

Can Physical Activity Moderate Relationships between School Related Stress and Health Complaints among Japanese Elementary School Children?

Minoru Takakura¹, Minoru Kobayashi², Masaya Miyagi³ Hisamitsu Kobashigawa²
and Atsushi Kurihara⁴

Faculty of Medicine, University of the Ryukyus, Okinawa, Japan¹, Faculty of Education,
University of the Ryukyus, Okinawa, Japan², Okinawa Prefectural College of Nursing,
Okinawa, Japan³, and Faculty of Culture and Education, Saga University, Saga, Japan⁴

Keywords: exercise, buffering effects, subjective symptoms

Introduction

In Japan, it is compulsory for all children from ages 6 to 15 years to attend elementary and junior high schools. As school children spend their time in school almost all day, their perceptions of school environments are associated with not only their academic performances but also with their physical and psychological well-being. In particular, school-related stresses, such as pressure from schoolwork and high academic demands, have been designated as primary sources of somatic and psychological complaints (Takakura & Sakihara, 2001; Torsheim & Wold, 2001). As greater frequency of subjective health complaints among school children are associated with their absence from school and poor academic achievement, effective school health promotion programs that address students' health concerns need to be developed.

Previous studies with adults suggested that physical activities have positive influences on people's health outcomes such as mortality, morbidity, somatic and mental health problems, and physical fitness. Among young people, however, low to moderate associations between physical activity levels and health outcomes have been shown (Sallis & Owen, 1999). For example, a study of Japanese school children demonstrated that physical activity level was significantly but weakly associated with stress responses ($r=-.18$, $p<.01$) (Uechi, Takenaka & Oka, 2000).

Past research also indicated that physical activity may have a buffering effect on health outcomes in the sense that physical activity acts as a moderator in the association between stress and health outcomes. Haugland, Wold & Torsheim (2003) showed that among Norwegian 15-year-olds there were positive relationships between the levels of school-related stress and the frequency of health complaints, and interactions between school-related stress and physical activity on health complaints, suggesting that school-related stress was more closely related to health complaints for adolescents who reported low levels of physical activity. Norris, Carroll & Cochrane (1992) also showed that high intensity exercise program for 10-week training period moderated the association between perceived stress and health outcomes among secondary school students.

However, these previous studies were carried out exclusively on adolescent populations. To our knowledge, no studies have attempted to examine a moderator effect of physical activity on the association between stress and health outcomes among Japanese elementary school children. Moreover, few studies have examined if practices such as eating breakfast, having enough sleep, watching TV, and playing PC games can moderate the association between stress and health outcomes among them.

This study aims to examine whether subjective health complaints are associated with school-related stress and physical activity among Japanese 6th grade school children and to determine the influence of physical activity on the relation of school-related stress to health complaints. In addition, other health practices were examined as moderators of the association between stress and health complaints.

Method

Procedures and Subjects

Classroom teachers conducted a self-administered questionnaire survey in a classroom setting in May and July 2002. The study sample consisted of 1,978 students in 6th grade (ages 11-12) at 25 public elementary schools throughout Okinawa, Japan. Schools were chosen based on the size of the student population in school districts and willingness of school administrators to participate in the study. A total of 1,573 students had complete data and were used for statistical analyses (51.2% boys and 48.8% girls).

Measures

The questionnaires mainly consisted of items adapted from the 1997/1998 Health Behaviour in School-aged Children Study (HBSC) by the World Health Organization (Currie, 1998). The questionnaires were translated into Japanese by a research team that included a bilingual speaker and they were reviewed for reliability and validity.

Health complaints were measured by the HBSC symptom checklist that included the items headache, abdominal pain, backache, feeling low, irritability, nervousness, sleeping difficulties, and dizziness. Students reported on a 5-point scale if each symptom was experienced seldom or never, about once every month, about once every week, more than once a week, or most days. Cronbach's alpha coefficient was .73. The logarithm of the scale score was used because of its skewed distribution. School-related stress was measured by one item: 'How pressured do you feel by the schoolwork you have to do?' The item was rated on a 4-point scale ranging from 'not at all' to 'a lot'.

Physical activity was measured by frequency and duration questions. The frequency question asked students 'Outside school hours: How often do you usually exercise in your free time, so much that you get out of breath or sweat?' The response categories were: 'Once a month or less', 'Once a week', '2-3 times a week', '4-6 times a week', and 'Every day'. The duration question asked students 'Outside school hours: How many hours do you usually exercise in your free time, so much that you get out of breath or sweat?' The response categories were: 'None', 'About half an hour per week', 'About 1 hour per week', 'About 2-3 hours per week', 'About 4-6 hours per week', and 'About 7 hours per week'. The responses were re-categorized to create a dichotomous summary measure. Students who reported being active '2-3 times a week' or more and 'about 1 hour per week' or more were classified as active. Students who reported being active for 'once a week' or less or 'half an hour per week' or less were classified as inadequately active (Booth, Okely, Chey & Bauman, 2001).

In addition, practice variables including eating breakfast, having enough sleep, watching TV, and playing PC games were assessed.

Results

The descriptive analyses showed that boys were more likely to report health complaints than girls ($t = -6.07, p < .001$). The levels of school-related stress among girls were significantly higher than those of boys ($\chi^2 = 34.63, p < .001$). Boys were more likely to report being physically active (76.3%) compared with girls (48.5%), $\chi^2 = 129.96, p < .001$. Boys played PC games for more hours than girls did ($\chi^2 = 136.90, p < .001$), while girls watched TV for more hours than boys did ($\chi^2 = 6.32, p = .012$). No gender differences in the proportions of students having enough sleep and eating breakfast were shown ($\chi^2 = .67, p = .41$; $\chi^2 = .74, p = .39$).

As a result of analysis of variance, school-related stress showed a significant main effect on health complaints among both boys and girls ($F = 11.78, p < .001$; $F = 8.99, p < .001$), suggesting the relationship between high levels of school-related stress and high levels of

complaints. However, physical activity did not show a main effect on health complaints among boys and girls ($F=1.44$, $p=.23$; $F=.83$, $p=.36$). In addition, there was no interaction between school-related stress and physical activity on health complaints among boys and girls ($F=1.36$, $p=.25$; $F=.61$, $p=.61$). As for other health practices, among girls, having enough sleep, eating breakfast, watching TV, and playing PC games showed significant main effects on health complaints ($p<.05$). Among boys, eating breakfast and playing PC games showed a significant main effect ($p<.05$). Students who slept for 7-8 hours, ate breakfast everyday, watched TV for less than 4 hours a day, or played PC games for less than 4 hours a week were less likely to report health complaints. A series of analyses of variance for health practices also showed significant main effects of school-related stress ($p<.05$). However, there was no interaction between school-related stress and each health practice on health complaints ($p\geq .05$).

Conclusions

This study shows that, at least among Japanese 6th grade school children in Okinawa, physical activity was not associated with the levels of health complaints and the relationship between school-related stress and health complaints. In other words, physical activity in this age group had no direct and buffering effects on health outcomes. The findings of this study were not consistent with previous studies of adolescent populations seeking to determine if physical activity could influence health outcomes and the relationship between stress level and health outcomes. A possible explanation could be that the impacts of school-related stress or other health practices surpass that of physical activity on health complaints. Indeed, school-related stress and health practices had significant main effects on health complaints in this age group. Our earlier cross-sectional studies revealed that physical activity was strongly associated with physical fitness level and also high level of physical fitness decreased health complaints. Therefore, it will be necessary to conduct a prospective study to confirm causal linkages between physical activity, physical fitness, and health outcomes among elementary school children.

References

- Booth, M.L., Okely, A.D., Chey, T., & Bauman, A. (2001). The reliability and validity of the physical activity questions in the WHO health behaviour in schoolchildren (HBSC) survey: a population study. *British Journal of Sports Medicine*, 35, 263-267.
- Currie, C. (1998). *Health Behaviour in School-aged Children: a WHO Cross-National Study (HBSC). Research Protocol for the 1997-1998 study*. Edinburgh, UK: University of Edinburgh.
- Haugland, S., Wold, B., & Torsheim, T. (2003). Relieving the pressure? The role of physical activity in the relationship between school-related stress and adolescent health complaints. *Research Quarterly for Exercise and Sport*, 74, 127-135.
- Norris, R., Carroll, D., & Cochrane, R. (1992). The effects of physical activity and exercise training on psychological stress and well being in an adolescent population. *Journal of Psychosomatic Research*. 36, 55-65.
- Sallis, J. F., & Owen, N. (1999). *Physical Activity and Behavioural Medicine*. Thousand Oaks, CA: Sage Publications, Inc.
- Takakura, M., & Sakihara, S. (2001). Psychosocial correlates of depressive symptoms among Japanese high school students. *Journal of Adolescent Health*, 28, 82-89.
- Torsheim, T., & Wold, B. (2001). School-related stress, school support, and somatic complaints: a general population study. *Journal of Adolescent Research*, 16, 293-303.
- Uechi, H., Takenaka, K., & Oka, K. (2000). The relationship between physical activity and stress response of children. *Japanese Journal of Health Psychology*. 13, 1-8 (in Japanese).