SPORTS AND EXERCISE MEDICINE

Openventio PUBLISHERS

ISSN 2379-6391 Open Journal http://dx.doi.org/10.17140/SEMOJ-1-119

Research

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Volume 1 : Issue 4
Article Ref. #: 1000SEMOJ1119

Article History:
Received: August 15th, 2015
Accepted: September 16th, 2015
Published: September 18th, 2015

Citation:
Martin B, Faught B, Liu J, Narushima M, Cairney J, Hay J. Social competence as a role-player in the game between motor performance and organized sports participation among school-age children. *Sport Exerc Med Open J.* 2015; 1(3): 118-125. doi: 10.17140/SEMOJ-1-119

Social Competence as a Role-Player in the Game between Motor Performance and Organized Sports Participation among School-Age Children

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ABSTRACT

Lifestyle choices from childhood, such as being physically active, track into adulthood. A key factor that influences a child's likelihood of being healthy is their level of social competence. Social Competence (SC) is the interaction between the environment and biologically determined abilities and is shaped by social support systems. An underdeveloped SC increases a child's risk of unhealthy lifestyles as an adult as they believe themselves incapable of adjusting their habits. Children with biologically determined inabilities, such as motor impairments, have been demonstrated to have an activity deficit, particularly in sport participation. The relationships between social competence, motor performance, and physical activity are largely unexplored. The purpose of this paper is to examine the role that SC plays as a mediator between Motor Performance (MP) and organized sports participation in preadolescent children. This sample is 1958 sixth grade children (50.2% males) taken from the Physical Health Activity Study Team (PHAST) study in Ontario, Canada. Organized sport participation was determined using the Participation Questionnaire, MP was established using the short form of the Bruininks-Oseretsky Test of Motor Proficiency (BOTMP) and SC was determined through Harter's Self-Perception Scale. The results indicated that MP and SC are independent predictors of sport participation. Children with low MP and low SC were at significantly greater risk of low sport participation (OR_{males}=2.82; $OR_{females}$=2.41). Children with low MP and high SC (OR_{males}=1.04; $OR_{females}$=1.41) or high MP and low SC (OR_{males}=1.12; $OR_{females}$=0.98) revealed no increased risk of low sport participation. SC plays an important role in organized sport participation during childhood and ameliorates the risk of inactivity associated with lower MP. With high SC diminishing the risk of low sport participation from low MP, a child's risk of low physical fitness may be subsequently reduced and therefore may be an important consideration for activity promotions.

KEYWORDS: Social competence; Physical fitness; Motor performance; Sport participation.

ABBREVIATIONS: BOTMP: Bruininks-Oseretsky Test of Motor Proficiency; SC: Social Competence; MP: Motor Performance; PHAST: Physical Health Activity Study Team; DCD: Developmental Coordination Disorder; DSBN: District School Board of Niagara; CIHR: Canadian Institutes of Health Research; PQ: Participation Questionnaire.

INTRODUCTION

Developing a healthy lifestyle in childhood is crucial for establishing those habits in adulthood and thereby reducing the risk of future disease. Evidence has accumulated demon-

ISSN 2379-6391 Open Journal http://dx.doi.org/10.17140/SEMOJ-1-119

strating that lifestyle choices established in childhood are maintained in adulthood.[1] In Canada, as few as 7% of children and youth meet the recommended levels of 60 minutes of moderate-to-vigorous physical activity for children (5-11 years) and youth (12-17 years) for the promotion and maintenance of health.[2-4] The trend toward increasingly sedentary lifestyles in childhood has been linked with a similar increase in prevalence of childhood obesity.[5] Children who are obese display lower levels of confidence in their ability to conquer physical activity barriers, leading to a preference for a sedentary lifestyle.[6] Physical activity patterns track into adulthood along with an increased risk for overweight and obesity as a result.[7] Reduced physical activity is also associated with lower psychological well-being and social skills among children and adolescents. This relationship further highlights the importance of children developing active lifestyles to build a healthy foundation for adulthood.

This study investigates the relationship between social competence, motor performance, and physical activity. For the purpose of this study, physical activity is viewed from a behaviouralist perspective and lies in the type of activity, the environment that the activity took place, and the volitional aspects of the child's activity.[8] The particular focus here is on a significant component of children's physical activity – organized sport participation.

Developmental Coordination Disorder (DCD) is defined as a chronic and normally permanent condition found in children characterized by motor impairments that interfere with their daily physical activities, as well as academic achievement.[9] Depending on the rigor of diagnostic criteria applied, a prevalence of 3-9% of school-aged children has been reported making DCD one of the most common childhood disorders.[10] Furthermore, poorer motor performance at a younger age significantly impacts a child's physical activity levels in later years.[11] emphasizing the importance of increasing physical activity levels at a younger age so the decline in activity is not as detrimental.

Social competence (SC) is the interaction between one's environment and their biologically determined abilities and is shaped by social support systems.[12] Gender is a focal feature associated with physical activity and social competence, with differing values that boys and girls place on physical activity, particularly with sport participation. External (social) and internal (self-perceptions) pressures account for the participation choices of being active in boys; however girls with an absence of either an external or internal pressure do not greatly change their participation over time.[13] Due to the various values that boys and girls place on physical activity, it is important to recognize that it is more than just motor competency that affects their physical activity participation.

Because of our limited knowledge on the potential moderating role of social competence between motor performance and physical activity, these interrelationships may have been overlooked. In order to develop a full understanding of the development of physical activity patterns in childhood, the relationships between motor performance, physical activity, and social competence warrant exploration. Therefore, our central research question is: Does social competence alleviate the risk of low sport participation in boys and girls with lower motor performance? This understanding will inform the development of more successful physical activity promotion programs particularly for those with poor motor performance.

MATERIALS AND METHODS

This was a cross-sectional investigation using data from a longitudinal study by the Physical Health Activity Study Team (PHAST).[13] PHAST was funded by the Canadian Institutes of Health Research (CIHR) and followed students for six years from grade 4(2004) to grade 9(2010) in the District School Board of Niagara (DSBN). The PHAST study received Research Ethics Board approval from Brock University and the DSBN. This investigation examined data from the winter term of Grade 6 in 2007 when the testing and training protocols were established, assembly of a cadre of trained assistants was done and pilot testing occurred in the fall of 2004. This wave was chosen as students were familiar with the study protocols, scores of the BOTMP were available for all participants and the recall period of physical activity contains the entire school year.

The study population included 2211 children in the sixth grade with 2035(92.0%) who received motor testing. However, 77 children were excluded from the multivariable models due to missing data from key outcome measurements, leaving a total of 1958 subjects for the investigation, 982 males and 976 females. The mean age of children was 11.91 years.

Organized sport participation is the main outcome variable in this analysis. In this investigation, activity levels were evaluated using the Participation Questionnaire (PQ).[14-18] This is a valid and reliable instrument for use in this population and includes a section devoted to organized sports. Information was collected on children's participation in sport teams, clubs, school sports, and sports and dance lessons over one year. The PQ measures activity units, defined as participation in a discrete activity involvement in the above mentioned activities, with both school and community settings reported. This score does not reflect duration or intensity, just participation.[14] The PQ has displayed construct validity with expected gender differences, overweight and obese status, and urban/rural differences present, along with consistency of test-retest reliability of 0.81.[15] The PQ was administered in the regular classrooms at school.

Motor performance is a predictor variable in this investigation. For the purpose of this investigation, children will not be categorized based on diagnosis of DCD based solely on motor performance. We will explore the relationship in children within the entire spectrum of motor capabilities. The

ISSN 2379-6391 Open Journal http://dx.doi.org/10.17140/SEMOJ-1-119

Bruininks-Oseretsky test of motor performance (BOTMP) is the most commonly used standardized test for motor performance, examining the full scope of motor ability[19] and has been used as an assessment tool for motor skills in children aged 4.5 to 14.5 years.[20] The short form of BOTMP will be used for this study and has also been validated against the long form of the test with correlations between 0.90 and 0.91 among children ages 8 to 14 years.[13] This test contains eight subsets including running speed and agility, balance, bilateral coordination, strength, upper-limb coordination, response speed, visual-motor control and upper-limb speed and dexterity, along with 46 separate items to ensure a comprehensive index of motor proficiency.[20] BOTMP is a well-established valid and reliable test for movement skill ability.[21] The short form of BOTMP was administered in the school gymnasium and a rank-percentile calculated for each participant. Children were then placed into quartile groups and high/expected competence (3rd and 4th quartiles) low/impaired competence (1st and 2nd quartiles) groups.

Social competence is the moderating variable in this investigation. In this investigation, self-perceived social competence is of interest where the responses reflect the child's own ability to engage in effective social interactions. The social competence sub-scale of the Harter Self-Perception Scale (which was completed at the same time and in the same manner as the PQ) was used for this analysis. The subscale of social competence described the child's amount of friends, how likeable they are, and how important they feel they are within the classroom setting. It is important to note that these scaled items are demonstrating the child's personal perceptions, compared to a clinical measure.[22] A z-score was calculated for each child to describe where the child was placed among its peers, then placed into high (>0 z-score) or low (<0 z-score) groups.

There are many variables that may confound the relationship between motor performance and physical activity, including fitness, ethnicity, pubertal stage, SES, BMI and gender. The PHAST study was not permitted to gather data regarding a participant's ethnicity; however the DSBN has a distinct homogeneity among their students with the large majority being Caucasian. Parental education is commonly used as a partial measure of SES;[23] therefore this was used as a proxy measure in PHAST and was taken into consideration.

Table 1 provides a detailed breakdown of our key variables separated into gender. The purpose of the analyses is to distinguish the interrelationship between organized sport participation, motor performance and social competence. Comparative t tests on sport participation were used to determine if there are any differences between motor performance quartiles or social competence groups. Multiple regression models were run on sport participation measure as the dependent variable to show the initial relationship of the key variables, as well as the impact from potential confounders. Logistic regressions were then performed to show the role that social competence plays on the well recognized relationship between physical activity and motor performance. Four sets of odds ratios were used to exemplify the moderating role of social competence on the existing relationship between motor performance and sport participation. Each set of odds ratios were compared with adjusted odds ratios with the previously mentioned confounders. All statistical analyses were completed using SAS 9.3. Assumption checks were done on linearity, independence, homoscedasticity and normality, with each measurement tool being previously validated through previous literature. Normality checks have been done in all key variables with no variable being normally distributed ($p<.005$). However, due to our large sample size, we continued the investigation with caution. Organized sport participation measurement was very highly skewed, which led us to square rooting the activity values.

	Males (n=982) Mean (SD)	Females (n=976) Mean (SD)
Age (years)†	11.92(0.35)	11.90(0.34)†
BMI (km/m2)£	19.95(3.94)	20.14(4.11)
Organized Sports Participation	5.73(5.30)	5.53(4.96)
BOTMP Rank*	71.55(28.98)	62.39(30.49)
Social Competence	19.69(3.86)	19.56(3.99)
College Education (%)	31.93	33.82

**Statistically different between genders (p<.05); £5 males and 4 females did not have a BMI reading; †1 female did not have a recorded age.*

Table 1: Descriptive characteristics by males and females.

RESULTS

Table 2A provides mean organized sport participation values by gender and motor performance quartiles. Table 2B provides mean organized sport participation values by gender and social competence groups. ANOVA tests for motor performance and sport participation on males and females computed F values of 27.51 and 18.18, respectively. All p values were less than the significant levels of 0.05, with comparative differences being based on Bonferroni post-hoc test. In males, significant differences in organized sport participation were in all motor performance comparisons except when comparing 1st and 2nd quartile. In females, organized sport participation had significant differences in all comparisons except when comparing the 2nd motor performance quartile to the 1st and 3rd quartiles. T- tests for social competence and sport participation were performed on males and females with t values being -7.16 and -8.37, respectively. All p values were less than the significance levels of 0.05. Based on visually and statistically comparing the mean organized sport participation measurements between high and low social competences groups, the high social competence group had significantly higher sport participation compared to the low social competence group in both genders.

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		Males (n=982)	Females (n=976)
1st Quartile	Sample Size	193	276
	Mean	3.90	4.25
2nd Quartile	Sample Size	224	274
	Mean	4.67	5.31
3rd Quartile	Sample Size	276	266
	Mean	6.05	5.94
4th Quartile	Sample Size	289	160
	Mean	7.45	7.46

Table 2A: Mean organized sport participation scores by gender and motor performance quartiles.

		Males (n=982)	Females (n=976)
High Social Competence	Sample Size	561	560
	Mean	6.68*	6.59*
Low Social Competence	Sample Size	421	416
	Mean	4.46	4.11

**significantly higher organized sport participation mean*

Table 2B: Mean organized sport participation scores by gender and social competence groups.

Table 3 displays the independent exposure odds ratios for motor performance and social competence by gender. Motor performance and social competence remained significant indicators of participation in organized sports when all confounders (age, BMI and SES) were included in the multiple regression models. The addition of social competence reduced the parameter estimate of motor performance, indicating a more impactful role of social competence on participation in organized sports. When parental education was included in the model for males, it also remained significant. The first two sets of odds ratios created through logistic regression are motor performance (quartiles) and social competence (high or low) as independent exposures to display previous findings shown through literature.[13] It is evident that both males and females are at risk of low participation in organized sports when compared to the 4th motor performance quartile, with this risk remaining after adjusting for confounders. Despite the child's gender, their risk of low sport participation is reduced as one goes into a higher motor performance quartile. Low social competence was shown to increase the risk of low sport participation when compared to children of the same age, BMI and SES with high social competence.

Table 4 displays the third set of odds ratios with four groups based on motor performance and social competence groups. Table 5 displays the fourth set of odds ratios with further categorized exposure for motor performance and social competence by gender where eight groups were created. The third set of odds ratios further classifies motor performance (MP) into high (3rd and 4th quartiles) and low (1st and 2nd quartiles) groups, with social competence (SC) groups remaining the same and four groups are created with these categories (Low MP/Low SC, Low MP/High SC, High MP/Low SC and High MP/High SC). This will allow for us to view the simplified version of the moderating role of social competence in our key relationship. Children with low MP and low SC, their odds of low sport participation are very high when compared to children with high MP and high SC (OR_{males}=4.938, $OR_{females}$=3.384). With the two exposures together, their odds of low sport participation are much greater. However, once either MP or SC is improved to higher levels, the odds of low sport participation are greatly reduced when compared to children with high MP and high SC – a key focus in this investigation. This left odds ratios of 2.132 and 2.999 when SC improved in males and females respectively, and odds ratios of 1.984 and 1.939 when MP was higher in males and females respectively. All odds ratios remained significant (p<.05) when compared to children with high MP and high SC. For the fourth set of odds ratios, motor performance is expanded back to its quartile form and eight groups are further created for this analysis – each quartile is grouped with high SC (4 groups) then with low SC (4 groups), for males and females (reference group=4th MP quartile with high SC). It is clear that for both genders, children in the 1st (lowest) MP quartile with low SC are at the highest odds for low participation in organized sports when compared to the reference group, even after adjusting for confounders. In males, the odds are slightly reduced as the child moves up the motor performance quartiles, with odds being eliminated when males are in the 4th MP quartile with low SC. In females, this relationship is not as clear with the 3rd MP quartile being at greater odds than the 1st and 2nd quartiles for low sport participation. However, these odds ratios are within each other's confidence intervals after adjusting for confounders.

	Males: Unadjusted	Males: Adjusted*	Females: Unadjusted	Females: Adjusted*
1st Quartile	3.841 (2.579-5.721)	3.629 (2.077-6.343)	2.950 (1.951-4.463)	3.256 (1.921-5.520)
2nd Quartile	2.509 (1.735-3.627)	2.395 (1.505-3.810)	2.240 (1.487-3.375)	2.330 (1.394-3.895)
3rd Quartile	1.857 (1.313-2.627)	1.665 (1.090-2.545)	1.896 (1.256-2.862)	2.466 (1.461-4.162)
4th Quartile	1.00	1.00	1.00	1.00
Low Social Competence	2.259 (1.727-2.954)	2.203 (1.575-3.082)	2.132 (1.632-2.786)	2.225 (1.588-3.117)
High Social Competence	1.00	1.00	1.00	1.00

**adjusted for age, BMI and SES.*

Table 3: Odds ratios on low participation in organized sports by independent exposures of motor performance and social competence by gender.

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	Males: Unadjusted	Males: Adjusted*	Females: Unadjusted	Females: Adjusted*
Low MP/Low SC	5.225 (3.617-7.547)	4.938 (3.028-8.055)	3.572 (2.521-5.062)	3.384 (2.162-5.299)
Low MP/High SC	2.143 (1.507-3.047)	2.132 (1.395-3.259)	2.529 (1.672-3.823)	2.999 (1.763-5.103)
High MP/Low SC	2.061 (1.447-2.937)	1.984 (1.249-3.150)	1.942 (1.385-2.724)	1.939 (1.263-2.976)
High MP/High SC	1.00	1.00	1.00	1.00

**adjusted for age, BMI and SES.*

Table 4: Odds ratios on low participation in organized sports by dichotomized motor performance with social competence by gender.

	Males: Unadjusted	Males: Adjusted*	Females: Unadjusted	Females: Adjusted*
1st MP/Low SC	7.129 (4.195-12.113)	6.723 (3.211-14.077)	5.364 (3.087-9.321)	6.200 (3.028-12.695)
2nd MP/Low SC	6.084 (3.635-10.181)	4.730 (2.452-9.121)	4.219 (2.412-7.379)	5.721 (2.827-11.576)
3rd MP/Low SC	4.066 (2.465-6.708)	3.713 (2.033-6.781)	5.396 (2.860-10.182)	8.378 (3.678-19.080)
4th MP/Low SC	1.716 (1.027-2.868)	1.418 (0.765-2.628)	1.865 (0.956-3.637)	2.888 (1.237-6.742)
1st MP/High SC	3.808 (2.226-6.514)	3.014 (1.426-6.371)	3.085 (1.779-5.352)	4.450 (2.218-8.930)
2nd MP/High SC	1.956 (1.205-3.173)	1.908 (1.049-3.471)	2.240 (1.311-3.830)	2.602 (1.313-5.154)
3rd MP/High SC	1.603 (1.035-2.482)	1.222 (0.707-2.112)	1.556 (0.926-2.615)	2.400 (1.227-4.693)
4th MP/High SC	1.00	1.00	1.00	1.00

**adjusted for age, BMI and SES.*

Table 5: Odds ratios on low participation in organized sports by motor performance quartiles with social competence by gender.

DISCUSSION

Globally, cardiovascular diseases are the leading cause of death with an estimated 26.3 million annual deaths predicted by 2030.[24] Low physical activity and poor physical fitness are significant risk factors for cardiovascular disease among adults.[24] In addition, atherosclerotic processes that result in coronary heart disease have their origins during childhood.[1] These are cardiovascular risk factors which are amenable to change and the importance of promoting active lifestyles among children is evident. A key concern with being physically active, such as participating in organized sports, is the capacity of a participant to execute skilled movements and not all children demonstrate high levels of motoric competence. However, as sport is a key aspect of a child's physical activity environment, the opportunity for all to participate is important. It has been repeatedly reported that there is an association between levels of motor performance, including children with DCD, and lower physical activity levels. This activity deficit is persistent over time, sincerely affecting girls more than boys.[25] Children with delayed motor development are at greater risk of being overweight, having lower overall fitness levels, perceiving themselves as physically incompetent, having lower activity levels and reduced motivation in sport participation.[14]

Self-efficacy, a component of social competence, has been recognized as one's ability to overcome barriers of physical activity, perceptions of physical competence, positive attitudes towards physical education, enjoyment of physical activity and parent/peer support as positive factors associated with higher physical activity in young children.[26] In order to develop and maintain a positive support system, one must have a relatively high social competence. Social competence is recognized as a 'central organized construct of development' in many aspects including education, communication and occupation.[27] Therefore, highlighting the importance of social competence for interventions among school-age children in crucial. Interventions need to focus on personal, family-related and peer-related factors which all impact a different aspect of social competence. Peer-to-peer exchanges are a vital component in the development of social competence, with factors including the context, culture and prior social experiences, and acceptance.[28] Another barrier children face in being physically active in organized sports is parental resources.[29] Many low income families do not have the financial capacity to support their child with enrollment in, and provide equipment for various extracurricular activities particularly sport teams or clubs. Social competence interventions in school-aged years can be expanded into physical education classes where organized sports are applied. Implementing man-

datory physical education class into schools, increased moderate-vigorous physical activity from 36.3% to 51.4%.[30] Relative to females, males physical activity levels appear more socially important. Males who are more physically active with peers are more socially accepted in the classroom, positively affecting their perceived social competence.[10] However, both sexes are able to improve their social competence through the use of friendships, social interactions, and group activities.[31] Children with poor motor performance, including children with DCD, have difficulties with attention, language, short-term memory, social skills, and academic performance. In environments where high levels of physical skills are valued, children with DCD are socially isolated by peers,[32] diminishing the opportunities to develop their social competence. As a consequence children with poor motoric consequence may be doubly impaired – both motorically and socially – in their capacity to participate in physical activity and particularly in organized sports.

The results make it evident that social competence plays a significant role both by itself in relation to involvement in sport and in the relationship between motor performance and sport participation. The ANOVA and t test results demonstrate that children with higher motor performance and higher socially competence, have greater participation in organized sports. Multiple regression models provided evidence that motor performance and social competence are independent contributors to sport participation for both sexes, with social competence having a greater moderating effect in females (17%) than males (9%). This is likely due to the fact that motor performance is a more prominent factor for sport participation in males, leaving less room for amelioration from social competence due to poor motor performance's profound effect on performance. Parental education plays a strong role in regard to sport participation, especially in males. This can be related to the cost of extracurricular activities borne by the parents as well as their drive to promote a healthy lifestyle.[33] Children with poor motor competence from lower SES groupings appear doubly burdened, limiting their opportunities to play organized sports. As previously described, this variable includes school teams, where coaches determine who is on the team, despite the child's desire to participate.

Odds ratio analysis demonstrates that having greater social competence reduces the odds of low sport participation in children (particularly girls) with lower motor performance, although it does not fully eliminate the risk. The majority of the final set of odds ratios remained significant after adjusting for known confounders, supporting the influential role that social competence has on sport participation.

There has been little research on the association between social competence and sport participation in children, and none which considers the effect on those with motor impairments. The results reported here suggest that providing children with motor limitations a supportive social network could facilitate regular involvement in physical activity. Having the opportunity to engage with more active friends and family members, will increase the likelihood that children will adapt healthy lifestyle choices, including physical activity participation.[34] It is important to recognize the dissimilar social norms of males and females for sport participation. Girls have a wider range of activities in which to view themselves as socially competent such as the dramatic arts or singing. However, the social expectations for boys are more focused within the physical activity spectrum. Boys who make the school's team and participate in intramural sports are more socially accepted by both peers and significant others thus aiding in the developing of their social competence. The differential effect of social competence among genders was shown in the odds ratios where social competence had a greater impact on male participation in sports.

We acknowledge that there are limitations to this study which preclude drawing any conclusions regarding causation. Both sports participation and social competence were self-reported although both were assessed using well established measures. Sexual maturity was not evaluated however within the age group reported the large majority of the participants in the PHAST study were in Tanner Stage 2.[35]

CONCLUSION

Lower social competence is an indication of lower social skills and interactions between peers.[36] It is important for Public Health to recognize the essential role that social competence plays at a young age in the adoption of healthy lifestyles.[37] Higher social competence provides children with a necessary skill to heighten engagement in organized sports across all motor performance levels, emphasizing the role that social competence plays in physical activity participation and healthy active living, regardless of motor performance. Due to the social norms placed on young boys to participate in physical activities, the particular importance of social competence for participation in organized sports for young boys and among those with motor impairments should be recognized when designing and implementing activity promotion strategies for youth.

CONFLICTS OF INTEREST

There is no conflicts of interest in this report as funding was from CIHR and there is no financial benefit accruing to any of the author's.

CONSENT

The patients of this study have provided written permission for publication of the case details.

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