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Gender equality predicts leisure-time physical activity: Benefits for both sexes across 34 countries

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Abstract: Although countries' gender equality is associated with important health outcomes, especially for females, it remains unclear whether gender equality is associated with leisure-time physical activity (LTPA). Data from 34 countries was acquired from the International Social Survey Program, the Pew Research Forum, the United Nations, and the World Bank. Separate analyses were conducted for 21,502 males and 26,652 females. Hierarchal nonlinear Bernoulli modeling was used to examine the association between gender equality and participation in LTPA. Both males and females residing in countries' with higher gender equality were more likely (twice and three times more likely, respectively) to report weekly LTPA than those residing in countries characterized by low gender equality. These effects persisted even when controlling for individual (i.e. age, education) and country-level (i.e. population, gross domestic product) covariates. However, significant variation in LTPA persisted at the country level, suggesting the need for further research. These findings provide novel evidence that both males and females benefit from gender equality. To explain these findings, we hypothesize that increased gender equality decreases the average number of offspring and, in turn, allows mothers more time for leisure, and to invest more resources in both male and female offspring, which may increase LTPA.

Subjects: Gender Studies - Soc Sci; Sport and Exercise Science; Sport and Leisure Studies; Sport Psychology; Sports Development

Keywords: leisure; sport; sex differences; cross-cultural; multilevel modeling; gender

1. Introduction

Physical inactivity is estimated to account for more than 69 million disability-adjusted life years and 3.2 million deaths each year (Lim et al., 2012). In fact, the World Health Organization (WHO) estimates that physical inactivity is the world's fourth leading risk factor for death (World Health

ABOUT THE AUTHORS

The author is interested in behavior change in health contexts, mainly youth sport. Most of the author's research concerns intuitive mental systems and how they drive conscious reasoning and health behavior. The author's current research examines the intuitive systems that regulate status striving and friendship alliances, and how these systems can help explain sport participation, including youth sport attrition and sex differences.

PUBLIC INTEREST STATEMENT

This study tested if countries' level of gender equality is associated with increased leisure-time physical activity (LTPA) for both males and females. We found that both males and females from countries with higher gender equality were more likely to report weekly LTPA. Importantly, this relationship held when controlling for individual and country-level covariates. We anticipate that policies that aim to increase gender equality may offer important health benefits via increased LTPA.

Organization, 2010). Given that physical activity is an influential determinant of health across the globe, it is important to understand how countries' socio-structural factors can impact levels of physical activity.

One promising country-level measure that may help explain variation in physical activity is countries' level of female empowerment, often termed gender equality. In the most recent and relevant study, Van Tuyckom, Van de Velde, and Bracke (2013) analyzed the 2005 Eurobarometer survey (25,000 individuals across 27 European countries) to examine how sex differences in leisure-time physical inactivity vary across countries. Van Tuyckom and colleagues found that gender differences in leisure-time physical inactivity were non-existent in countries characterized by high levels of gender equality. However, several limitations exist with their analyses. Van Tuyckom and colleagues not only examined inactivity (rather than activity), but also only examined relative differences between males and females. Therefore, their results did not provide information on the unique influence that equality had on each gender's leisure-time physical inactivity. In other words, the negligible gender difference in LTPA in countries with higher gender equality could be explained by a reduction of male inactivity to the level of females, or an increase in female inactivity to the level of males.

More recently, Lowen, Deaner, and Schmitt (2014) found initial evidence that suggests countries' level of gender equality may have a positive effect on athletic participation for both males and females. They found gender equality was associated with increased Olympic participation and number of medals won not only for females, but also for males, even when accounting for known confounds such as countries' level of democracy, gross domestic product (GDP), population, and the percentage of a country's population that is Muslim. Together, these findings suggest that gender equality is an important country-level characteristic that may have population-level impacts on both female and male athletic participation and performance.

In the present study, we sought to examine whether gender equality was associated with increased leisure-time physical activity (LTPA), which we define as participation in leisure activities (i.e. voluntary activities with no direct financial incentives). We also sought to examine whether the effect of countries' gender equality was gender specific (i.e. influences male and female LTPA). We hypothesize that increased gender equality increases female autonomy, especially regarding reproductive practices (e.g. pregnancies), and thus, in turn, provide females more time and freedom to participate in LTPA. Furthermore, because females in more gender equal societies tend to have fewer children (Carneiro, Meghir, & Parey, 2013), and invest more heavily in those children, we also hypothesize that male LTPA will also be positively associated with increased gender equality; however, to a lesser degree than females.

2. Methods

Individual-level LTPA data was acquired from the International Social Survey Programme (ISSP), an ongoing multinational consortium conducting surveys covering topics relevant to social sciences research. Between 2006 and 2008, the ISSP conducted a leisure-time and Sports Survey module (see Scholz & Heller, 2009) that aimed to gather nationally representative from 36 countries. This survey module accumulated 49,729 individual observations, with sample sizes across countries ranging from 906 to 2,907. However, due to missing data (e.g. non-response), this study examined 48,154 (21,502 males and 26,652 females). Also, several country regions were combined (i.e. Jewish Israel and Palestine Israel; East and West Germany) thus limiting the analysis to 34 countries (Argentina, Australia, Austria, Belgium, Bulgaria, Chile, Croatia, Cyprus, the Czech Republic, the Dominican Republic, Finland, France, Germany, Great Britain, Hungary, Ireland, Israel, Japan, Latvia, Mexico, New Zealand, Norway, Philippines, Poland, Russia, Slovak Republic, Slovenia, South Africa, South Korea, Sweden, Switzerland, Taiwan, the United States, Uruguay). The ISSP data were collected through face-to-face interviews or self-completed surveys. The ISSP leisure-time and Sports survey module was conducted by each country and according to agreed upon ethical guidelines within each country (see Scholz & Heller, 2009).

The dependent measure of LTPA was taken from one question included in the ISSP data-set. Specifically, participants were asked "How often do you do each of the following activities in your free time: take part in physical activities such as sports, going to the gym, going for a walk." Responses were recoded into binary form such that those who reported engaging in physical activities several times a week or more were categorized as active participants (1) and those with less than weekly LTPA were categorized as non-active participants (0). Although single-item measure of LTPA are less desirable than more sophisticated measures, similar single-item measures of LTPA have shown moderate to strong levels of reliability and validity (see Iwai et al., 2001; Milton, Bull, & Bauman, 2010).

Individual-level independent variables consisted of two demographic variables: age and level of education. For age, participants simply reported their age in years (15–98 years of age). We categorized responses into four groups to account for the nonlinear relationship between age and LTPA (i.e. 15–30, 31–45, 46–60, 61–98). For example, it is well established that specific forms of LTPA, such as sport, peak during adolescence, especially for males (Apostolou, 2015; Deaner et al., 2012). For level of education, those who reported receiving more than secondary level education (e.g. high school) were categorized as highly educated (1) and those with secondary level education or less were categorized not highly educated (0).

At the country-level, the critical independent variable was the United Nations Gender Inequality Index (GII), which represents a measure of women's advancement in a country (Human Development Report Office, 2013). The GII replaces previous indices such as the Gender Development Index and Gender Empowerment Measures because it is supposed to more directly measure sex differences in social achievement and empowerment within a country (Permanyer, 2013). Specifically, the GII is based on three sub-measures: (1) reproductive health (e.g. death due to pregnancy complications), (2) parliamentary representation and higher education attainment (e.g. females holding political positions), and (3) the labor force participation rate (e.g. females who are employed). The GII is a continuous measure, with scores ranging from 0 to100. The GII measure was used in the current study as it has demonstrated relationships with important sporting outcomes (Lowen et al., 2014). For the purposes of this study, we categorized the GII into three equal size groups (High Gender Equality = 0–14.5, Moderate Gender Equality = 14.6–22.6, Low Gender Equality > 22.6). We categorized GII into three levels mainly to ease interpretation. First, categorization can facilitate interpretation by helping to reveal what level of gender equality is necessary for promoting LTPA, if such a relationship exists. For example, do countries with moderate levels of gender equality exhibit more LTPA than those with low gender equality, or do differences only exist between countries with high and low gender equality? Second, we used Bernoulli modeling which produces easily interpretable odds ratios for categorical predictors. For example, such modeling may reveal that those living in a country with high gender equality are twice as likely to engage in LTPA as those in countries with low gender equality.

Country-level data pertaining to GDP (in billions USD) and population (Pop. in millions) were acquired from the World Bank (The World Bank Group, 2014). Data pertaining to the percentage of a country's population that is Muslim (Pct. Mus.) was taken from the Pew Research Center (2011) Data on countries' gross domestic product, population, and Muslim population were controlled for, given that they have been associated with sport relevant outcomes (e.g. Lowen et al., 2014).

3. Data analysis

Given the hierarchal structure of cross-national data—individuals nested within countries—hierarchal nonlinear Bernoulli modeling was employed to account for country-level clustering effects. Bernoulli modeling is well suited for testing the dichotomous dependent variable as it allows for the estimation of the relative probability of event occurrence (e.g. weekly LTPA) among different levels of a socio-demographic category (e.g. gender equality) while accounting for clustering (see Raudenbush, Bryk, & Congdon, 2004).

Data analysis—for each sex—occurred in two stages. First, unconditional models were calculated to assess if significant cross-country variation in the dependent variable existed (i.e. whether hierarchal linear modeling was necessary). Unconditional models were tested for both males and females. Second, four nonlinear, multi-level Bernoulli models were constructed to control for individual variables and country level clustering effects. For example, in model 1, weekly females' LTPA was regressed onto age and education level at the individual level (Level-1) using a random intercept and random slope while controlling for the country-level clustering at the country level (Level-2). The same model was subsequently used for model two, which tested female physical activity, but also included additional country-level covariates. Models 3 and 4 involved only males. Analyses were performed using HLM 6.3 software (Raudenbush et al., 2004).

4. Results

Results of the unconditional model revealed that rates of physical activity varied significantly across countries for both females (intercept coefficient = −0.42, SE = 0.13, $p = 0.003$, intraclass correlation coefficient = 0.22) and males (intercept coefficient = −0.34, SE = 0.09, $p = 0.001$, intraclass correlation coefficient = 0.29), justifying the use of HLM.

4.1. Females (models 1 and 2)

Females residing in countries characterized by higher gender equality were more likely to report weekly LTPA than those residing in countries characterized by low gender equality (OR = 3.02, 95% CI = 1.80–5.02). Females residing in countries characterized by moderate gender equality trended toward a greater likelihood, but did not significantly differ, from those residing in countries characterized by low gender equality (OR = 1.48, 95% CI = 0.82–2.69). At the individual level, participants between 15 and 30 years of age were more likely than those older than 60 years of age to engage in LTPA (OR = 1.36, 95% CI = 1.26–1.62), as were participants aged 46–60 (OR = 1.10, 95% CI = 1.00–1.21). Participants aged 31–45 did not differ from those older than 60 (OR = 1.08, 95% CI = .93–1.27). Participants with more than secondary education were more likely to engage in LTPA than those who had secondary education or less (OR = 1.42, 95% CI = 1.27–1.59). The addition of country-level covariates including country population (Pop.), GDP and percentage of the country that is Muslim (Pct. Mus.) did not meaningfully change the relationships between gender equality and weekly LTPA for females (see Table 1). Moreover, none of the country-level covariates reached significance.

4.2. Males (models 3 and 4)

Males residing in countries' characterized by higher gender equality were more likely to report weekly LTPA than those residing in countries characterized by low gender equality (OR = 2.09, 95% CI = 1.40–3.10). However, males residing in countries characterized by moderate gender equality trended toward a greater likelihood, but did not significantly differ from those residing in countries characterized by low gender equality (OR = 1.13, 95% = .72–1.78). At the individual level, participants who were 15–30 years of age were more likely than those older than 60 years to engage in LTPA (OR = 1.77, 95% CI = 1.40–2.24). However, participants aged between 46 and 60 years of age were less likely to engage in LTPA relative to those older than 60 (OR = 0.85, 95% CI = 0.75–0.96). Participants aged 31–45 did not differ from those older than 60 (OR = 0.95, 95% CI = 0.79–1.15). Participants with more than secondary education were also more likely to engage in LTPA (OR = 1.78, 95% CI = 1.59–1.99). Adding country-level covariates (population of country, gross domestic product, and percentage of the country that is Muslim) did not meaningfully change the relationships between gender equality and weekly LTPA (see Table 2). Percentage of the country that is Muslim (Pct. Mus.) was the only country-level covariate that reached significant, albeit marginally (OR = 0.95, 95% CI = 0.91–0.99).

5. Discussion

This study provides novel evidence that countries' gender equality is positively associated with both male and female weekly LTPA, even when controlling for individual- and country-level covariates. In this discussion section, we first consider possible mechanisms or pathways that might mediate this relationship.

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Table 1. Bernoulli models for female leisure-time physical activity (models 1 and 2)

Variables	Model 1		Model 2	
	Coefficient (SE)	VC	Coefficient (SE)	VC
Intercept	−1.10 (0.22)	0.74	−0.80 (0.27)	0.47
Level two variables	Odds Ratio (95% CI)		Odds Ratio (95% CI)	
GII				
High gender equality	3.02** (1.80–5.01)		2.79** (1.69–4.59)	
Moderate gender equality	1.48 (0.82–2.69)		1.36 (0.74–2.48)	
Low gender equality	1.0 (Ref. Cat.)		1.0 (Ref. Cat.)	
Gross domestic product	–		1.00 (1.00–1.00)	
Population	–		0.99 (0.99–1.00)	
Percent Muslim	–		0.93 (0.86–1.00)	
Level one variables	–		–	
Age: 15–30	1.35** (1.08–1.69)		1.36* (1.08–1.73)	
Age: 31–45	1.08 (0.93–1.27)		1.08 (0.92–1.27)	
Age: 46–60	1.10* (1.00–1.21)		1.11* (1.00–1.22)	
Age: >60	1.0 (Ref. Cat.)		1.0 (Ref. Cat.)	
Highly educated	1.42** (1.27–1.59)		1.44** (1.28–1.62)	

Notes: SE = standard error, VC = variance component, CI = confidence intervals.

*$p \leq 0.05$.

**$p \leq 0.001$.

Perhaps the most plausible hypothesis for mediation between countries' gender equality and male and female LTPA, is that gender inequality increases females' autonomy and education, which in turn, change females' (and partners') reproductive goals toward a low yield, high investment strategy. In other words, empowering women through autonomy and education may not only foster the choice to have fewer children, but also women's ability and/or choice to invest more heavily in their children. There is some evidence to support this hypothesis. First, the United Nations GII includes a measure of female education (Human Development Report Office, 2013), and higher levels of female education are known to be negatively associated with number of offspring and positively associated with greater health outcomes for both males and females (Carneiro et al., 2013). Further, Carneiro et al. (2013) discovered that mothers with higher levels of education—which is often accompanied by more autonomy—invested more in their children's leisure time. Finally, Davis-Kean (2005) reported that socioeconomic factors, such as increased parental education, positively affected children's achievement via increasing parental expectations and, in turn, achievement-related experiences such as spending time together in leisure activities, including sport and exercise. We anticipate that the effect of gender equality may be more pronounced for females because increased female autonomy may prolong marriage and increase the average age at which they experience their first childbirth, thus allowing for more resources during later adulthood to be devoted to LTPA.

Regarding our findings that GDP, population, and percent of the population that identifies as Muslim did not significantly predict LTPA at the country level, we expect that country-selection bias may have limited the effect of these variables. Specifically, because our analyses were restricted to data from the International Social Survey Program, we did not have access to countries where the majority of the population was Muslim. Considering that sport-relevant outcomes have been shown to be influenced by the portion of a country's Muslim populations in the past (Lowen et al., 2014), we would expect that with the inclusion of more diverse countries, that GDP, population, and religious factors would play a larger role in predicting LTPA at the country level. Furthermore, political factors may also be equally important. Balish (in press) recently found that the level of democracy ithin a

Table 2. Bernoulli models for male leisure-time physical activity (models 3 and 4)

Variables	Model 3		Model 4	
	Coefficient (SE)	VC	Coefficient (SE)	VC
Intercept	−0.80 (0.18)	0.29	0.07 (0.19)	0.20
Level two variables	Odds Ratio (95% CI)		Odds Ratio (95% CI)	
GII				
High gender equality	2.09** (1.40–3.10)		1.97** (1.32–2.95)	
Moderate gender equality	1.13 (0.72–1.78)		1.09 (0.68–1.74)	
Low gender equality	1.0 (Ref. Cat.)		1.0 (Ref. Cat.)	
Gross domestic product	–		1.00 (1.00–1.00)	
Population	–		1.00 (0.99–1.00)	
Percent Muslim	–		0.95* (0.91–0.99)	
Level one variables	–		–	
Age: 15–30	1.77** (1.40–2.24)		1.78** (1.40–2.27)	
Age: 31–45	0.95 (0.79–1.15)		0.95 (0.78–1.14)	
Age: 46–60	0.85* (0.75–0.96)		0.84 (0.75–0.95)	
Age: >60	1.0 (Ref. Cat.)		1.0 (Ref. Cat.)	
Highly educated	1.78** (1.59–1.99)		1.80** (1.60–2.02)	

Notes: SE = standard error, VC = variance component, CI = confidence intervals.

*$p \leq 0.05$.

**$p \leq 0.001$.

country predicted levels of self-reported membership in sport organizations across 52 countries. Furthermore, democracy fully moderated sex differences in sport membership.

This study has several limitations. First, this study relied on a single measure of LTPA. Using only one question may limit the validity of the measure. With a more in-depth array of questions to test different qualities and quantities of LTPA, future research may provide not only more valid and reliable insights, but deeper insights into which types of LTPA are associated with gender equality. Indeed, using more objective measures, such as accelerometers, may also provide more precise estimations of how LTPA varies as a function of countries' gender equality. A second limitation of this study was that we transformed (a) a continuous measure of gender inequality into three categories, and (b) a five-level measure of LTPA into a dichotomous outcome. While these transformations permitted the use of a powerful analytical approach (i.e. Bernoulli model) and yielded intuitive interpretations (i.e. odds ratios), it involved a loss of specificity in the data. This loss of specificity prevented a precise description of the relationship between gender inequality and weekly LTPA.

6. Conclusion

Increased gender equality was associated with higher female LTPA, but not at the expense of male LTPA. That is, this study demonstrated that both males and females' LTPA are positively associated with gender equality. Future research may benefit from testing the hypotheses outlined above, namely that increased female autonomy and education will change the reproductive strategy of females, leading mothers to invest more heavily in fewer children, such as by increasing children's opportunities to engage in sport and exercise.

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Competing interests
The authors declare no competing interests.

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