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HEALTH-RELATED CORRELATES OF PSYCHOLOGICAL WELL-BEING AMONG GIRLS AND BOYS 6-8 YEARS OF AGE - THE PANIC STUDY

Abstract

Aim: Due to limited knowledge on differences in the correlates of psychological well-being (PSWB) between girls and boys, we compared the correlates of PSWB between primary school girls and boys.
Method: A population sample of 412 children participated in the Physical Activity and Nutrition in Children (PANIC) Study. Parents completed a questionnaire including 19 questions on the components of PSWB, and a PSWB score was computed. We assessed correlates of PSWB, including physical activity, sedentary behavior, cardiorespiratory fitness, diet quality, body fat content, sleep duration, sleep disordered breathing (SDB), prevalent diseases, and parental characteristics. We used logistic regression to analyze the risk of being in the lowest third of PSWB score.
Results: Low parental education was associated with increased risk (odds ratio [OR] 2.34, p=0.039) and high cardiorespiratory fitness with decreased risk (OR 0.26, p=0.006) of poor PSWB in girls. At least 2 hours of screen-based sedentary behavior per day (OR 1.93, p=0.037), daily parental smoking (OR 2.10, p=0.034), and SDB (OR 4.24, p=0.003) were related to increased risk of poor PSWB in boys.
Conclusions: There are large differences in the correlates of PSWB between girls and boys. Most of these correlates are modifiable and related to the health behavior of children and their parents.

Key words psychological well-being, children, SDB, health behavior

What is already known on this topic

- Correlations between psychological and physical well-being, psychological and social well-being and physical and social well-being are high.
- Lower levels of physical activity and higher levels of screen-based sedentary behavior, obesity, inadequate sleep quantity and quality, chronic diseases and socioeconomic conditions of the family are associated with impaired psychological well–being in children.

What this paper adds:

- There are large differences in the correlates of psychological well-being between girls and boys.

- The correlates of psychological well-being are related to the health behavior of children and their parents.
- The correlates of psychological well-being in children are modifiable.

Introduction

The World Health Organization (WHO) defines mental health as a state of well-being in which individuals, regardless of age, realize their potential, cope with the normal stresses of life, work productively, and are able to make a contribution to community. The WHO further defines health as a state of complete physical, mental, and social well-being, and not only the absence of disease or infirmity.[1]

Lower levels of physical activity and higher levels of screen-based sedentary behavior have been linked to poorer psychological and psychosocial well-being among children.[2-4] Some studies have observed an association between higher levels of screen-based sedentary behavior and poorer psychological well-being only in boys or girls.[4] There are few if any studies on the associations of cardiorespiratory fitness and dietary factors on psychological well-being among children. Overweight and obese children have been reported to be more likely to have psychological problems than normal-weight children, although the contribution of adiposity to mental health may be relatively small among younger children.[5,6] Inadequate sleep quantity and quality have also been linked to many psychological phenomena, such as poor attention, impulse control, and behavior regulation, among children and adolescents.[7] Moreover, some chronic diseases have also been associated with impaired psychological well-being among children.[8-11] Socioeconomic conditions of the family, such as low parental education, low family income, single custody, and unemployment,[12,13] as well as smoking and a high alcohol consumption of the parents may also impair children's well-being.

Few studies have comprehensively investigated the correlates of psychological well-being among children and compared these correlates in girls and boys. We therefore investigated whether physical activity, sedentary behavior, cardiorespiratory fitness, diet, body fat content, sleep duration, sleep disordered breathing (SDB), asthma, parental education, household income, parental unemployment, and parental smoking and alcohol consumption are associated with psychological well-being in a population sample of children 6-8 years of age. We hypothesized that there are some differences in the correlates of psychological well-being between girls and boys.

Subjects and methods

Study design and study population

The present analyses are based on the cross-sectional baseline data of the Physical Activity and Nutrition in Children (PANIC) Study, which is an ongoing physical activity and dietary intervention study in a population sample of primary school children from the city of Kuopio, Finland. Altogether

736 children 6-8 years of age were invited in the baseline examinations, and 512 children (70%) participated. The present analyses are based on data from 412 children (205 girls, 207 boys) who had complete data on variables needed in the analyses. We chose variable for the analyses based on existing evidence on the correlates of well-being among children and also utilized the comprehensive data on possible correlates of well-being collected in the PANIC study. The study protocol was approved by the Research Ethics Committee of the Hospital District of Northern Savo. All participating children and their parents gave their informed written consent.

Assessment of psychological well-being

The parents filled out a questionnaire concerning their children´s psychological well-being. The questionnaire was developed by the PANIC research group to assess the most important components of well-being in general populations of children. The questionnaire included 19 items of psychological well-being (timidity, tearfulness, insecurity, anxiety, frustration, depression, restlessness, squeamishness or anger, aggressiveness, difficulties in concentration, problems in concentration at home work, difficulties in home work, unwillingness to go to school, troublemaking in class, discouragement, feeling of inferiority, forgetting things, sleeping difficulties and difficulties in reaching the age-appropriate level in doing things). Each item was rated on a 5-point scale (0 = not at all, 1 = once or twice during the previous 3 months, 2 = sometimes, 3 = often, 4 = every day or almost every day). The rates were summed to form the psychological well-being score (range 0-76), a higher score indicating a lower well-being. A separate score for more severely deteriorated psychological well-being was computed by dichotomizing the individual items and then summing them. The highest third of this sum was denoted the most deteriorated psychological well-being.

Assessment of sleep and sleep disordered breathing (SDB)

The sleep questionnaire was based on an established Basic Nordic Sleep Questionnaire that has been used to screen for sleep disturbances and SDB.[14] SDB was defined as apneas, frequent or loud snoring, or nocturnal mouth breathing observed by the parents.[15] Sleep duration was assessed using a combined heart rate and movement sensor (Actiheart, CamNtech, Cambridge, UK).[16] Children were asked to wear the Actiheart device continuously for at least four consecutive days. Sleep duration was analyzed manually from heart rate and movement data by one exercise specialist and was confirmed by one physician, if needed.

Assessment of body composition and cardiorespiratory fitness

Body fat percentage and lean body mass were assessed by dual-energy x-ray absorptiometry (DXA) (Lunar Prodigy Advance, GE Healthcare, Madison, Wisconsin, USA).[17] Cardiorespiratory fitness was assessed by maximal exercise stress test using electromagnetic cycle ergometer (Ergoselect 200 K, Ergoline, Bitz, Germany).[18] We used the peak workload divided by lean body mass as the measure of

cardiorespiratory fitness.

Assessments of physical activity and sedentary behavior

Physical activity and sedentary behavior were assessed by the PANIC Physical Activity Questionnaire filled out by the parents with their child at home.[19] Total physical activity included organized sports, organized exercise other than sports, unsupervised physical activity, physically active school transportation, physical activity during recess, and physical education. Physical activity assessed by the questionnaire had a moderate to strong correlation with physical activity assessed by combined heart rate and movement sensing in a subsample of children.[19] Total sedentary behavior included screen-based sedentary behavior and other sedentary behaviors, as explained in detail earlier.[19].

Assessment of diet

The consumption of foods and the intake of energy and nutrients were assessed by food records administered by the parents on four predefined consecutive days.[17] The food records were analyzed using The Micro Nutrica® dietary analysis software, Version 2.5 (The Social Insurance Institution of Finland). The Dietary Approach to Stop Hypertension (DASH) Score, that consisted of seven components of diet (scored 1-5) and ranged between 7 and 35, was used as an indicator of a healthy diet.[20] A higher DASH Score indicated a higher diet quality.

Assessment of parental characteristics

The characteristics of the parents were assessed using a structured questionnaire filled out by mothers and fathers. Parental education was categorized as low, middle and high. Annual household income was categorized as ≤30 000 €/year, 30 001-60 000 €/year and >60 000 €/year. The employment status of mothers and fathers was categorized as unemployed and other (including employed, self-employed, retired, and students). Both parents were also asked to report their daily smoking (yes, no) and alcohol consumption (portions/week).

Statistical methods

The data were analyzed using the IBM SPSS Statistics for Windows software, Version 21.0 (IBM Corp., Armonk, NY, USA). Cronbach's alpha was calculated to assess the internal consistency of the psychological well-being score. The Chi-square Test was used to analyze differences in categorical variables between girls and boys and between children with low and normal psychological well-being. However, the Fisher's Exact Test was used when the numbers of children in some cells were small. Differences in continuous variables between girls and boys and between children with low and normal psychological well-being were analyzed using the Student's T-test for normally distributed variables and the Mann-Whitney U-test for variables with skewed distributions. These analyses showed that screen-based sedentary behavior, cardiorespiratory fitness, SDB, parental education, and daily

parental smoking differed between those with low psychological well-being and those with normal psychological well-being among girls or boys. Logistic regression analysis was used to study the associations of these variables with the risk of being in the lowest third of the psychological well-being score adjusted for age in girls and boys separately. Differences and associations with a p-value of ≤0.05 were considered statistically significant.

Results

The girls had a higher body fat percentage ($p<0.001$) and total sedentary behavior ($p=0.048$), a better diet quality assessed by the DASH score ($p=0.004$), higher psychological well-being ($p=0.006$), and lower cardiorespiratory fitness ($p<0.001$), total physical activity ($p<0.001$) and screen-based sedentary behavior ($p<0.001$) than the boys. Internal consistency for the psychological well-being score was high (Cronbach's Alpha 0.91).

SDB was more common in boys with low psychological well-being than in boys with normal psychological well-being ($p=0.001$). Cardiorespiratory fitness was lower in girls with low psychological well-being than in girls with normal psychological well-being ($p=0.004$). Screen-based sedentary behavior was higher ($p=0.012$) and daily parental smoking ($p=0.041$) was more common in boys with low psychological well-being than in boys with normal psychological well-being.

Boys with SDB were four times more likely to have increased risk of low psychological well-being than boys without SDB (Table 1). Girls who were in the highest third of cardiorespiratory fitness were less likely to have low psychological well-being than girls in the lowest third. Boys with at least two hours of screen-based sedentary behavior per day had two times higher risk of low psychological well-being than boys with lower screen-based sedentary behavior. Moreover, boys whose parents smoked daily had a higher risk of low psychological well-being than boys whose parents did not smoke. Girls whose parents had lower education had a higher risk of low psychological well-being than girls whose parents had higher education.

Discussion

This cross-sectional study in a population sample of children 6-8 years of age showed that boys had lower psychological well-being than girls and that there are large differences in the correlates of psychological well-being between girls and boys. SDB, daily parental smoking, and higher screen-based sedentary behavior were associated with lower psychological well-being in boys, whereas lower cardiorespiratory fitness and lower parental education were related to lower psychological well-being

in girls. Most of the correlates of psychological well-being among children are modifiable and related to the health behavior of children and their parents. Future studies are warranted to confirm these findings in other large population studies among children and to explain the observed gender differences.

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245 **Table 1** Risk factors for having low psychological well-being in girls and boys

	Girls (n=205)		Boys (n=207		p-value for interaction with gender
	OR† (95% CI)	p	OR† (95% CI)	p	
Sleep disordered breathing					0.013
No	1.00		1.00		
Yes	0.32 (0.08-1.24)	.099	4.24 (1.63-11.00)	.003	
Cardiorespiratory fitness, w/kg lean body mass					0.410
<3.48	1.00		1.00		
3.48-3.88	0.86 (0.43-1.71)	.663	0.66 (0.29-1.49)	.311	
>3.88	0.26 (0.10-0.68)	.006	0.63 (0.29-1.39)	.252	
Screen-based sedentary behavior					0.084
<2h/day	1.00		1.00		
≥2h/day	0.66 (0.31-1.42)	.291	1.93 (1.04-3.57)	.037	
Parental daily smoking					0.105
No	1.00		1.00		
Yes	0.69 (0.31-1.42)	.354	2.10 (1.06-4.15)	.034	
Parental education					0.755
Polytechnic or university	1.00		1.00		
Vocational	2.34 (1.05-5.25)	.039	1.07 (0.48-2.36)	.868	

246 †The values are odds ratios (OR) and their 95% confidence intervals (CI) from logistic regression
247 models in which all these variables and age were entered simultaneously.