already reviewed the evidence linking the gender difference in competitiveness to the gender gap in real-world outcomes. Moreover, women's reluctance to compete may be costly not just for them but also for society. Government agencies, private initiatives, and philanthropic organizations increasingly sponsor competitions for socially desirable goals such as technological or educational innovation (Bays et al. 2009). If qualified women opt out of these competitions and other competitively structured opportunities, such as applying for grants, running for office, or seeking coveted professional positions, this would mean a narrowing down of the talent pool from which the larger society can benefit. Targeting women's beliefs about competition may help avoid such individual and collective losses.

Despite this apparent desirability of making women more competitive, we would also like to note that starting with the pioneering work of Deutsch (1949), scholars have raised questions about the value of competition and pointed to the

need to consider how and why social structures that emphasize competition need to change (for a review, see Kohn 1992). We do not subscribe to the notion that competitiveness is categorically good and women should strive to be more competitive. Instead, we believe that for both genders, there is value in developing more complex cognitions about competition and recognizing its various individual and societal benefits *and* costs. Simply filling out the Lay Beliefs about Competition Scale may help people crystalize their beliefs about competition and trigger a reflective process. Such reflection would be particularly fruitful if some of the gender gap in the endorsement of positive beliefs stems from women's lesser practice with competition or from not having given much consideration to competition's potentially positive effects.

At the same time, asking women to become more competitive would be unfair and counterproductive if women's beliefs reflect deeper inclinations and/or actual experiences with competition. If competition does not help women to be more successful, more confident, and more creative, as it helps men, women should not be encouraged to be more competitive. In this case, we should deliberate how to structure our schools, organizations and societies in ways that will optimally motivate both genders and give them equal chances to flourish as individuals, become successful, and contribute to society. After all, organizations have largely been formed by and for men, and organizational practices are strongly aligned with men's values and preferences (Acker 1990; Ely and Meyerson 2000). Highly competitive structures may disadvantage women who are less competitive and more comfortable with flat structures (Nicholson 2000), leading to suboptimal individual, organizational, and societal outcomes.

Limitations

Our research also has some limitations. First, our sample was limited to a Western and predominantly White population, living in English-speaking countries. The belief structures we captured are likely to be culturally bound, and we currently do not have any evidence on whether the structure of beliefs and their endorsement vary across cultures. More broadly, we need more research on the determinants of the gender difference in competitiveness and how they vary across cultures.

Second, we have examined how beliefs about competition are associated with biological sex. An alternative and complementary approach would be linking competitive beliefs to the dimensions of psychological femininity and masculinity (Bem 1974). The value of such an approach would be showing how competitive beliefs are related to feminine and masculine psychological profiles which, unlike biological sex, are non-binary.

Third, we have studied only one aspect of beliefs about competition, namely the positive and negative outcomes people attribute to it. There may be other kinds of competition-related beliefs, which shape how people construe competitive situations and regulate themselves before, during, and after competition. For example, people may differ in whether they see competition as stressful and taxing versus exciting and fun (cf. Brooks 2014; Crum et al. 2013). They may also differ in the extent to which they believe competitiveness is a fixed trait or a situation-specific and malleable attribute. While we tried to capture the basic beliefs people hold on competition's consequences, future research may extend the domain of psychologically meaningful competition-related beliefs.

Fourth, our measure of competition beliefs is a self-report measure. Our findings may thus suffer from biases that befall self-report measures, such as social desirability and self-generated consistency (Podsakoff and Organ 1986). Future research may develop implicit measures of competitive attitudes which would complement self-report measures.

Fifth, there remains a large gap between our ultimate goal of better understanding the gender gap in socio-economic outcomes, and what we have accomplished, namely documenting that women are less likely than men to attribute positive outcomes to competition. While our work informs the gendered psychology of competition, future research should delve into the meso-level mechanisms that bridge micro-level cognitions to macro-level outcomes.

Conclusion

The foregoing discussion highlights that we cannot fairly and optimally structure social organizations and design interventions before we have a better understanding of the gendered psychology of competitiveness. Research aiming at such understanding should empirically test how women and men respond differently to competition, including the external factors involved in their choices to compete, as well as the effects of competition on their motivation, emotion regulation, performance, self-esteem, and relationships. As the field moves toward tackling these questions, the scale presented herein may provide a view into the cognitive structures that underlie variance in competitive attitudes and behaviors. A deeper understanding of the gender differences in competitiveness that will grow out of these research efforts should be the basis of more nuanced cultural conversations and more informed choices on how to structure our classrooms, teams, and organizations.

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