Women have surpassed men in education outcomes, like college attendance and graduation rates [@Blau2017; @Goldin2006; @Stoet2014], but continue to be underrepresented in top management positions in nearly all sectors [@Bertrand2001]. And a sizable gender gap still persists worldwide [@Blau2017]. Traditional economic variables, such as household division of labor and discrimination, account for some, but not all, of these disparities [@Blau2017]. As such, researchers have begun to consider psychological gender differences, including the predilection for competition, as means of understanding persistent gender gaps in labor market outcomes [for review, see @Niederle2011].

Women are, on average, less competitive than men (for review, see @Niederle2011). Seminal work on gender differences in competitiveness operationalized competitiveness as the choice of a tournament payment scheme, that reaps potentially higher earnings but requires outperforming an opponent, over a piece-rate scheme, where participants are paid per unit of work they produce [@Niederle2007]. This research found that women are less likely to enter tournaments while completing mathematical problems, even when they would have earned more by competing [@Niederle2007]. Numerous conceptual replications over the past 15 years suggests that the gender difference in willingness to compete is robust [see @Niederle2011; @Niederle2017a; @Niederle2017b for review]. Notably, this effect has been replicated in diverse populations (e.g., across age groups and cultures) [@Apicella2015; @Buser2014; @Sutter2016; @Andersen2013; @Buser2017b; @Sutter2010; @Dreber2014; @Mayr2012] and with a diverse set of tasks [@Apicella2015; @Saccardo2018; @Bjorvatn2016; @Sutter2015; @Frick2011; @Samek2019]. Importantly, this laboratory measure of competitiveness predicts labor market outcomes, including education choices [@Buser2014; @Zhang2012], entrepreneurial decisions [e.g., investment, employment; @Berge2015], and earnings [@Reuben2015]. Thus, competitive preferences may contribute to gender differences in labor market outcomes [@Blau2017].

Both confidence and risk attitudes have been implicated in driving the gender gap in willingness to compete [@Niederle2011; @Veldhuizen2017]. For instance, in the original study by Nierderle and Vesterlund (2007), 27% of the gender gap in tournament entry was explained by men being more overconfident than women about their relative performance on the task.

Confidence is conceptualized as the accuracy of one’s perceived performance or ability on a task [@Beyer1997]. Within the literature on the gender gap in competitiveness, confidence is operationalized as the belief about one’s relative performance during a competition, where individuals who have inaccurately high (low) ratings of their performance are deemed overconfident (underconfident). If an individual does not believe their performance is higher than the individuals they are competing against, they are unlikely to make the decision to compete for fear of missing the opportunity to earn money.

While most individuals are overconfident [@Alicke2013; @Dunning2004b], there is ample research to suggest that women are less (over)confident on average than men across a number of domains [@Mobius2011; @Niederle2011; @Croson2009; @Lundeberg1994; @Niederle2007; @Bertrand2010a; @Beyer1990; @Beyer1997; @Jakobsson2013]. Because women are less overconfident, they compete less often than they should, given their actual ability [@Niederle2007]. Confidence too may help explain why, in some situations, the gender gap in competitiveness may be reduced or eliminated. For instance, women tend to compete more when tasks are female-typed or gender-neutral [@Iriberri2017; @Boschini2014; @Boschini2019; @Apicella2015; @Grosse2010; @Gunther2010; @Dreber2014; @Dreber2011; @Shurchkov2012], when they are facing other female opponents [@DattaGupta2013; @Booth2012], or when competing against themselves [@Apicella2017a]. For instance, Apicella et al. (2017) document a gender difference in confidence when women and men are competing against other individuals, but not when they are competing against themselves (i.e., their own past performance). There are several non-mutually exclusive and potentially interacting explanations that could account for women’s relatively lower (over)confidence, including differences in performance or ability, experience, innate psychological differences, and stereotype threat [@Steele1997; @Spencer1999; @Spencer2016]. In the latter case, for instance, women may decide to forgo competitions because they either believe negative stereotypes about their ability to perform certain tasks, or because stereotypes provoke enough anxiety to reduce confidence [@Gunther2010; @Grosse2010; @Iriberri2017; @Shurchkov2012; @Burow2017]. Taken together, this body of research suggests that interventions designed to increase confidence in women, may embolden them to compete more.

A second variable that has been identified as a possible explanation for gender differences in competitiveness is risk attitude, typically construed as the preference for a certain gain over a gamble, even if the gamble has an equal or greater monetary expectation [@Kahneman1982]. Competitive payment schemes are inherently riskier than piece-rate payment schemes because the variance in returns is greater. With piece-rate payment schemes, individuals are guaranteed a certain amount for every unit they produce. Moreover, there typically exists uncertainty in competitions since one’s relative performance is unknown [@Niederle2011]. Researchers investigating gender differences in risk attitudes find that men are typically more risk-seeking than women [@Eckel2008; @Charness2012; @Croson2009; @Bertrand2010a; @Apicella2017], including in hunter-gatherers [@Apicella2017], but see Harrison et al (2007) - insert cite for an exception. While most studies report a gender difference, the difference appears to be small to medium [@Apicella2017] and culturally-dependent [@Gneezy2009; @Henrich2002]. Indeed, some of the gender gap in competitiveness is explained by men and women’s differing risk attitudes [@Niederle2011]. In fact, some recent work suggests that nearly 30% of the gender gap in competitive choices can be explained by risk attitude [@Gillen2019; @Veldhuizen2017].

The extent to which confidence and risk attitudes account for the gender differences in willingness to compete is debated. The seminal research in this literature suggests that confidence and risk attitude do not completely explain gender differences in competitiveness, since there remained a residual gap after controlling for these factors [@Niederle2007]. The unexplained component of the original gender effect was then taken as evidence of a distinct “competitiveness” trait, separate from risk attitude and confidence [@Niederle2007; @Niederle2011]. However, recent work correcting for measurement error [@Gillen2019] and using experimental techniques to isolate the effects of the competitiveness trait [@Veldhuizen2017] suggests that risk attitudes and confidence may fully explain the gender gap in the choice to compete. Regardless of whether competitiveness is a “stand-alone” trait, it is clear that both confidence and risk attitude can generate differences in how men and women react to competitions. As such, interventions designed to increase women’s confidence and decrease their perceptions of risk and uncertainty in competitive contexts may help reduce the gender gap in competitiveness.

In the current study, we examine whether and how preparation may influence willingness to compete. Confidence on a task may improve with preparation and training [@Gist1992; @Schunk1981; @Schunk1982; @Usher2008], since, in most cases, people are able to observe a gradual improvement in their skills over time. For instance, @Lent1996 found that college students listed past accomplishments as the most influential factor in determining their confidence. Other research directly compared the effects of mastery experiences, vicarious experiences (e.g., watching others perform a task), and a control treatment without any intervention on confidence, finding that mastery increased confidence significantly more than vicarious experiences and the control treatment [@Bandura1977a]. Based on previous evidence of the benefits of enactive mastery through preparation and training on confidence, providing women with an adequate opportunity to prepare before a task may alleviate the gender gap in choice to compete (see cite charness Dao, & Shurchkov, 2020).

Preparation and the feelings of preparedness that follow, may also decrease the perceived riskiness of competitions. Again, little work has examined this. However, there is evidence that risk attitudes play a greater role in predicting decisions to compete when individuals are competing against other individuals, rather than themselves (i.e., their own past performance), possibly because there is more uncertainty in estimating an opponent’s ability versus one’s own ability [@Apicella2017a]. Surprisingly, little work has explored how preparation impacts men and women’s confidence, risk attitudes, or their willingness to compete.

Notably, both knowing about an opportunity to prepare before competing and the actual act of preparing may encourage high-ability women to enter competitions more often. In knowing one can prepare beforehand, one may assume that they can resolve any discrepancies between their current ability and their desired ability level for competition or that they can reduce uncertainty surrounding their performance by preparing. This knowledge, in and of itself, may be sufficient to reduce gender differences in competitiveness, regardless of whether women actually take advantage of this opportunity. Additionally, the act of preparation may be uniquely motivating, since preparation allows an individual to observe an improvement in their performance over time and/or give them an opportunity to observe their performance, which may reduce the perceived uncertainty of competition. As such, women may choose to compete more after preparing for or practicing a task.

Here, we examined the role of preparation on the gender differences in willingness to compete through three experiments. In the first experiment, we test whether simply knowing that there will be an opportunity to prepare before performing a task affects the gender gap in willingness to compete. That is, we manipulate participants’ knowledge of whether they will have time to prepare before they make their decision to compete. We anticipate that participants with this information would be more inclined to compete compared to participants without this information and that this effect would be stronger for women, who tend to be relatively less confident. Thus, we expected an interaction between gender and condition on the choice to compete, along with a main effect of condition. In the second experiment, we examined how actual preparation influences the decision to compete. That is, we manipulated whether participants were required to prepare before making the decision to compete. Again, we expected that women in the preparation condition would be especially inclined to compete. Finally, in experiment 3, we examine how an unlimited amount of preparation affects willingness to gender differences in the willingness to compete. Across all experiments, we measured gender differences in actual preparation after administering the treatment and eliciting preferences to compete. Finally, we monetarily incentivized participants in both studies to correctly predict which gender would prepare and compete more. The research design, hypotheses, measures and analyses were preregistered unless otherwise stated and all analyses were conducted in R statistical software (version 4.0.4).