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Outrunning the Gender Gap – Boys and Girls Compete Equally

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Abstract

Recent studies find that women are less competitive than men. This gender difference in competitiveness has been suggested as a possible explanation for why men occupy the majority of top positions in many sectors. In this study we explore competitiveness in children. A related field experiment on Israeli children shows that only boys react to competition by running faster when competing in a race and that only girls react to the gender of their opponent. Here we test if these results carry over to 7-10 year old Swedish children. Sweden is typically ranked among the most gender equal countries in the world, thus culture could explain a potential difference in our results to those on Israeli children. We also introduce two more "female" sports: skipping rope and dancing, in order to study if reaction to competition is task dependent. Our results extend previous findings in two ways. First, we find no gender difference in reaction to competition in running. In our study, both boys and girls compete. We also find no gender differences in reaction to competition in skipping rope and dancing. Second, we find no clear effect on competitiveness of the opponent's gender, neither on girls or boys, in any of the tasks. Our findings suggest that the existence of a gender gap in competitiveness among children may be partly cultural, and that the gap found in previous studies on adults may be caused by factors that emerge later in life. It remains to be explored whether these later factors are biological or cultural.

Keywords: competitiveness; gender differences; field experiment.
JEL codes: C93, D03, J16.

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Non-Technical Summary

Men occupy the majority of top positions in many sectors, including academia and business. Meanwhile, recent studies find that women are less competitive than men, and this has been suggested as a possible explanation for the gender gap in top positions.

The policy implications of the gender difference in competitiveness depend on what we believe causes the difference. Most previous studies look at adults. Thus, whether these gender differences are innate or acquired later in life remains unknown. Children therefore provide an interesting subject pool for the study of this distinction.

In this paper, we explore whether there are gender differences in competitiveness among children. A related field experiment on Israeli children shows that boys, but not girls, react to competition by running faster when competing in a race and that the gender of the opponent matters only for girls, who compete less when running against another girl. Here we test if these results carry over to 7-10 year old Swedish children. Sweden is typically ranked among the most gender equal countries in the world, thus culture could explain a potential difference in our results to those on Israeli children. We also introduce two more "female" sports: skipping rope and dancing, in order to study if reaction to competition is task dependent.

Competitiveness is measured in the same way for all three tasks. First the children perform the task individually. Their performance is measured and they are then matched together in pairs of two depending on their result. Thereafter the children perform the task a second time in these matched pairs. Competitiveness is measured as the difference in performance between the individual and matched performance, and is thus considered as the reaction to competition.

Our results extend previous findings in two ways. First, we find no gender difference in reaction to competition in running. In our study, both boys and girls compete. We also find no gender differences in reaction to competition in skipping rope and dancing. Second, we find no clear effect on competitiveness of the opponent's gender, neither on girls or boys, in any of the tasks. Our findings suggest that the existence of a gender difference in competitiveness among children may be partly cultural, and that the difference found in previous studies on adults may be caused by factors that emerge later in life. It remains to be explored whether these later factors are biological or cultural.

1. Introduction

Men occupy the majority of top positions in most societies, both in the private and in the public sector. The proposed reasons for this remain highly controversial within academia as well as politics (Ceci & Williams 2006). Today, women in many countries are at least as likely as men to pursue higher education, and female labor force participation has risen to levels similar to that of men. Meanwhile, a number of recent studies show that women compete less than men. Competitiveness is typically measured as either a preference for competition, such as self selecting into a tournament instead of a piece-rate payment scheme, or by the performance response as a reaction to a competitive setting compared to a non-competitive setting. The largest part of studies find that only males perform better under competition (Gneezy et al. 2003; Gneezy & Rustichini 2004; Niederle & Vesterlund 2007), or that when both men and women perform better, males still perform significantly better than women (Datta Gupta et al. 2005). It has also been shown that women tend to prefer the non-competitive setting even when there is no gender gap in performance in the competitive setting (Niederle & Vesterlund 2007). Some studies find that women's performance, contrary to that of men, depends on the institutional framework and the gender of the opponent(s) (Gneezy et al. 2003; Gneezy & Rustichini 2004; Niederle & Yestrumskas 2008; Price 2008). In some cases, men compete more than what is optimal for them, and women less (Gneezy et al. 2003; Niederle & Vesterlund 2007). These gender differences have been suggested as a possible explanation for the gender gap in the labor market.

The policy implications of a gender gap in competitiveness depend on what we believe causes the gap. Apart from Gneezy and Rustichini (2004), all of the aforementioned studies look at adults. Thus, whether these gender differences are innate or acquired later in life remains unknown. Children therefore provide an interesting subject pool for the study of this distinction.

In this paper, we explore whether there are gender differences in competitiveness among children. Two previous studies investigate this. One study (Booth & Nolen 2008) looks at how 10-11 year old boys and girls from single-sex schools and from mixed schools solve simple mathematical tasks under a competitive setting. They conclude that each gender compete more in the single-sex schools than in the mixed.[1] Girls from single-sex schools choose competition as much as boys from mixed schools. In a field experiment looking at 9-

[1] Boys have a higher baseline and thus compete more than the girls in the mixed schools.

10 year old Israeli children, Gneezy and Rustichini (2004) find that boys, but not girls, respond to competition by running faster against another child than when running alone. Moreover, they find that the gender of the opponent matters only for girls, who compete less when running against another girl.

We run a field experiment on 7-10 year old children in Sweden. The design is similar to that of Gneezy and Rustichini (2004), where the children compete in running. In addition, in our study the children also compete in skipping rope (where two individuals turn the rope while one child jumps) and dancing. The running task is included in order to have a direct comparison to previous work, while varying culture (Israel vs Sweden). The other two tasks are included to study whether there are male and female areas of competition. If tasks are gendered, it is possible that this leads to gender differences in both motivation for, and payoffs from, competing. Most competitiveness studies build on tasks such as solving mazes and performing simple arithmetic, which are generally considered as male tasks. Several studies show that women perform worse on standardized tests when they are reminded of negative stereotypes about female math ability (Steele 1997; Shih et al. 1999; Inzlicht & Ben-Zeev 2003; O'Brien & Crandall 2003).[2] This kind of stereotype has been suggested as one reason why women in mixed gender groups compete less than men in some of the tasks previously studied in this literature (Gneezy et al. 2003). Thus, to explore competitiveness more generally than what has previously been done, we also look at what we consider more female tasks. Since our experiment is conducted with children, our inspiration comes from tasks that children perform.

Competitiveness is measured in the same way for all three tasks. First the children perform the task individually. Their performance is measured and they are then matched together in pairs of two depending on their result. Thereafter the children perform the task a second time in these matched pairs. Competitiveness is measured as the difference in performance between the individual and matched performance, and is thus considered as the reaction to competition.

Given previous literature, we hypothesize that if there is a gender gap in running, boys will compete more than girls. We also hypothesize that if there is a gender gap in the female tasks

[2] Interestingly when women are told that there are no differences between men and women in abstract math tests, women perform as well as men (Spencer et al. 1999).

it will be the opposite since, if anything, these tasks have positive stereotypes regarding female ability.

In our study we find no evidence in support of our hypotheses. We find no gender differences in competitiveness among children in Sweden in any of the three tasks. Boys and girls increase their performance equally in the competitive setting for running and skipping rope, and there is no difference between the average increases. Regarding the dancing task, both boys and girls decrease their performance when competing, possibly due to attempts of imitating the other child.[3] However, this decrease in performance is not significantly different between the two genders. Our results also indicate that the gender of the opponent does not alter performance of either gender in any of the three tasks.

We believe that this contradiction to earlier results can be explained by culture. It has previously been shown that cultural factors such as gender norms may influence competitive behavior (Gneezy et al. 2008). Comparing a matrilineal society in India with a patriarchal society in Tanzania, women are found to prefer the competitive setting more than men in the matrilineal society, whereas the inverse is found in the patriarchal society.[4] Our results also suggest that cultural factors matter. Even though Sweden and Israel are both Western societies with high female labor force participation, Sweden usually performs higher on gender equality indices.[5] Thus, results on the running task deviating from those presented in Gneezy and Rustichini (2004) point to cultural factors playing an important role in competitiveness also among Western countries.

Our paper is organized as follows. In section 2, we describe the experimental design of our field study. In section 3, we present our results. We conclude in section 4, where we also discuss the possible explanations for our findings as well as promising directions for future research.

[3] Hannah Riley Bowles pointed out to us that dancing is often a cooperative or communal activity. This aspect of dancing might explain why the children were imitating one another in the competitive stage.

[4] The task at hand is the toss of a tennis ball into a bucket. Gneezy et al. are unaware of any resemblance between this task and some popular task in the cultures that are being studied, thus it is unlikely that the specific task had a certain gendered stereotype. In general, however, throwing objects could be considered more male in many cultures since men have typically been the hunters (e.g., men hunt through spear throwing).

[5] The Global Gender Gap Report 2007 lists Sweden as the most gender equal country in the world. Israel ranks 36th out of 128 countries.

2. Experimental design

The field experiment was conducted in 11 primary school classes in the Stockholm area during 2008 and 2009. All tasks were performed during physical education classes and the experiment was overseen by the teacher. The children, aged 8-10 years old, did not realize that they were participating in an experiment: the tasks are standard in Swedish physical education classes. On two or three different occasions, the children competed in running, skipping rope and modern dance. These three tasks were carefully chosen. Running has previously been explored in Gneezy and Rustichini (2004) and is part of physical education in Sweden. Skipping rope is a task that girls perform during school breaks throughout the world, including Sweden. Dancing is often considered female (Henschel-Pellet 2001), and during the Swedish school year it typically takes up one physical education class. The running task was administered by the teachers on a separate occasion, whereas the skipping rope was instructed and administered by the experimenters as an exercise complementary to the dancing. The dancing task was designed, instructed and scored by a professional dance teacher on one or two occasions depending on the length of the class. All teachers, including the dance teacher, were unaware of the gender perspective of the study. The children were given some time to practice the dancing and the skipping rope tasks prior to the start of the experiment.

Competitiveness was measured in the same way in all three tasks. Each task consisted of two stages. At the first stage, the children performed the task by themselves and individual performance was measured. At the second stage, the children performed the task in competition with another child. The children knew that their competitor had achieved a similar score at the first stage.[6] If more than two children obtained the same result in the first stage, matching was done randomly.[7] In running, the children were scored based on how fast they ran 60 meters. In skipping rope, performance was measured as the number of jumps performed. In dancing, the dance teacher scored the children based on how they performed compared to the set goal of the dance choreography. The dance choreography included ten distinct exercises and the children were awarded one point for each of these ten movements

[6] The children were unaware of the existence of a second stage when performing the task in the first stage.

[7] When an unequal number of children performed equally well, they were randomly paired. The remaining child was matched with the child with the next best result. If more than one child had the next best result, the remaining child with the higher score from the first matching was randomly matched with one of these children. During the competitive part of the experiment, the competing pairs participated in random order.

that they performed correctly.[8] Our measure of competitiveness is the change in performance between the first and the second stage of the tasks.

The dance teacher presented the tasks as competitive activities. The dance competition was presented as a "battle", in the spirit of a popular TV show.[9] For the skipping rope task, two ropes were put next to each other. The children were instructed to start jumping at the same time and were told that the winner was the child who performed the greatest number of jumps. All rules were explained by the dance teacher and the experimenters and no compensation was awarded apart from the intrinsic motivation that comes from winning, as in Gneezy and Rustichini (2004).

3. Results

Previous literature (Gneezy et al. 2003; Gneezy & Rustichini 2004) found gender differences in performance in a non-competitive versus a competitive setting, as well as differences in reaction to the gender composition of the competing pair. We test whether these two results hold for children in Sweden and whether the nature of the task affects the size and direction of the gender gap. We start by looking at gender differences in competitive behavior. We then address the effect of the gender composition in the competitive setting. We also present a robustness check and a survey on how boyish/girlish children perceive the explored tasks to be. For all tests in the analysis, we have performed a Mann-Whitney test, a two-sided t-test and used bootstrap techniques. Throughout the analysis we present only the p-value for the Mann-Whitney test.[10]

3.1 No significant gender differences in competitive behavior

In our study, 149 children participated in running, 143 in skipping rope, and 146 in dancing. The gender distribution in the three sports was 71 boys and 78 girls in running, 69 boys and

[8] The dance task consisted of a one minute long modern dance phrase. The choreography of the phrase was focusing on strength, coordination and balance rather than "feminine grace", in order to minimize subjectivity in the evaluation of dance. Since the dance teacher was not aware of the purpose of the study, we hope that any potential subjectivity is orthogonal to the gender of the child evaluated.

9 The TV show "So you think you can dance" was aired on Swedish television during the time the study was performed. In the show, participants dance pair-wise in competition and are eliminated based on their relative performance within the pair. We expect this TV show to have decreased the cooperative or communal aspects of the dancing task, if anything.

[10] We present the Mann-Whitney test since none of our variables are normally distributed when using a skewness and kurtosis test. When there is a difference between the tests in terms of significance we also report the p-values for the t-test and the bootstrap-based critical values.

74 girls in skipping rope and 64 boys and 82 girls in dancing.[11] Consistent with sex-stereotypic expectations, we find that in the individual setting (stage 1) boys ran on average faster than girls, and girls skipped and danced better compared to boys. In running, the p-value for a significant gender difference is 0.0040, in skipping 0.0151 and in dancing 0.0478. When it comes to competitiveness, table 1 below shows that in all three tasks, and for both genders, average performance in the competitive setting differs significantly from average performance in the non-competitive setting, ($p<0.01$). Both genders improve significantly in running and skipping rope in the competitive setting, but perform worse in dancing.

	Running		**SR**	**Skipping rope**		**SR**	**Dancing**		**SR**
	Stage 1	Stage 2	p-value	Stage 1	Stage 2	p-value	Stage 1	Stage 2	p-value
Girls	11.948	11.688	0.000	48.851	69.405	0.000	5.866	5.134	0.001
Boys	11.534	11.396	0.001	33.130	45.783	0.004	5.266	4.484	0.001

Table 1. Average performance in stage 1 and in stage 2. Signrank test p-values of performance change for girls and boys separately.

Figures 1-3 below show the distribution of the performance change in the different tasks. The three histograms indicate that girls tend to improve their performance slightly more in running and skipping rope, and deteriorate slightly less in dancing. However, these gender differences are far from statistically significant (running: $p=0.53$, skipping rope: $p=0.23$, dancing: $p=0.85$).[12]

[11] Two subjects, one boy and one girl, were dropped from the sample due to physical disabilities. The differences in number of children between activities are due to the fact that we had different number of occasions depending on the structure of the physical education classes in the different schools. There is no significant difference in performance change between school classes that had one occasion or school classes that had more occasions ($p=0.44$).

[12] To further investigate a possible gender difference in performance change we also performed quantile regressions for each task, controlling for gender of opponent (performed for quantile 0.1-1.0). Gender has an effect only in the top 10% of the performance change distribution in running and skipping rope. In this part of the distribution the performance change of boys is larger than girls in running and the opposite for skipping rope.

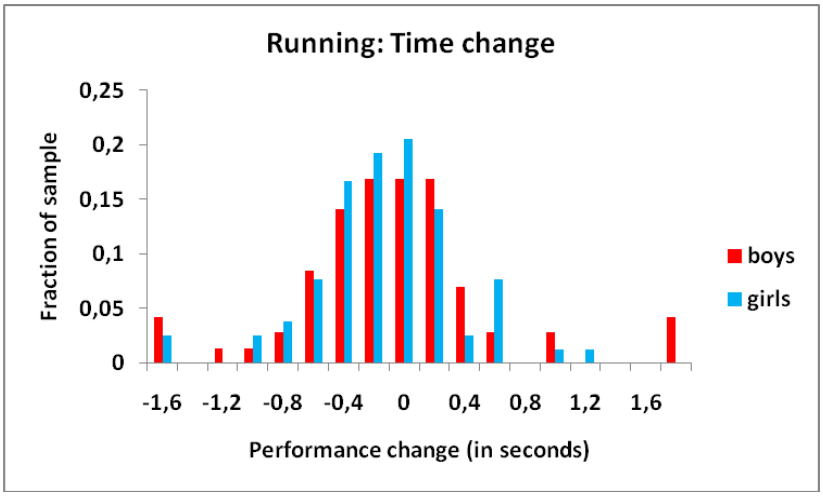

Figure 1. Distribution of change in running time (stage 2 - stage 1), by gender.

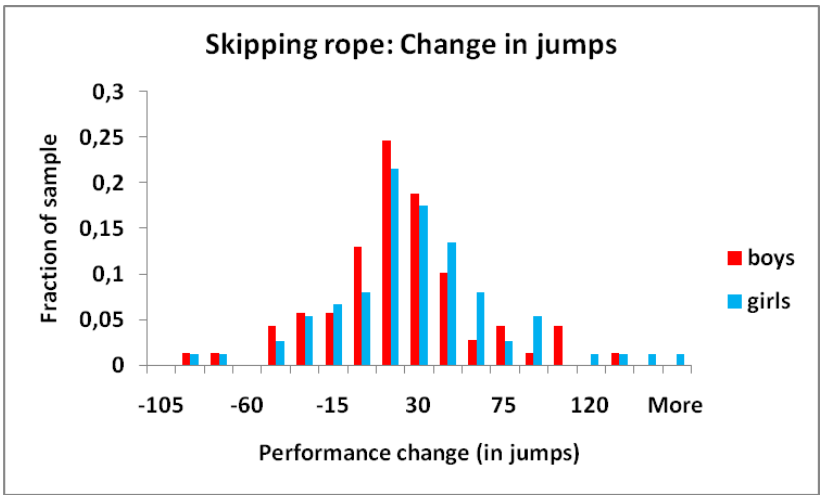

Figure 2. Distribution of change in jumps (stage 2 – stage 1), by gender.

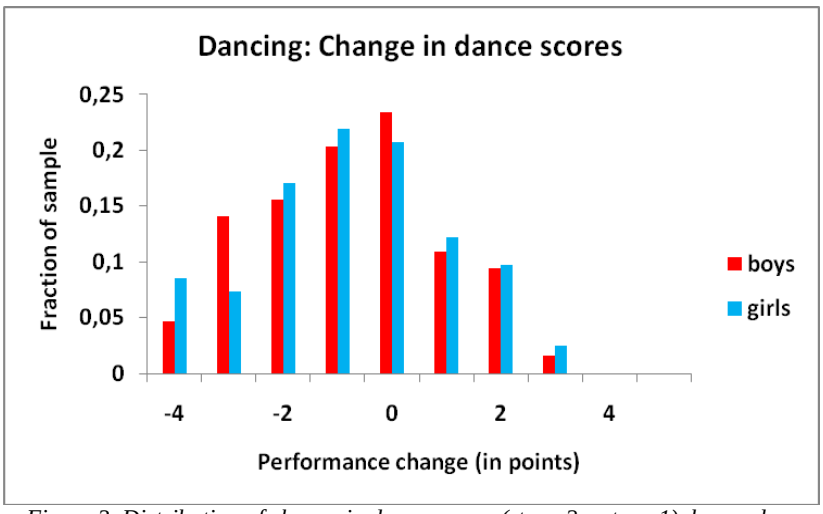

Figure 3. Distribution of change in dance scores (stage 2 – stage 1), by gender.

The pattern of gender similarities are displayed in an aggregated manner in figures 4-6 below. These plots show the average change in performance by each gender. The point estimate indicates that girls increase their performance more than boys in both running and skipping rope. In running, girls improve on average 0.26 seconds, or about 2.2%. This can be compared to the average decrease in running time of 0.14 seconds, or 1.2%, for boys.[13] The corresponding numbers for skipping rope is an increase of 21 versus 13 jumps, implying an improvement of 38% and 42% respectively. The point estimate for dancing indicates that competition is less detrimental to the performance of girls than boys. On average, boys dance performance deteriorates by 0.78 points (15%) on average and girls by 0.73 points (12%). However, as stated above and as indicated by the error bars, the difference in average change in performance between boys and girls is not statistically significant in any of the three cases.[14] These results also hold within all age groups in our sample.

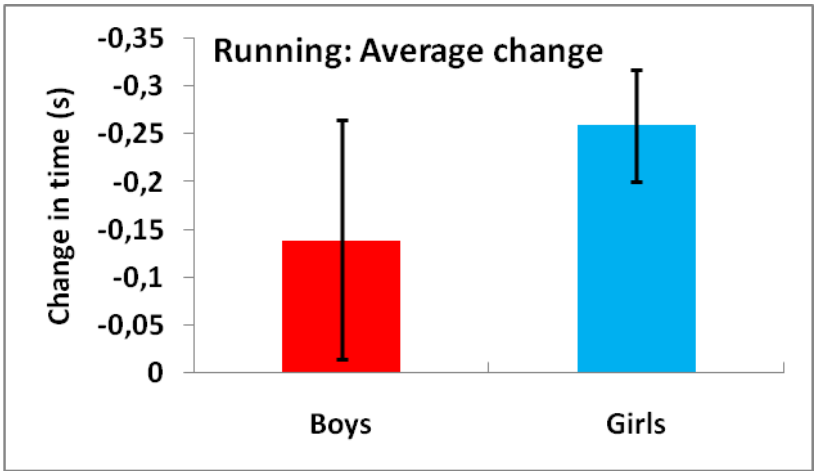

Figure 4. Average change in time (stage 2 – stage 1), by gender. The error bars indicate 95% confidence intervals for the mean. 78 girls and 71 boys.

[13] We conducted the same analysis with relative performance, where relative performance was defined as ((race2-race1)/race1). This did not change any of our results. Our findings further remain stable when excluding outliers. An outlier is defined as an observation that lie more than two standard deviations away from the sample mean.

[14] A power analysis indicates that 750, 450 and 20000 observations would be needed to obtain a significant result for the running, jumping and dancing respectively. The basis for the power calculation is a significance level of 5% and a power of 80%.

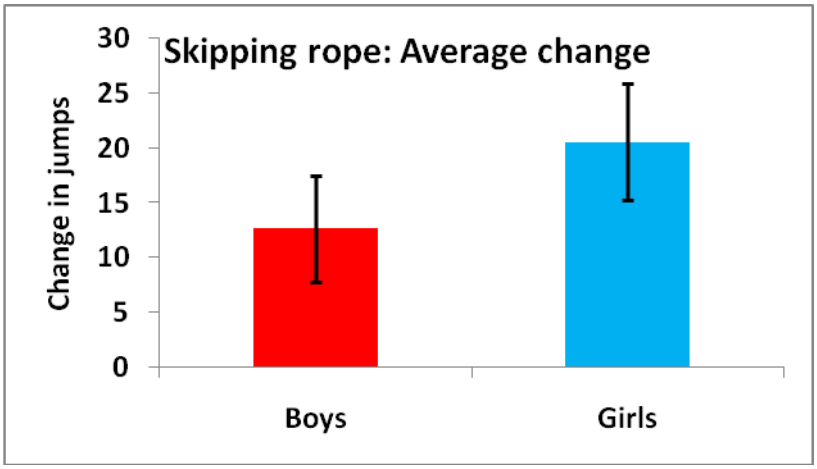

Figure 5. Average change in jumps (stage 2 – stage 1), by gender. The error bars indicate 95% confidence intervals for the mean.74 girls and 69 boys.

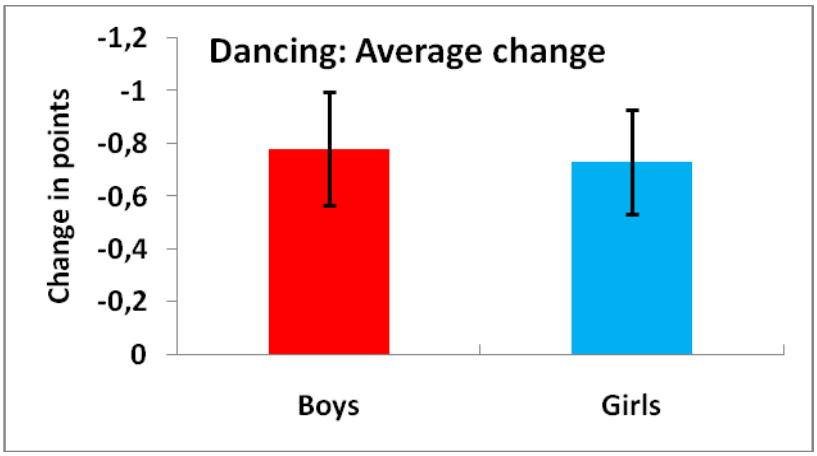

Figure 6. Average change in dance scores (stage 2 – stage 1), by gender. The error bars indicate 95% confidence intervals for the mean. 82 girls and 64 boys.

3.2 Impact of opponent gender on competitive behavior

Some previous studies find that women compete more against women, and men more against men (e.g., (Gneezy et al. 2003; Datta Gupta et al. 2005)). On the contrary, Gneezy and Rustichini (2004) find that boys are not affected by the gender composition but girls compete more against boys. Our results suggest that girls are not influenced by the gender of their opponent. For boys, the results are inconclusive. Table 2 gives an overall summary of our results for the different pair compositions. In running, both girls and boys improve the most when running against a girl. However, the difference in competitive behavior for girls when facing the same vs facing the opposite gender is small and statistically insignificant (p=0.43). For boys the (Mann-Whitney) p-value is 0.0357, indicating that boys respond to the gender of the opponent in running, competing more fiercely against a girl. However, the parametric t-test and the bootstrap-based critical values show no significance (t-test: p=0.8833, bootstrap:

p=0.850). The difference between these three tests could be a result due to extreme observations (outliers) in the sample. Running the same tests when excluding observations more than two standard deviations away from the sample mean reveal a consistent significant difference in how boys respond to gender composition (Mann-Whitney: p=0.0156, t-test: p=0.0120, bootstrap: p=0.008). Assuming that running is a male stereotyped task as suggested by our survey results, one plausible explanation to this result could be that boys experience more confidence or pressure of winning if they face a girl. In skipping rope and dancing, girls compete more fiercely against boys, but none of these results are significant (skipping rope: p=0.2111, dancing: p=0.4982). Boys on the other hand compete more against boys in skipping rope and more against girls in dancing, though also these differences are not significant (skipping rope: p=0.7907, dancing: p=0.4519).

	Running			Skipping rope			Dancing		
Sample	**n**	**Stage2-stage1**	**p-value**	**n**	**Stage2-stage1**	**p-value**	**n**	**Stage2-stage1**	**p-value**
Total	149	-0.20	0.000	143	17	0.000	146	-0.75	0.000
Girls	78	-0.26	0.000	69	21	0.000	82	-0.73	0.001
Boys	71	-0.14	0.001	74	13	0.004	64	-0.78	0.001
Girls with girls	45	-0.27	0.001	39	14	0.031	41	-0.83	0.002
Boys with boys	43	-0.12	0.192	31	15	0.010	27	-0.96	0.005
Girls mixed pairs	33	-0.25	0.002	35	27	0.001	41	-0.63	0.079
Boys mixed pairs	28	-0.16	0.000	38	10	0.122	37	-0.65	0.054

Table 2. Performance change (stage 2 – stage 1) based on the gender composition of the competing pairs.

3.3 Robustness checks

We also let a separate group of children perform the task alone in the second stage, serving as a control group. We thereby control for unobservable factors that could cause differences in the outcome, such as one gender getting tired faster than the other. The control group includes 66 children in the running task (31 boys and 35 girls), 65 children in the skipping rope task (29 boys and 36 girls), and 49 children in the dancing task (19 boys and 30 girls). For running, both boys and girls perform worse in stage 2 compared to stage 1 ($p<0.001$). Importantly, however, there is no significant gender difference when we test performance change between boys and girls (p=0.4878). The fact that stage 2 performance in running is

worse than stage 1 performance indicates an even greater reaction to competition in running for both boys and girls than if there would have been no performance change in the control. The absolute performance change between stage 2 and stage 1 in skipping rope and dancing is not significant (skipping rope: p=0.1627, dancing: p=0.3206). This indicates that when not competing against another child there is no significant improvement in performance in these two tasks. Moreover, there are no significant differences in these two tasks when we test performance change between boys and girls (skipping rope: p= 0.9106, dancing: p=0.9664).

Even though we find no significant gender differences in mean change in performance in our main analysis, there may be differences in the variances of the performance distributions. We find no significant differences in the variance of change in performance between boys and girls.[15] See table 3 for more details on the results.

CONTROL		Running			Skipping rope			Dancing	
Sample	**n**	**Stage2-stage1**	**p-value**	**n**	**Stage2-stage1**	**p-value**	**n**	**Stage2-stage1**	**p-value**
Total	66	0.35	0.001	65	6.77	0.163	49	-0.35	0.321
Gender difference	66	-0.20	0.488	65	-3.69	0.911	49	0.22	0.966

Table 3. Performance change (stage 2 – stage 1) in the control, and whether there is a gender difference in this performance change.

3.4 Do children perceive the tasks to be gendered?

In a survey of children aged 9-10 years old, we asked how boyish/girlish they considered running, skipping rope and dancing to be. We also elicited perceptions of how boyish/girlish competing in these tasks was. The children were asked to use a scale where a lower number indicates rating the task as more boyish and a higher number as more girlish (1=very boyish, 2=boyish, 3=neutral, 4=girlish, 5=very girlish).

Table 4 shows that, on average, running is perceived to be more boyish than skipping rope and dancing. This is the case both in absolute and relative terms.

[15] The most common test, F-test for the homogeneity of variances (sdtest), for comparison of standard deviations is very sensitive to the assumption that that the data are drawn from an underlying normal distribution. Therefore we also performed a robust test (Levene's test with mean, median and 10% trimmed mean). None of these tests indicated significant differences in the variances.

Variable	Obs	Mean	Std Dev	Min	Max
Running	34	2.68	0.73	1	4
Skipping rope	35	4.17	0.79	3	5
Dancing	34	4.03	0.83	2	5
Competition running	35	2.29	0.83	1	4
Competition skipping rope	35	3.77	0.94	2	5
Competition dancing	35	4.03	0.82	3	5

Table 4. Summary statistics of ratings.

Most of these variables are not normally distributed according to a skewness and kurtosis test. Thus, we perform a Mann-Whitney test for differences in distributions between the tasks.

Running is perceived as significantly more boyish than skipping rope ($p<0.001$) or dancing ($p<0.001$). When comparing skipping rope and dancing there is no significant difference ($p=0.5432$). When it comes to the perceptions of how boyish/girlish it is to compete in these tasks, we observe the same pattern. Competing in running is rated as more boyish than competing in skipping rope or dancing

We also compare the rating of competing in a certain task with the general rating of the task. Competition in itself is rated as more boyish compared to the general rating for both running and skipping rope ($p=0.0315$ and $p=0.0211$), but not for dancing. For dancing there is no significant difference between competition and the general rating of the task ($p=1.000$).

When merging these data, competition seems to be rated more boyish compared to the rating of the task in general ($p=0.0167$).

3.4.1. Do boys and girls have different perceptions?

In table 5 we divide the ratings by gender. Girls tend to rate running as more gender neutral compared to boys ($p=0.0021$). Moreover, girls tend to rate dancing as more neutral, whereas boys rate it as more girlish ($p=0.0430$). Boys and girls give skipping rope a similar score. Regarding competition, there is no significant difference in the ratings for any of the tasks.

	Running	Skipping rope	Dancing	Competing running	Competing skipping rope	Competing dancing
Girls	3.06	4	3.81	2.53	3.65	3.88
Boys	2.31	4.35	4.35	2.06	3.82	4.18
Total	2.68	4.17	4.03	2.29	3.77	4.03

Table 5. Average ratings by gender.

When merging the data on the three tasks, girls and boys rate competition in the same way in terms of how boyish/girlish it is (p=0.6993).[16]

4. Discussion

Previous literature on competitive behavior finds that men compete to a larger extent than women. This difference in behavior may explain part of the gender gap observed in many areas in society. In this literature, however, only a few tasks have been used to measure competitiveness, and these tasks can arguably be considered as more male than female. As far as we know, no previous study investigates whether the gender gap is reversed in other types of tasks. Meanwhile, work in social psychology suggests that individual perceptions about relative performance, such as (over)confidence, and especially stereotypes may have important implications for actual performance (Steele, 1997 and Shih et al. 1999). Exploring more tasks than maze solving and simple arithmetic is thus important in order to increase our understanding about gender differences in competitiveness and the potential role of stereotypes.

In this paper we study how children compete in three distinct tasks. We let the children compete in running in order to create a comparison with previous literature. Moreover, we add two more "female" tasks to the competition; skipping rope and dancing. Competitiveness is measured by reaction to competition, i.e. as the child's increase in performance when competing against another child, compared to when the task is performed individually. We find no gender differences in competitive behavior in any of these tasks. Boys respond to competition, and so do girls. Contrary to previous literature (Gneezy et al. 2003; Gneezy & Rustichini 2004; Datta Gupta et al. 2005) we also find no conclusive evidence that the gender of the opponent affects boys or girls in any of the three tasks.

[16] When we control for age in a tobit regression (upper limit 5 and lower limit 1), there is a gender difference in rating only for running, and age does not have a significant effect. It should be noted that the variation in age is small. When controlling for age, boys and girls do not have different opinions concerning the rating of competition.

We believe that the main difference between our running result and that of Gneezy and Rustichini (2004) can be explained by culture, thus our results add to the literature on how culture may influence economic behavior. It has previously been shown that culture affects important economic decisions such as labor market participation and fertility (Fernández & Fogli 2006). Moreover, the institutional setting has been found to influence competitive behavior (Gneezy et al. 2008; Niederle & Yestrumskas 2008). For example, women have been found to compete more than men in a matrilineal society whereas men compete more than women in a patriarchal society (Gneezy et al. 2008). Even though our study only includes children in Sweden, we can compare our running results to those of Gneezy and Rustichini (2004). Where we find no gender gap, Gneezy and Rustichini (2004) instead find that among Israeli children only boys respond to competition in a running task. It is possible that the more gender neutral culture in Sweden decreases the difference in competitive behavior between boys and girls in general, but also that it diminishes the degree to which tasks are gendered. If this is the case, this could explain why boys and girls compete equally in all tasks in our study.

However, making inferences about adult behavior from findings on children is not straightforward. Even though we do not find a gender gap among children in Sweden, it may be that men's and women's behavior change differently over time. This could be due to socialization, biological factors, or some mix of the two. Observing gender diversity in behavior among adults does not tell us the underlying reasons for these gender differences. For example, if a gender gap in behavior occurs during the teenage years, this could be caused by socialization or by the hormone surge that puberty brings along. To study the development of competitive behavior at different ages can shed some light on this question. More cross-cultural research and work on biological variables should also be of great interest. Thus far, studies looking at the importance of sex hormones to explain individual differences in competitiveness get mixed and inconclusive results. For example, a study looking at competitiveness among men find no relationship between self-selection into a tournament and current testosterone levels (Dreber et al. 2009), whereas another study looking at the menstrual cycle as a proxy of hormone levels finds that women are less likely to self-select into a tournament when progesterone and estrogen levels are high (Buser 2009).[17]

[17] Dreber et al. (2009) find that neither circulating testosterone nor digit ratios (considered a proxy of prenatal hormone exposure) correlate significantly with competitiveness. There is some evidence of facial masculinity (considered a proxy of hormone exposure during puberty) being at best a marginally significant predictor of competiveness, but this result is not very robust for the inclusion of other variables. However, due to the small

Meanwhile, another study finds that exogenously providing estrogen or testosterone to women does not affect their economic preferences (Zethraeus et al. 2009).[18] More work is thus needed to disentangle the importance of sex hormones in explaining gender differences in competitiveness and other economic preferences.

Our findings open up interesting avenues for further research. If competitive behavior among boys and girls is cultural and/or task dependent, competitive behavior should be studied in a variety of tasks and cultural settings. Since we find no gender differences among children in Sweden, it would also be of great interest to see if there is a gender gap in competitiveness among Swedish adults, and if so at what age this first occurs. Once we have answers to these questions it will be possible to make more general claims about gender and competitiveness, and possibly how and if this relates to labor market outcomes.

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number of subjects (n=98) this could be due to a power issue. Moreover, Buser (2009) finds no effect of the cycle on competitiveness as measured by reaction to competition or risk preferences. This latter result contradict two studies that in turn also get opposing results when looking at competitive bidding/risk preferences. The first study finds that men and women who are menstruating (thus have low estrogen levels) act similarly (Chen et al. 2005), whereas a follow-up study finds that women menstruating or in the premenstrual part of the cycle act significantly different from men (Pearson & Schipper 2009).

[18] However, it could be the case that it is the long-term organizational effects of hormonal exposure that matter and not the effects from short-term exposure.

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