Patterns of Out-Of-School Time Use Around the World: Do They Help to Explain International Differences in Mathematics and Science Achievement

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Abstract: International studies suggest that the U.S. ranks below many Asian and European countries in the 21st century in terms of mathematics and science achievement. Few have looked beyond the classroom to understand these differences. Absolute and relative time spent in various out-of-school time (OST) activities may provide one explanation. This study used the Trends in International Mathematics and Science Study (TIMSS), which includes data on the OST and achievement of 8th graders from nearly 50 countries worldwide. OST variables included technology-based (e.g., using the internet), labor (e.g., chores), and leisure activities (e.g., sports, playing with friends). Students completed an internationally standardized mathematics and science achievement test. Results for absolute OST suggest that, beyond the large contribution of a country's human development index, OST is an important predictor of achievement. Further, relative OST is an important predictor, such that, those countries whose profile of time use was highest in technology also had the highest achievement scores. Future research should consider a broader view of education and related contexts that includes understanding the variability in OST use both within and between nations.

Keywords: out-of-school time activities, academic achievement, TIMSS, international comparison

International studies suggest that there are large differences in mathematics and science achievement around the world. For example, Asian countries, such as Japan and Korea, and European countries, such as Czech Republic and Hungary, score higher than the United States (U.S.) in mathematics and science achievement at the junior high and high school grade levels (Beaton et al., 1996a; Beaton et al., 1996b; Organization for Economic Cooperation and Development [OECD], 2011). These differences initiated an education crisis in the U.S. in the early 1990's and have directly influenced education policies since; however, recent reviews suggest little change over the years in the international rankings of U.S. students (e.g., OECD, 2011). In fact, the most recent international achievement studies, the Trends in International Mathematics and Science Study (TIMSS) and the OECD's Programme of International Student Assessment (PISA), suggest that the U.S. still ranks below many Asian and European countries in the 21st century (OECD, 2011; Olson, Martin, & Mullis, 2008). Researchers have considered educational, psychological, and sociological explanations for these differences, but few have looked beyond the classroom to understand achievement. The goal of this study is to examine the relation between out-of-school time (OST) use and achievement in mathematics and science in multiple nations around the world. We begin by discussing theoretical considerations and empirical evidence for the link between OST and achievement. Next we consider the potential importance of distinguishing between absolute and relative time in out-of-school activities. Then, we provide a brief overview of research on international differences in various OST domains. Finally, we consider some alternative explanations for the OST-achievement relation that are addressed in this investigation.

1 Theoretical Considerations for OST and Academic Achievement

Not surprisingly, most research has focused on classroom settings to explain achievement. National and international studies suggest that school-level (e.g., demographic composition) and classroom-level factors (e.g., teaching and learning strategies) matter for achievement (e.g., Chiu, Chow, & Mcbride-Chang, 2007), but few have tested whether OST matters for achievement. Several theories suggest that OST matters for academic achievement. Rogoff's (1995) theory of learning in sociocultural contexts suggests that youth's environments cannot be separated from the ways in which they learn. That is, youth develop cognitive skills through the activities in which they engage, not just through formal learning in the classroom. Rogoff (1995) suggests that youth develop as they participate with others in shared activities reflecting their cultural traditions. This suggests that many of youth's learning opportunities transcend formal classroom learning and occur during youth's OST. In fact, similar theoretical notions were suggested by Larson and Verma in their 1999 study of global OST. Larson and Verma (1999) viewed OST as a proxy for a particular set of socialization experiences. That is, how youth spend their OST influences their socialization experiences and in turn, their development more broadly. Different skills, cognitions, and motivational beliefs are associated with OST versus classroom settings (Larson, 2000). For example, adolescents develop initiative, or the independent ability to achieve a goal, in some of these settings, but not others. Intrinsic motivation and concentration are necessary components of initiative, both of which are associated with structured OST settings, but not classroom settings (Larson, 2000). The Positive Youth Development (PYD) perspective is in line with these notions, such that OST settings provide a safe context in which youth may practice social and cognitive skills that are useful in academic settings (Lerner, Phelps, Forman, & Bowers, 2009). The unique skills that youth learn in OST settings can be transferred to formal academic settings, thus, improving youth's academic achievement. OST may have a substantial impact on academic achievement.

Although research on international OST and academic achievement is limited, within nation studies provide support concerning the positive relations between OST and academic achievement. On average, research suggests that participation in high quality organized out-of-school activities and skill-building informal activities are effective in facilitating youth's academic achievement across childhood and adolescence (Mahoney, Vandell, Simpkins, & Zarrett, 2009; Simpkins, Davis-Kean, & Eccles, 2006). Several reviews and meta-analyses support that time spent participating in organized out-of-school activities is linked with increased academic achievement (e.g., Bohnert, Fredricks, & Randall, 2010; Durlak, Weissberg, & Pachan, 2010; Farb & Matjasko, 2012). Indeed, more time spent participating in organized out-of-school activities is related to higher degree completion, school self-esteem, and problem-solving skills, as well as more school enjoyment (Dotterer, McHale, & Crouter, 2007; Hofferth & Sandberg, 2001; Simpkins, Ripke, Huston, & Eccles, 2005). Time spent in academically-oriented, informal skill-based activities, such as mathematics, science and reading, is associated with increased achievement (Simpkins et al., 2006). Contrary, time spent in informal activities that are not academically oriented or lack skill-building components, such as watching television or doing household chores, is associated with lower achievement (Goodnow, 1988). Thus, how youth spend their OST across a variety of domains may influence how well they achieve in the classroom.

2 Absolute Versus Relative OST

There is empirical support for the notion that the absolute amount of time spent in different out-of-school activities matters for academic achievement. For example, the most recent collection of data from the OECD's PISA (2006) study included an intensive examination of OST learning (OECD, 2011). Researchers collected mathematics and science achievement data, as well as self-reported time spent inside and outside of school learning these subjects, from upwards of 50 countries around the world. The major findings of this report were surprising, suggesting that increases in OST spent learning mathematics and science was related to decreases in average country-level achievement in these subjects. One obvious explanation for this finding is that students who achieve poorly may increase their OST spent on remedial learning experiences, rather than learning for the sake of enrichment. Given the cross-sectional nature of the PISA data, it is impossible to disentangle the direction of causality in this case.

Nevertheless, OECD researchers performed a series of supplemental analyses to further explain this discrepancy. The authors found that *absolute* time spent learning is less important than *relative* time spent learning. That is, achievement is higher in countries where a large proportion of their total learning time (inside and outside of school) is spent learning these subjects, than in countries where they spend relatively little time learning these subjects. In other words, the absolute time spent learning may not matter as much as the relative time spent across different learning activities. There is empirical evidence in the OST literature that the absolute amount of time spent in out-of-school activities versus the relative pattern of participation across various types of out-of-school activities each provided unique information in relation to youth's developmental outcomes. Zarrett and colleagues (2009) found that although the amount of time spent participating in sports was related to positive developmental outcomes, this effect was stronger for those who participated in sports plus youth development programs compared to those who participated in only sports. Thus, rather than exploring absolute time spent in various OST domains, the patterns of time spent across these domains may be informative. An exploratory goal of this study is to examine the relation between patterns of OST around the world and achievement in mathematics and science. Specifically, we assess whether, and in what direction, international differences in absolute and relative time spent in different categories of out-of-school activities relate to mathematics and science achievement.

3 Variation in OST Domains Around the World

Youth engage in a variety of different activities during their OST. The most basic distinction between different categories of out-of-school activities is whether the activities are obligatory (Larson & Verma, 1999). Youth's obligatory activities include labor devoted to either the family (e.g., household chores) or to school (e.g., homework). Youth often engage in these activities to contribute to the family or to acquire skills for their own future livelihood. Conversely, youth's leisure activities are typically voluntary and can be active or sedentary in nature. Sedentary activities include technology-based activities (e.g., watching television, surfing the internet) or solitary activities, such as reading. Active leisure activities include playing sports or playing with friends.

There is much variability in time spent in these various OST domains around the world. This variability may be due to the differential cultural value placed on these domains. Non-industrial countries place high emphasis on labor domains, whereas post-industrial countries place high emphasis on self-sufficiency and independence through schoolwork and leisure settings (Flammer, Alsaker, & Noack, 1999; Steinberg, Dornbusch, & Brown, 1992; Verma & Larson, 2003). Further, OST settings are differentially related to developmental outcomes. Time spent on household chores is related to poor development both in the U.S. and internationally (Bachman, Safron, Sy, & Schulenberg, 2003; Goodnow, 1988). Contrary, time spent in active leisure domains, such as sports and hanging out with friends, is related to positive development (Flammer et al., 1999; Larson, 2000). It is unclear whether and how time spent in various OST domains is related to achievement globally.

4 Alternative Explanations

One alternative explanation for international achievement differences, based on economic theory, suggests that academic achievement is determined by the level at which education systems are financed. That is, an index of the human development status of the country that incorporates health, education, and living standards may best explain international achievement differences. Empirical research supports these notions, such that, the average academic achievement of underdeveloped countries is typically lower than that of developing or developed nations (Mullis & Martin, 2007; OECD, 2011). To our knowledge, the role of country-level human development status has seldom been examined with regard to OST and academic achievement. OECD took strides to include proxy variables for indicators of economic or developmental status of schools in PISA. However, PISA neither examined OST broadly, nor did it include a proxy of economic development, either at the school or country level. In this study, we test the relation between OST and academic achievement, above and beyond countries' human development index (HDI).

5 Summary and Study Goals

The U.S. trails behind many European and Asian countries in terms of mathematics and science achievement at the junior high school level. Many explanations for this difference have been attributed to school- and classroom-level factors (e.g., Chiu et al., 2007), but few have tested whether OST matters for achievement. This study has two goals: (1) to test relations between absolute OST and mathematics and science achievement using variable-based analyses, and (2) to test relations between relative OST and mathematics and science achievement using nation-centered pattern analyses. The examination of OST takes a nation-centered approach, such that, the unit of analysis is the country, rather than the individual. All analyses examine the relations between OST and achievement above and beyond the HDI of the country.

6 Method

Dataset and Participants

Data for this study come from the Trends in International Mathematics and Science Study (TIMSS) which began in 1995. TIMSS reports every four years on the mathematics and science achievement, as well as extensive background information, of 4^{th} and 8^{th} graders in 59 countries worldwide. Sampling weights from the TIMSS were used to ensure that the sample means were representative of their respective national populations and the sampling variances were estimated correctly (Joncas, 2008a; Joncas, 2008b). Data for this study come from the most recent wave of 8^{th} grade data collected in 2007 and includes 49 countries (*N range* = 3,060–7,377 students per nation).

Measures

Mean-level achievement for each country was determined from student performance on an *internationally standardized mathematics and science achievement test* administered by TIMSS. The achievement tests covered multiple content areas and were intended to represent mathematics and science proficiency in general (e.g., mathematics: algebra, geometry; science: biology, chemistry). Due to the heavy burden of administering tests to such a large sample, every student did not complete every section of the tests. Rather, the TIMSS database provides five separate imputed scores for the mathematics and science proficiency scales. Mathematics and science achievement in this study is the standardized raw score averaged across the five plausible values for each student and then averaged by country across students (Range = 288.0–599.2).

OST variables included self-reported time spent in eight out-of-school activities: watching television, computer games, internet, playing with friends, sports, chores, reading, and homework (1 = *none*, 5 = *>4 hours per day*).

The *Human Development Index* (HDI) from the United Nations (U.N.) provides relative ratings of countries around the world with respect to health, education and living standards (*Range* = .467–.902, *M* = .75, *SD* = 0.11). HDI is calculated by the U.N. based on data from multiple organizations as a frame of reference for social and economic development worldwide (United Nations Development Programme [UNDP], 2010).

7 Results

The results are described in three sections. First, we provide descriptive information that demonstrates the raw associations between study variables. Next, we employ hierarchical regression analysis to evaluate whether the absolute amount of time spent in OST relates to international differences in mathematics and science achievement. Finally, we examine whether the relative amount of time spent in out-of-school activities, as assessed by national patterns of OST use, predicts international differences in mathematics and science achievement.

Descriptive Information

Bivariate correlations between all study variables are presented in Table 1. Several of the OST domains were positively correlated with mathematics and science achievement. Specifically, technology-based activities (i.e., watching television, using the computer and internet) were all moderately and positively correlated with achievement, whereas labor domains (i.e., doing jobs at home, doing homework) were moderately and negatively correlated with achievement. Leisure domains demonstrated less consistency with relations to achievement. That is, time with friends was positively correlated with achievement, whereas reading books was negatively correlated with achievement. Playing sports was not correlated with either achievement variable. All variables showed similar bivariate relations to both achievement variables (i.e., mathematics and science).

Absolute OST and Achievement

Hierarchical linear regressions were conducted to examine the contribution of the eight OST variables to mathematics and science achievement, controlling for HDI (Table 2). These variable-based analyses suggested that, beyond the large contribution of HDI to mathematics and science achievement (i.e., $r^{2=}$ 40.1 % and 42.1 %, respectively; Mathematics: $F(1, 42)=28.13$, $p<.001$; Science: $F(1, 42)=30.49$, $p<.001$), OST variables as a set were significantly related to international differences in achievement ($r^2\Delta=18.4$ % and 13.7 %; Mathematics: $F(9,34)=5.33$, $p<.001$; Science: $F(9,34)=4.78$, $p<.001$). A closer examination of Cohen's *d* effect sizes suggests that one technology domain (i.e., internet use), one labor domain (i.e., homework), and all leisure domains were associated with a medium effect size on achievement, but in different directions. Internet, as well as two of the leisure domains (i.e., hanging out with friends and playing sports) positively predicted achievement, whereas the remaining leisure domain (i.e., reading books) and one of the labor domains (i.e., homework) were negatively related to achievement.

Relative OST and Achievement

Finally, we explored national profiles of OST across the eight variables using SLEIPNER v2.1 (Bergman & El-Khouri, 2002). A five-pattern solution was chosen for its conceptual meaningfulness and distinctness. This solution explained 62 % of the variance in the OST variables. The identified patterns of OST use demonstrated some geographic heterogeneity; however, many were clearly tied to geographic region (Figure 1).

Whether the identified profiles consisted of unique patterns of OST variables was assessed with ANOVAs and whether these profiles differentially predicted achievement with ANCOVAs (Table 3). ANOVA findings suggest that there were differences across the five profiles of OST for all eight of the OST variables and HDI. Profiles were labeled according to these patterns of OST (see Table 3). OST profiles were related to achievement, such that, those profiles highest in technology use (i.e., technology and leisure and technology only profiles) demonstrated the highest levels of achievement, above and beyond HDI (Table 3).

8 Discussion

This appears to be one of the first empirical studies to consider OST from a global perspective. Theory and empirical findings suggest that learning transcends the classroom and that OST matters for mathematics and science achievement (e.g., Chiu et al., 2007). Although the developmental status of the nation explains the bulk of variation in international achievement differences, how youth spend their OST tells us something more and very different. This new information supports the need to view adolescent education in broader terms that transcend the classroom and include OST. Adolescents may be learning the skills necessary for in-classroom learning in OST settings. OST contexts promote social learning, teamwork, personal goal-setting, and critical thinking (Larson, 2000). For example, adolescents experience more concentration and intrinsic motivation (i.e., components necessary for exemplar learning experiences) in structured voluntary settings (e.g., sports, hobbies) compared to classroom settings (Larson, 2000). Adolescents can learn to apply these skills to classroom settings and promote learning. In this study, internet use and some leisure domains were related to academic achievement, whereas time spent in labor domains was negatively related to achievement, at least in terms of OST. Both absolute and relative OST were predictive of international differences in mathematics and science achievement and this held after controlling for HDI. Therefore, efforts to understand how youth spend their OST around the world may help us to develop the most effective education policies and practices.

Not only is it important for researchers to begin thinking about whether OST matters for achievement, but it is also important for researchers to consider how to study global OST. Existing studies of international time use tend to group countries together based on geographic location and study mean-level OST in geographic regions (e.g., Larson & Verma, 1999). Few researchers have taken an empirical approach to determine the similarity of countries within geographic proximity. Profiles examined in this study exhibited some geographic heterogeneity, however, many profiles contained geographically proximal countries. Thus, geographic proximity may be an indicator of similarity between countries, but it is not the only indicator. Just as with academic achievement (e.g., OECD, 2011), adolescents in nations sharing geographic proximity do not always share similar patterns of OST. Researchers should begin to think about what factors are important for characterizing global OST. For example, countries have different resources available for out-of-school activities and place different cultural values on such activities (e.g., Larson & Verma, 1999). One avenue for future research may be to examine what meaning and value parents and youth attribute to various OST domains. For example, a recent qualitative study about international time use found that although European and North American parents place similar emphasis on the family, they attribute this value to different types of activities (Harkness et al., 2011). Spanish families attribute familial value to dinner time, whereas North American parents attribute familial value to time spent going on family outings. Some countries may share similar profiles, yet have different reasons for the ways in which their youth spend their OST, which may also matter for achievement. Gaining a more nuanced perspective on how youth spend their OST and why may better explain international achievement differences.

Finally, there is much to be learned from the findings on how absolute and relative OST predicted mathematics versus science achievement. The findings for relative OST present a clear pattern across these achievement domains. Those OST profiles that were highest in technology use demonstrated the highest levels of achievement. This finding may be due, in part, to the types of achievement considered. This study considered mathematics and science achievement, but not overall academic achievement. Technology-based activities are more likely to involve mathematics and science learning and reasoning than other types of activities considered in this study. Academic achievement and school success defined in broader terms may be able to capture both a range of academic subject matter, as well as those cognitive and social skills deemed critical for success in the 21st century (e.g., critical thinking, social networking). Unfortunately, this sort of global achievement was not available in TIMSS; however, future research may find that the positive features of profiles low in technology-use may come into focus when considering a more global academic achievement outcome.

One unique finding about absolute OST and achievement was that reading books was not related to mathematics, but was negatively related to science achievement. It is important to note that this finding must be interpreted in light of the measure used. The item is worded to capture youth's reading for enjoyment. One possibility is that this negative relation may reflect youth's interests rather than reading comprehension ability. According to the internal/external frame of reference model (I/E model), youth's interests or abilities in one domain is based in part on comparisons of their interests or abilities across multiple domains (Marsh, Walker, & Debus, 1991). For example, Marsh and colleagues (1991) found that mathematics self-concept of ability negatively predicted English ability. Youth who read books for enjoyment may be more oriented towards the arts (e.g., English, humanities) than the sciences. We also found that a similar domain, homework, was negatively related to achievement. Another aspect of the TIMSS items worth exploring is that the items measure time spent in the domain rather than the content of the domain. Previous research suggests that time is not a good indicator of the benefits of homework (Cooper & Valentine, 1999). Rather, one needs to know what the homework consisted of and how well the student did. Future research will benefit from exploring more intricate methods to measure OST in various domains.

Limitations

This study is one of the first to our knowledge to consider global OST as an explanation for international achievement differences. This study provides interesting preliminary findings about how OST matters for achievement; however, it does not come without limitations. There are several considerations for measures that best capture global OST. The measures used in this study are basic and broad. For example, the item for television viewing could encompass both television programs and watching movies. Previous research suggests that time spent watching television is negatively related to academic achievement (e.g., Duckworth & Seligman, 1991). The lack of refinement of these measures may explain the discrepancies in findings related to these variables. In other words, the finding that television viewing was not related to academic achievement may become clearer if we disentangle television programs from movies.

Our sample may also present some potential shortcomings. Our unit of analysis was the country, rather than the individuals within the country. Thus, given our small sample size (49 countries), we focused our attention on effect sizes rather than absolute probability values. This study was designed as such to present a broad overview of this emerging area. Once we begin to define the big picture with regard to OST and achievement, future research may benefit from more intricate analytic plans, such as multi-level models. These sorts of analytic models may better capture the variance in achievement within countries, as well as between countries.

Finally, the design of the study also comprises limitations. As with similar international studies, such as PISA, this study is cross-sectional. Although we allude to the potential processes or mechanisms explaining the relation between OST and achievement, we do not suggest directionality. In other words, we cannot determine whether selection or influence explain these findings. For example, youth who spend their OST in structured activities (e.g., school clubs) achieve higher academically than youth who spend time in unstructured activities (e.g., hanging out with friends; Larson, 2000). However, it is unclear whether this is because youth who are more academically oriented select to participate in structured activities or whether structured activities bolster (i.e., influence) academic achievement. Although several within-nation longitudinal studies have shown that OST predicts the development of student achievement (for a review, see Mahoney et al., 2009), international studies with longitudinal data are needed in general, and particularly to examine the contribution of OST to academic achievement globally.

Conclusion

Future research should consider a broader view of education and related contexts that includes understanding the variability in OST use both within and between nations. Further, researchers should explore methodological approaches best able to capture dimensions of OST participation from a global perspective. Finally, although HDI is an important predictor of a country's mean-level achievement, OST is also an important predictor. Researchers should design more globally-centered studies, rather than nation-centered studies, in order to gain knowledge of how OST matters for achievement within and between different nations and around the world.

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Table 1: Bivariate Correlations between all Study Variables

		1	2	3	4	5	6	7	8	9	10	11
1	Math achievement	--	.92	.63	.47	.49	.40	-.43	.00	-.34	.46	-.51
2	Science achievement		--	.65	.52	.45	.43	-.39	.10	-.49	.44	-.48
3	HDI			--	.75	.67	.57	-.55	.37	-.71	.77	-.54
4	Watch television				--	.59	.50	-.37	.32	-.51	.53	-.28
5	Use computer					--	.47	-.60	.13	-.50	.82	-.33
6	Time with friends						--	-.05	.64	-.53	.55	-.35
7	Jobs at home							--	.07	.47	-.56	.40
8	Play sports								--	-.46	.32	-.14
9	Read books									--	-.63	.38
10	Use internet										--	-.51
11	Do homework											--

Note: HDI = Human Development Index. Pearson's r correlation effect sizes: Large= >.50; Medium= .30-.50; Small=.10-.30.

Table 2: Standardized Hierarchical Linear Regression Coefficients of the Human Development Index (HDI) and Out of School Time Use on Achievement

	Dependent variable					
	Mathematics achievement			Science achievement		
Variable	β	d	R^2	β	d	R^2
			Δ=.184			Δ=.137
1. HDI	.63*	1.62	.401	.65*	1.68	.421
2. Time use			.585			.558
Watch television	-.03	.05		.03	.05	
Use computer	.17	.21		.14	.17	
Time with friends	.38	.63		.29	.46	
Jobs at home	-.08	.14		.01	.01	
Play sports	.34	.66		.27	.51	
Read books	.03	.06		-.26	.44	
Use internet	.42	.49		.45	.51	
Do homework	-.23	.50		-.18	.37	

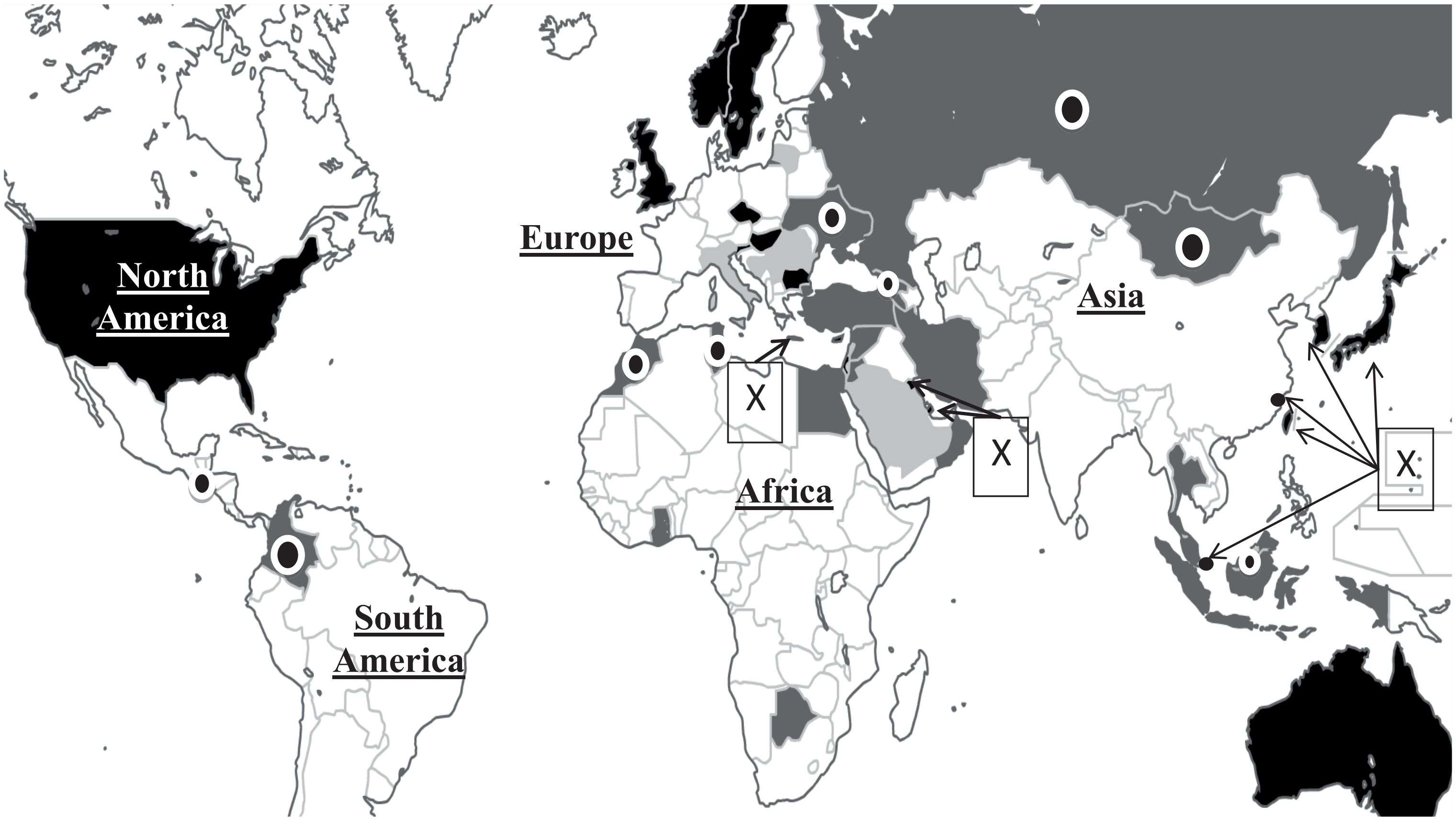
Note: HDI = Human Development Index. Cohen's d effect sizes: Large= >.80; Medium= .50-.80; Small=.20-.50. *p<.05.

Table 3: ANOVA and ANCOVA Results (Including Standardized Means) for OST Variables for Adolescents in Five OST Clusters

	Clusters and countries						
	Technology and leisure (n=12; Australia, Bulgaria, Cyprus, Czech Republic, Hungary, Israel, Norway, Scotland, Slovenia, Sweden, U.S., United Kingdom)	**Technology only** (n=9; Bahrain, Chinese Taipei, Hong Kong, Japan, South Korea, Kuwait, Malta, Qatar, Singapore)	**Active labor** (n =10; Botswana, Colombia, El Salvador, Georgia, Malaysia, Mongolia, Morocco, Russia, Tunisia, Ukraine)	**Moderate labor, inactive technology and leisure** (n=11; Armenia, Ghana, Indonesia, Iran, Jordan, Oman, Palestine, Syria, Thailand, Turkey, Egypt)	**Moderate in all** (n=7; Bosnia and Herzegovina, Italy, Lebanon, Lithuania, Romania, Saudi Arabia, Serbia)	Significance test	Cohen's *d*
OST variable							
Television	0.56_{b}	0.70_{b}	-0.25_{b}	-1.15_{a}	0.31_{b}	$F(4,44) = 11.67^{***}$	2.06
Computer	0.68_{b}	0.81_{b}	-0.87_{a}	-0.89_{a}	0.43_{bc}	$F(4,44) = 19.47^{***}$	2.66
Friends	1.14_{d}	-0.47_{ab}	-0.04_{bc}	-1.08_{a}	0.40_{cd}	$F(4,44) = 21.71^{***}$	2.81
Jobs at home	-0.30_{b}	-1.18_{a}	1.40_{c}	0.15_{b}	-0.20_{b}	$F(4,44) = 27.45^{***}$	3.16
Sports	1.08_{c}	-0.76_{a}	0.09_{ab}	-0.76_{a}	0.18_{bc}	$F(4,44) = 13.44^{***}$	2.21
Books	-0.88_{a}	-0.20_{ab}	0.91_{c}	0.62_{bc}	-0.50_{a}	$F(4,44) = 11.15^{***}$	2.01
Internet	1.09_{c}	0.82_{c}	-0.93_{a}	-0.99_{a}	-0.05_{b}	$F(4,44) = 56.49^{***}$	4.53
Homework	-0.94_{a}	-0.40_{ab}	1.02_{c}	0.39_{bc}	0.06_{b}	$F(4,44) = 11.61^{***}$	2.05
Controls							
HDI	0.97_{c}	0.75_{bc}	-0.74_{a}	-1.12_{a}	0.14_{b}	$F(4,39) = 27.65^{***}$	3.17
Outcomes							
Math SAS	0.52_{a}	0.61_{a}	-0.48_{ab}	-0.65_{b}	0.04_{ab}	$F(4,44) = 4.31^{**}$	1.25
Science SAS	0.65_{a}	0.40_{ab}	-0.53_{b}	-0.53_{b}	-0.05_{ab}	$F(4,44) = 3.85^{**}$	1.18

Note: Means in the same row that do not share subscripts differ at $p<.05$ in Tukey's post-hoc differences comparison. F-values correspond to the cluster variable and do not represent the full model. All Cohen's d effect sizes are large effects. $^{***}p<.001$. $^{**}p<.01$. SAS = Standardized Achievement Score.

Figure 1: Graphic representation of the five OST clusters (specific countries are listed for each cluster in Table 3).



Note. Black marked with "X" and an arrow = Technology only. Black without marks = Technology and leisure. Medium grey marked with a black circle (outlined white) = Active labor. Medium grey without marks = Moderate labor, inactive technology and leisure. Light grey = Moderate in all.