

Effects of an outdoor education intervention on the mental health of schoolchildren

Per E. Gustafsson^{a*}, Anders Szczepanski^b, Nina Nelson^b, and Per A. Gustafsson^b

^aUmeå University, Umeå, Sweden; ^bLinköping University, Linköping, Sweden

This study aimed at examining the effects of an outdoor educational intervention on the mental health of schoolchildren. Two elementary schools participated ($N = 230$); one experimental school where the intervention was implemented, and the other a reference school. Demographic questions and the Strengths and Difficulties Questionnaire were completed by the parents. An outdoor educational intervention was implemented at the experimental school, and the data collection was repeated after one year. The results point towards a small but non-significant improvement in mental health at the experimental school while adjusting for demographics. However, this effect was significantly moderated by gender: boys generally fared better than girls at the intervention school, relative to the reference school. The results indicate that it may be important to address gender issues when educational programmes are implemented in schools.

Keywords: *Schoolchildren; Outdoor education; Response to intervention; Mental health; Gender*

Introduction

Children spend most of their waking hours in school. It is therefore no surprise that the school environment affects the mental well-being of children (Anderman, 2002). The nature of this influence may be further understood from an ecological perspective. The school, much like the family and the peer group, comprises an important developmental context for the child; a microsystem (Bronfenbrenner, 1979; Farmer & Farmer, 1999). A microsystem is the web of relations between the individual and its environment, and constitutes a physical setting, where the participants engage in particular activities in particular roles for a particular period of time.

*Corresponding author: Department of Public Health and Clinical Medicine, Family Medicine, Umeå University, SE-901 85 Umeå, Sweden. Email: per.e.gustafsson@fammed.umu.se

The microsystems are themselves embedded in, and influenced by, a context: the mesosystem, which is the interrelations of major microsystems; the exosystem, which is the broader formal and informal social structure not directly containing the individual; and the macrosystem, which describes the general institutional patterns of the relevant culture or subculture (Bronfenbrenner, 1979).

There are several mechanisms through which the school as a microsystem may influence the mental well-being of the child (Farmer & Farmer, 1999). First, at the level of exosystem or macrosystem, the educational context itself is influenced by structural factors such as stratification of school districts, funding source and special education needs. This stratification creates different microsystems where education takes place, and thus also influences instructional aspects of the school (Gamoran, 1986) with social, psychological and behavioural consequences for the individual child. The school also influences children through the peer network (Farmer & Farmer, 1999), which constitutes a microsystem for schoolchildren that, to a substantial degree, overlaps with the school microsystem. These mediating and moderating roles of the school environment may be a partial explanation as to why early problems in school (Kellam, Ling, Merisca, Brown, & Ialongo, 1998; Masten, 2003; Rutter, 1980) or negative perceptions about the school (Andersson & Strander, 2004) may predict later maladjustment.

From this apparent importance of the school for child development follows the need for a school environment that is supportive of the child and thereby promotes mental health and well-being. Also considering the administrative structure provided by the school, the school therefore constitutes a suitable physical and organizational setting in which preventive interventions can be undertaken (Cowen & Durlak, 2000).

There is a multitude of school-based mental health programmes, and the growing research field of school mental health continuously evaluates the effectiveness of such programmes to reduce the 'research-practice gap' (Durlak, 1995; Durlak & Wells, 1997). Most of these programmes focus on the individual (Durlak, 1995). Examples of such individual-centred interventions are affective education, aiming at increasing children's awareness and expression of feelings and of the causes of behaviour, and interpersonal problem-solving training, focusing on developing cognitive skills in order to increase children's ability to identify interpersonal problems and to employ effective approaches to solve them (Durlak & Wells, 1997). Less common are interventions aimed at changing the environment, even though there are strong theoretical grounds that environment-centred interventions may produce broader psychosocial benefits for children (Berryhill & Prinz, 2003; Bronfenbrenner, 1979). Most commonly, environment-centred interventions focus on improving the psychosocial classroom milieu (Durlak & Wells, 1997). For example, an intervention directed at reducing childhood aggression described by Hawkins, Von Cleve, and Catalano (1991) included training of teachers in the use of proactive classroom management, cognitive social skills and interactive teaching methods. Others have however employed even more ambitious programmes, involving several actors (teachers, administrators, mental health professionals and parents) to change the structural

and functional aspect of the school (Comer, 1985), or implementing a child development centre as a completely new setting supporting behavioural adjustment in school (Johnson & Breckenridge, 1982).

Outdoor education is an environment-focused educational approach characterized by action-centred and thematic learning processes frequently involving outdoor activities (Dahlgren & Szczepanski, 1998). It aims to foster learning through the interactions between emotions, actions and thoughts, based on practical observation in authentic situations (Dahlgren & Szczepanski, 2004). This perspective on knowledge and learning, where a diverse learning environment is emphasized, contrasts with the traditional educational system, which is based on theoretical knowledge taught in a classroom setting and which limits the interactions between emotions, actions and thoughts. Outdoor education has the potential to become an integrative, complementary education form in a pragmatic and progressive pedagogy tradition, which can offer students and teachers opportunities to learn on the basis of observations and experiences in authentic situations. Moreover, a more movement-intensive form of learning is created in outdoor education (Grahm, Mårtensson, Lindblad, Nilsson, & Ekman, 1997).

Although the literature on the psychological effects of physical activity in youth is under-developed and mostly concerns adolescents, available findings suggest that there are beneficial effects of physical activity on self-esteem (Ekeland, Heian, Hagen, Abbott, & Nordheim, 2004), depression and anxiety (Larun, Nordheim, Ekeland, Hagen, & Heian, 2006). These psychological gains may be partly mediated by the buffering effect of exercise on stress exposure (J. D. Brown & Lawton, 1986; J. D. Brown & Siegel, 1988; Norris, Carroll, & Cochrane, 1992). Such stress-buffering effects could possibly be explained by counter-conditioning mechanisms, where initially negative stimuli (exercise) obtain positive motivational properties through the association to other positive stimuli (e.g. social interaction) and thereby influence general stress tolerance (Salmon, 2001). School policies have been shown to be important determinants in accomplishing increased physical activity in children (Ferreira et al., 2007; Gordon-Larsen, McMurray, & Popkin, 2000), rendering school-based interventions a particularly promising prospect.

In addition to the potential beneficial effects of physical activity, a growing body of literature also suggests that the natural environment has profound effects on well-being, particularly in children as a result of their greater plasticity (Wells & Evans, 2003). A study of 10 schools and a state-wide programme by the National Environmental Education & Training Foundation (2000) found that when schools utilize the context of local areas and naturalized schoolyards in their instructional practices, academic performance improves in reading, maths, science, social studies and writing. A study of 40 schools in California that used the natural environment as 'an integrated context of learning' (Leiberman & Hoody, 1998) with hands-on, project-based learning found that student performance improved in standardized test scores, grade point average, willingness to stay on task, adaptability of different learning styles and problem-solving ability (Leiberman & Hoody, 1998). Examples of beneficial effects of experiences in nature on child development and well-being are

improved cognitive functioning (Wells, 2000) and ability to apply self-disciplined behaviour (Taylor, Kuo, & Sullivan, 2002), better psychological well-being and capacity to cope with adversity (Wells & Evans, 2003) and a reduction in anti-social behaviour such as violence, bullying, vandalism and littering, as well as a reduction in absenteeism (Coffey, 2001; Moore & Cosco, 2000). Thus, the potential benefits of outdoor education for children's well-being could be explained by a combined effect of physical activity and of the natural environment.

Although changes in educational practices are frequently implemented in schools, few are systematically evaluated with respect to their potential impact on child mental health. Instead, when new programmes or other organizational or pedagogical changes are implemented, focus is more often placed on the impact on achievement (Anderman, 2002; Lipsey & Wilson, 1993; Watt, 2003) while improvements in well-being are assumed rather than investigated (Cowen & Durlak, 2000). A recent systematic review (Gustafsson et al., 2010, pp. 155–156) concluded that the amount of research which investigates relations between different aspects of schooling and mental health is limited, particularly research concerning organizational factors and different educational factors, such as teaching methods and activities. However, a relatively large enough amount of research exists concerning relations between mental health on the one hand, and the individual students' academic and social achievements and failures on the other hand. The reviewers' major conclusions were that academic achievement and mental health are reciprocally related; that early school failures and in particular reading difficulties cause internalizing and externalizing mental health problems; that problems of academic achievement and mental health tend to be stable over time; that investment of time and effort in schoolwork without achieving expected outcomes is related to development of depression; that relations with peers and teachers are involved in establishing the negative effects of school failure on mental health, but that relations with peers and teachers also can protect against development of mental health problems. Thus, there is obviously a potential that educational measures can influence psychological well-being in schoolchildren.

When outdoor educational programmes are quantitatively evaluated, low-constraint designs such as post-test or pre-test–post-test designs are most commonly employed. Furthermore, the most frequent outcome measures of well-being are self-concept, self-confidence or locus of control (Neill & Richards, 1998). The mental well-being of the child from a psychiatric perspective has not been examined in this context. Even when improved mental health is not the explicit aim of the intervention implemented in schools, child mental health is an important factor to consider as an outcome. For example, it would be beneficial to develop and evaluate non-traditional interventions that are relevant both to the needs of the educational system as well as to the mental health field (Ringelsen, Henderson, & Hoagwood, 2003). Moreover, any intervention that fundamentally changes an important microsystem of the child probably affects the well-being of the child, for better or for worse. Therefore, in addition to the specific psychological gains of increased physical activity, a pervasive general change in the school environment is also interesting to study from a mental health perspective.

However, activity in the natural outdoor environment should not be expected to be gender-neutral. For example, some researchers have argued that girls and boys gain qualitatively different experiences from outdoor activities (Ärlemalm-Hagsér, 2006). There is also a debate about whether there are gender role differences that might be relevant for the emphasis on movement that is present in outdoor education (Ärlemalm-Hagsér, 2006). Moreover, girls and boys differ across childhood with respect to type and level of psychiatric problems presented (Rutter, Caspi, & Moffitt, 2003). Therefore, gender is an important aspect to consider when studying the mental health impact of outdoor education.

The present study investigates the effects of an outdoor educational intervention on the mental health of schoolchildren, aged 6 to 12 years. The intervention is thus evaluated as a universal, environment-centred primary prevention intervention of mental health. We aimed at investigating the effect on general mental health and on specific dimensions of mental health, as well as the trait-treatment effect of gender.

Method

Participants and procedures

This study employed a quasi-experimental non-equivalent groups design. Participating children were recruited from two elementary schools (pre-school to grade 6) in the Municipality of Linköping, Sweden. One school (the intervention school) was situated in the urban fringe of the city of Linköping, while the other school (the reference school) was located in the city. The data collection was part of a study concerning biological and psychosocial aspects of stress, approved by the Local Ethics Committee. First, the principals of the schools were informed about the study and were offered participation on behalf of the respective school. Next, written and oral information was given individually to the children and their parents, who were offered participation on an individual basis. Informed consent forms and questionnaires were issued to the parents, and were returned to the research group by mail or were collected at the schools. Two waves of reminder telephone calls were made to the parents who had not given their decision about participation. During the following year a pedagogical intervention, described below, was carried out at one of the schools ('School 1') while the other school ('School 2') comprised the reference school.

One year after the initial data collection, a follow-up was implemented. The time frame of 12 months was chosen according to practical circumstances at the participating schools. The procedures described above, about information to the parents and children and the data collection, were repeated. For practicality and for satisfying other aims of the study, all children at the schools were included at both measuring points.

At the first data collection, Time 1, 342 out of 417 children participated, and 334 Strengths and Difficulties Questionnaires (SDQ, see below) were collected. The second year, Time 2, 315 out of 376 children participated with 278 questionnaires

Table 1. Demographic information by school ($n = 230$)

| | Intervention school ($n = 121$) | Reference school ($n = 107-109$) | Test, p value of difference |
|-----------------------|--------------------------------------|---------------------------------------|----------------------------------|
| Gender, % girls | 43.8 | 48.6 | χ^2 , <i>ns</i> |
| Age, mean (SD) years | 8.6 (1.6) | 8.1 (1.5) | t -test, $p = .021$ |
| Socio-economic status | | | χ^2 , $p < .001$ |
| Low (%) | 17.4 | 67.9 | |
| Middle (%) | 41.3 | 22.9 | |
| High (%) | 41.3 | 9.2 | |
| Immigrant parents (%) | 0.0 | 64.5 | χ^2 , $p < .001$ |

collected. From Time 1 to Time 2 the oldest children had begun a new grade at new schools and new pre-schoolers had entered each school. Thus, the effective sample for the present investigation comprised those children participating at both data collections, in total 230 children (121 children at School 1 and 109 at School 2). There were 106 girls and 124 boys, and mean age at Time 1 was 8.3 years (range 6–11 years). Demographic information by school at Time 1 is shown in Table 1. Children in School 1 were significantly but marginally older than for School 2. The socio-demographic distributions differed between the schools with School 2 including a substantially higher proportion of immigrants and families with low socio-economic status.

Pedagogical intervention

Outdoor education (Dahlgren & Szczepanski, 1998; Humberstone, Brown, & Richards, 2003; Szczepanski, 2008) is an approach that aims to foster learning through the interplay between experience and reflection, based on practical observation in authentic situations. The pedagogical intervention entailed education of the teachers according to an outdoor educational perspective. Didactic sessions in the out-of-doors were held during the 6 months following the initial data collection, in total about 15 days of education. Two of these sessions consisted of whole working days while the rest mainly were held from 14.00–18.00 h in the afternoon.

The teachers were introduced to exercises related to the national elementary school curricula in language, mathematics, natural sciences, arts, music, drama and physical education. The aim was to give the teachers insights into outdoor educational methods directly applicable in a physically active instructional setting located outside the traditional classroom environment (Dahlgren, 2007; Dahlgren & Szczepanski, 2004). This resulted in the pupils being taught outdoors for at least one hour each school day. All classes were gender-mixed and were held by the regular teachers. Teachers at the intervention school had an interest in outdoor education and in their ordinary teaching sometimes used outdoor education methods before the intervention started. However, no formal pilot study was performed.

School work at the reference school employed traditional methods; all education was book-based and consisted of paper-and-pencil work in the indoor classroom environment. Outdoor education was used at the intervention school as a contrasting type of didactic method. At the intervention school, material from the natural environment was used as teaching material and the teaching was taking place in the outdoor environment. As an illustration from the mathematics lectures, branches, stones and cones were used as examples of geometrical forms. Similarly, in language classes the children made use of objects from nature and culture in their local environment to illustrate grammatical concepts (adjectives, nouns and verbs), exemplified by the sentences 'The hard stone is rolling on the asphalt' and 'The thin leaf floats through the air and down to the ground'. For this specific activity the children themselves participated and physically acted with the stones and the leaves; the whole body in motion is a part of the education process, and is an example of how learning in the intervention school was performed in a more movement-intensive manner, based on the green context rather than on the classroom context. Similarly, to learn key concepts in geography classes, items in the outdoor environment, e.g. branches, stones, cones and ropes, were used to construct maps, e.g. of Sweden and Europe. Children had to create the maps through the use of local landscape topography and experience the three-dimensional landscape model that they themselves created and subsequently reflected on, discussed and argued about within the study group and with the teacher. As an illustrative contrast, in the reference school the same subject was taught through traditional methods with paper and pencil based on two-dimensional pictures, in the learning environment of the classroom.

Demographics

A socio-demographic form about the parents' education and occupation, country of origin and family composition was gathered from the parents. Classification of socio-economic status (SES) was derived from parents' occupation, using a three-graded scale (Statistics Sweden, 1984). Parents granted an early retirement and those unemployed were classified, together with skilled and unskilled workers, as the lowest SES group. Children were defined as belonging to an immigrant family if at least one of the parents was born outside Scandinavia. The majority of immigrant children originated from the Middle East.

Outcome measure

As a measure of mental health we used *The Strengths and Difficulties Questionnaire* (SDQ) (Goodman, 2001; Goodman & Scott, 1999). For each child, the SDQ was completed by his or her parents (parent-version). Parents were chosen as principal informants since they, in contrast to the teachers, were not directly involved in the intervention and thus could be expected to provide less biased measures of the mental health of the children. Although teacher ratings originally were intended to

complement this primary assessment of the children's mental health, the teachers at the reference school declined the assessment at Time 2.

The SDQ is a 25-item screening instrument for general psychiatric symptoms in children and adolescents and is well-validated for different populations, including Sweden (Malmberg, Rydell, & Smedje, 2003; Smedje, Broman, Hetta, & von Knorring, 1999). It takes about 20 minutes to complete. SDQ generates five subscales with 5 items each: emotional symptoms; conduct problems; hyperactivity/inattention; peer problems; and prosocial behaviour. The problem scales (all except prosocial behaviour) are summed up to form a total difficulties score. We used both the total difficulties score and the separate subscales as time-dependent variables in the analysis. Table 2 gives descriptive information of the SDQ total score and subscales, by data collection phase, school and gender. The SDQ scores of the total sample approximately matched the Swedish standardized norms of the questionnaire (Smedje et al., 1999), with the intervention school scoring slightly less and the reference school slightly more problem scores compared to the norm.

Table 2. Descriptive statistics of SDQ scores by time, school and gender ($N = 230$)

| | Intervention school (53 girls, 68 boys) | | Reference school (53 girls, 56 boys) | |
|----------------------|--|----------------------------|---|----------------------------|
| | T1, <i>M</i> (<i>SD</i>) | T2, <i>M</i> (<i>SD</i>) | T1, <i>M</i> (<i>SD</i>) | T2, <i>M</i> (<i>SD</i>) |
| <i>Girls</i> | | | | |
| Total difficulties | 4.1 (3.0) | 4.3 (3.4) | 7.1 (4.6) | 6.6 (4.1) |
| Emotional symptoms | 1.4 (1.4) | 0.9 (1.2) | 2.0 (1.6) | 1.5 (1.8) |
| Conduct problems | 0.7 (0.9) | 0.7 (1.0) | 1.3 (1.3) | 0.9 (0.9) |
| Hyperactivity | 1.5 (1.4) | 2.0 (1.9) | 2.5 (2.3) | 2.2 (2.1) |
| Peer problems | 0.5 (1.0) | 0.6 (1.1) | 1.3 (1.3) | 1.9 (1.6) |
| Pro-social behaviour | 8.8 (1.6) | 8.5 (1.9) | 8.7 (1.5) | 8.7 (1.3) |
| <i>Boys</i> | | | | |
| Total difficulties | 6.4 (4.6) | 5.0 (4.6) | 9.6 (6.3) | 11.0 (6.6) |
| Emotional symptoms | 1.2 (1.3) | 0.8 (1.2) | 2.2 (2.0) | 2.7 (2.3) |
| Conduct problems | 1.4 (1.4) | 1.0 (1.3) | 1.6 (1.6) | 1.8 (1.5) |
| Hyperactivity | 2.8 (2.3) | 2.5 (2.4) | 3.5 (2.5) | 3.9 (2.4) |
| Peer problems | 0.9 (1.3) | 0.8 (1.2) | 2.3 (2.1) | 2.6 (2.5) |
| Pro-social behaviour | 8.5 (1.7) | 8.3 (1.9) | 8.3 (2.0) | 7.6 (2.0) |

Note. SDQ = The Strengths and Difficulties Questionnaire, T1 = Time 1, Initial assessment, T2 = Time 2, 1-year follow-up.

Statistical analysis

To examine demographic differences between the schools, independent samples t -test and χ^2 -test were used.

To examine the effect of the intervention on mental health by gender, we carried out a series of $2 \times 2 \times 2$ full factorial split-plot ANOVAs (time: pre-intervention vs. one-year follow-up SDQ score; school (condition): School 1 (intervention) vs. school 2 (reference); gender (trait): girls vs. boys). As the time variable we first used the Total difficult score of the SDQ, and subsequently in separate models, the subscales of SDQ (emotional symptoms, conduct problems, hyperactivity/inattention, peer problems and prosocial behaviour). As the schools differed substantially regarding demographics, socio-economic status and immigrant parents were included as covariates in the models. Exact p values are reported except $ps > .10$, which are reported as *ns* (not significant).

As an estimate of the strength and direction of the intervention effect, as well as of the influence of gender, effect sizes (ES) with similar metric as the well-used Cohen's d were calculated, using the formula $((M_{\text{post, E}} - M_{\text{pre, E}})/SD_{\text{pre, E}} - (M_{\text{post, C}} - M_{\text{pre, C}})/SD_{\text{pre, C}})$ for independent groups pre-test–post-test design (Morris & DeShon, 2002). Effect sizes for main and interaction effects are reported as partial η^2 , adjusted for covariates.

Although the sample was too small to permit detailed examinations of the possible effects of age, this was explored in complementary analyses. The analyses for total problems as well as the subscales were re-run with a two-level age variable (6–8 years vs. 9–11 years) including main and interaction effects. The results of these analyses indicated that age did not influence the results substantially (age effects $ps > .05$, data not shown). Therefore, only the analyses without age are reported in the results section.

Results

Our first aim was to investigate if the intervention impacted on mental health. The overall change in mental health problems indicated a more positive development for the children in the intervention school, with effect size (ES) = .24 for total difficulties score, .37 for emotional symptoms, .12 for conduct problems, .002 for hyperactivity, .26 for peer problems and $-.05$ for prosocial behaviour. However, when adjusting for demographics, the Time \times School effect was non-significant for total difficulties as well as for all SDQ subscales (all $ps > .10$ and $\eta^2s < .01$, data not displayed), indicating that the intervention did not have a significant overall effect on mental health independently of the demographic factors.

Our second aim was to examine whether the impact of the intervention was dependent of gender (Table 3). The effect of the intervention differed between boys and girls, as displayed by a significant Time \times School \times Gender interaction effect for total difficulties score ($p = .001$, $\eta^2 = .049$). This result corresponded to significant interaction effects for the subscales emotional symptoms ($p = .044$, $\eta^2 = .018$), conduct

Table 3. Summary of the main results: interaction effects of gender on intervention impact. Stochastic and quantitative estimates of the experimental effects for the separate Strengths and Difficulties Questionnaire (SDQ) subscales ($N = 228$)

| SDQ score | Time \times School \times Gender effect | | | |
|---------------------|---|------------------------|------------------------------------|-------|
| | Partial η^2 ^a | p value ^a | Effect size ^b by gender | |
| | | | Girls | Boys |
| Total difficulties | .049 | .001 | -0.17 | 0.51 |
| Emotional symptoms | .018 | .044 | 0.01 | 0.59 |
| Conduct problems | .040 | .003 | -0.32 | 0.42 |
| Hyperactivity | .036 | .005 | -0.48 | 0.28 |
| Peer problems | .000 | <i>ns</i> | 0.27 | 0.29 |
| Prosocial behaviour | .009 | <i>ns</i> | 0.17 | -0.21 |

Note. Positive effect sizes indicate a positive change (decrease in psychiatric symptoms or in the case of prosocial behaviour increase in competence). *ns* = not significant, $p > .10$.

^aAdjusted for socioeconomic status and immigrant parents.

^bNot adjusted for covariates.

problems ($p = .003$, $\eta^2 = .040$) and hyperactivity ($p = .005$, $\eta^2 = .036$), but non-significant effects for the subscales peer problems and prosocial behaviour. As shown in Tables 2 and 3, the trait-treatment effect was generally explained by a numerical decrease in mental health problems for boys at the intervention school, coupled with a slight increase or no substantial difference for girls, as compared to the reference school.

Discussion

This study examined the effect of a pedagogical intervention on different mental health dimensions of schoolchildren, within the time frame of one year. We found no evidence for a general mental health effect of the intervention. However, we found a significant differential effect on boys and girls; while boys at the intervention school generally displayed a decrease in mental health problems, compared to the reference school, the girls at the intervention school rather showed a non-change in mental health problems. It should be noted that the intervention school (for practical reasons) was situated outside the city area, while the reference school was situated in a typical urban school milieu. It seems probable that the outdoor education programme would have meant much more change for the children if the intervention had been done in the urban school. The fact that we were able to demonstrate some favourable effects of the intervention, despite this contextual difference and despite the fact that the pupils at the intervention school displayed less psychiatric symptoms at baseline, supports the notion that outdoor education possibly could be beneficial for schoolchildren's mental health.

The trait-treatment interaction is best described as a more positive effect of the intervention for boys than for girls. This is an important result since it indicates that the intervention under study may be more beneficial for the mental well-being of boys than of girls. The finding that the girls' psychiatric health was not improved could be compared to previous findings showing that academic achievement problems might cause internalizing mental health problems specifically for females. Internalizing and externalizing mental health problems also have negative effects on academic achievement through mechanisms that are partly age- and gender-specific (Gustafsson et al., 2010, pp. 77–78).

We did not do any systematic observations about the social dynamics of the intervention or of the children's perceptions of it, but previous research suggests that boys engage in physical activity more often than do girls, and that school-based physical activity interventions may be more appreciated by boys (Ridgers, Stratton, & Fairdough, 2006). Furthermore, boys generally report more positive perceptions about their physical capabilities than do girls due to the nature of physical activity (Lee, Carter, & Xiang, 1995); physical education is typically a stereotypical, 'gendered', practice (Azzarito & Solomon, 2005; D. Brown, 2005). Perhaps such conceptions are also reproduced in other activity-focused educational situations. Hopefully, future studies will shed further light on the influence of gender in outdoor education.

In a review of prevention programmes for children, Durlak and Wells (1997) reported a mean effect size of 15 school-based, environment-focused programmes of 0.35 (Durlak & Wells, 1997). A further breakdown in problems versus competencies outcomes yielded a significant mean effect size of 0.26 for studies with problems as outcomes. This subgroup of intervention programmes is comparable to the present study intervention, as is the estimation of effect size. This suggests that the pedagogical intervention reported here may be similarly effective as environment-focused mental health programmes, although we did not find any stochastic evidence when controlling for the demographic characteristics of the samples.

The beneficial effects of outdoor and adventure programmes have been documented before. In a comprehensive review (Hattie, Marsh, Neill, & Richards, 1997), the authors reported a mean effect size across all studies of 0.34. This review, however, included a very heterogeneous group of studies with respect to study design, sample characteristics, intervention type and outcome measure, which makes direct comparison dubious at best.

Limitations

There are several methodological issues that limit the interpretation of the results. We employed a quasi-experimental design with non-randomized groups. The two schools included in the study were situated in areas of markedly different socio-economic and ethnic composition. The intervention school was located in a small urban fringe community in physical proximity to the woods and the families were mainly from the middle class and with no exception of Swedish heritage. Apparently, the children who participated in the intervention were from an

environmentally and socially privileged area. As expected from this, the children at the intervention school scored lower on the SDQ than the Swedish norms (Smedje, Broman, Hetta, & von Knorring, 1999) and lower than the reference school at baseline. These conditions suggest that the settings might not be compared without difficulty and this is a suboptimal situation when studying the effects of an intervention. Randomization at the individual level was obviously not possible as the intervention was school-based rather than individual-based. To take these differences into consideration, we adjusted for demographic factors in our analyses. An alternative approach would have been more stringent balancing of important confounders (e.g. socio-economic status and ethnicity) when selecting the schools included in the study, although this strategy might be difficult to successfully implement in practice.

These threats to internal validity make it difficult to confidently attribute the changes to the intervention. However, in examining the reported effect sizes of interventions in the behavioural sciences, Lipsey and Wilson (1993) found that there was no clear bias towards higher effect size estimates in study designs of low constraint, as long as a comparison group was used. The bias towards higher effect size was on the other hand evident in single-group comparisons (Lipsey & Wilson, 1993). In the more specifically fitting field of primary prevention mental health programmes for youth, Durlak and Wells (1997) did not find any systematic difference in mean effect size between randomized and non-randomized designs. It should also be noted that the schools indeed were comparable regarding several other important aspects, e.g. the schools were located in the same municipality in Sweden and the children were of similar age. Still, this baseline difference between the schools is a caveat which one should bear in mind when interpreting the findings and generalizing to other settings.

In the Swedish school system the children remain in the same class through grades 0 to 6, thus the children in the study did not change peers or school. The teacher is changed between grades 0 and 1 and between grades 3 and 4. Thus the likely impact of the children changing grades on the outcome measures is judged as being small. Moreover, the employment of a quasi-experimental design ascertained that any independent effect of changing grade was considered by the design. Although the present sample was too small to reliably examine results by age, exploratory analyses did not suggest that results varied substantially by age.

Another limitation is that we had only rudimentary control of the actual impact on the school microsystem the intervention led to—how weak or strong the experimental contrasts actually were. This makes it difficult to attribute the changes to the intervention or to explain the exact components that supposedly contributed to the change.

As the time-frame of one year was chosen due to practical constraints, the outdoor education intervention obviously had had quite a short time period during which it could have influenced the mental health of the children. This rather short duration of exposure would be expected to reduce the estimated strength of effect.

A generalized placebo effect (Lipsey & Wilson, 1993) is a possible contribution to the estimated beneficial effects of an intervention; that is, the effect might not be specific to the intervention. While the presence of a placebo effect clearly is possible in the present study, there are two arguments against a substantial impact. First,

there was not a general positive effect on the children but a differential effect by gender. Second, we used parental ratings of their own children's symptoms. Compared to other possible informants, such as teachers and the children themselves, the parents were the informants least involved in the intervention, and can therefore be considered relatively independent and unbiased.

Strengths of the study

In addition to the methodological caveats, the study has several strengths as well. Mental health effects of changes in the school setting is a poorly studied area and there is therefore a great need for knowledge. Although the study groups in many aspects were very different, the use of a reference group still has merits compared to employing a pre-test–post-test design. For example, especially when studying children that are developing, it is very important to control for maturing effects, especially in combination with gender (Rutter & Taylor, 2002; Sameroff, 2000). The two groups were of roughly the same age and had similar gender distribution, so the influences of age and gender were controlled for by design.

Another strength of the study is the relatively large sample. Small samples ($n < 100$) have been found to contribute to over-estimation of effect sizes, although the nature of this bias is unknown (Lipsey & Wilson, 1993). Our measure of outcome, SDQ, is a well-used and psychometrically sound measure of children's mental health, and it is specifically designed to be used as a screening instrument in normal populations of school-aged children. The utilization of standardized outcome measures has been shown to be very important for validity in similar studies (Durlak & Wells, 1997). Likewise, the focus of preventive interventions on general emotional and behavioural problems instead of specific disorders has been advocated for in previous research (Durlak & Wells, 1997). The choice of parents as informants was, as mentioned above, sensible since they were not directly affected by the intervention. The follow-up time of one-year is, within the context of this particular research field, a comparatively long time (Durlak, 1995), and due to this rather long time period our study provides evidence that there might be mental health effects beyond the immediate effects of the programme.

The problems of generalizability of the results have been addressed above. However, the initiative for this intervention came from the educational field, and was formulated according to the contextual needs of the school system (Ringeisen et al., 2003) by providing training for the teachers. This training supported the development of professional skills of the teachers as well as of the learning environment at the school. Thus, the intervention focused on the teaching and learning practices involved in the core responsibility of the school system as an educational institution. This is an argument in favour of the applicability of such a programme, regardless of any beneficial mental health effects.

Conclusions and directions for future research

This evaluation of an outdoor educational intervention demonstrates trait-treatment interactions represented by moderate positive overall mental health effects for boys

with small to moderate positive effects on specific mental health dimensions, but an inconclusive effect for girls. These results signify that gender may be an important characteristic to address when educational programmes are evaluated. The reason for this gender difference also needs to be examined further. Particularly important is that gender issues are concerned in the process of programme development to avoid educational programmes being principally designed to meet boys' needs, at the cost of girls' needs.

Acknowledgements

We thank Elin Allansson-Kjölhede for participation in the data collection and the staff at the participating schools. The study was financially supported by The Erik Johan Ljungberg Educational Fund, HAGS Aneby AB, The Swedish Medical Society/The Foundation of Söderström-Königska Sjukhemmet and the County of Östergötland.

Author biographies

Per E. Gustafsson has in his dissertation within child and adolescent psychiatry studied psychosocial, psychiatric and physiological aspects of stress in childhood. Currently, his main area of research is life course epidemiology and specifically the long-term health consequences of adverse social conditions across the life course.

Anders Szczepanski has in his licentiate dissertation studied the variation of teachers' perceptions of outdoor education and the landscape as a learning environment. The study indicates a multiplicity of varied perceptions of the special nature of outdoor education and can thus be said to characterize this as richly diversified.

Nina Nelson is associate professor in paediatrics and former head of the paediatric clinic at the University Hospital in Linköping, and at present director of research and development in the county of Östergötland, Sweden. Her research interest began from within neonatology and cardiology, and has increasingly been focused on stress and health issues in the growing individual, and care-givers and teachers, from biological, pedagogical and socio-economic viewpoints.

Per A. Gustafsson is associate professor in child and adolescent psychiatry and also works clinically as a child psychiatrist. His research field has mainly focused on mind-body interactions in children and adolescents, and their interplay with the immediate social environment, but also neuropsychiatric disorders in young people.

References

- Anderman, E. M. (2002). School effects on psychological outcomes during adolescence. *Journal of Educational Psychology*, 94(4), 795–809.
- Andersson, B.-E., & Strander, K. (2004). Perceptions of school and future adjustment to life: A longitudinal study between the ages of 18 and 25. *Scandinavian Journal of Educational Research*, 48(5), 459–476.

- Azzarito, L., & Solomon, M. A. (2005). A reconceptualization of physical education: The intersection of gender/race/social class. *Sport, Education and Society*, 10(1), 25–47.
- Berryhill, J. C., & Prinz, R. J. (2003). Environmental interventions to enhance student adjustment: Implications for prevention. *Preventive Science*, 4(2), 65–87.
- Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge, MA: Harvard University Press.
- Brown, D. (2005). An economy of gendered practices? Learning to teach physical education from the perspective of Pierre Bourdieu's embodied sociology. *Sport, Education and Society*, 10(1), 3–23.
- Brown, J. D., & Lawton, M. (1986). Stress and well-being in adolescence: The moderating role of physical exercise. *Journal of Human Stress*, 12(3), 125–131.
- Brown, J. D., & Siegel, J. M. (1988). Exercise as a buffer of life stress: A prospective study of adolescent health. *Health Psychology*, 7(4), 341–353.
- Coffey, A. (2001). Transforming school grounds. In T. Grant & G. Littlejohn (Eds.), *Greening school grounds: Creating habitats for learning* (pp. 2–4). Toronto: Green.
- Comer, J. P. (1985). The Yale–New Haven Primary Prevention Project: A follow-up study. *Journal of the American Academy of Child Psychiatry*, 24(2), 154–160.
- Cowen, E. L., & Durlak, J. A. (2000). Social policy and prevention in mental health. *Development and Psychopathology*, 12(4), 815–834.
- Dahlgren, L.-O. (2007). *Utomhuspedagogik som kunskapskälla: Närmiljö blir lärmiljö* [Outdoor education as source of knowledge]. Lund: Studentlitteratur.
- Dahlgren, L.-O., & Szczepanski, A. (1998). *Outdoor education—Literary education and sensory experience. An attempt at defining the identity of outdoor education*. Kisa, Sweden: Kinda Education Center.
- Dahlgren, L.-O., & Szczepanski, A. (2004). *Rum för lärande—Några reflexioner om utomhusdidaktikens särart* [Room for learning—Some reflections on the distinctive nature of outdoor didactics]. In I. Lundegård, P.-O. Wickman, & A. Wohlin (Eds.), *Utomhusdidaktik* (pp. 9–23). Lund: Studentlitteratur.
- Durlak, J. A. (1995). *School-based prevention programs for children and adolescents* (Vol. 34). Thousand Oaks, CA: Sage.
- Durlak, J. A., & Wells, A. M. (1997). Primary prevention mental health programs for children and adolescents: A meta-analytic review. *American Journal of Community Psychology*, 25(2), 115–152.
- Ekeland, E., Heian, F., Hagen, K. B., Abbott, J., & Nordheim, L. (2004). Exercise to improve self-esteem in children and young people. *Cochrane Database of Systematic Reviews*, 1, CD003683.
- Farmer, E. Z. M., & Farmer, T. W. (1999). The role of schools in outcomes for youth: Implications for children's mental health services research. *Journal of Child and Family Studies*, 8(4), 377–396.
- Ferreira, I., van der Horst, K., Wendel-Vos, W., Kremers, S., van Lenthe, F. J., & Brug, J. (2007). Environmental correlates of physical activity in youth—A review and update. *Obesity Reviews*, 8(2), 129–154.
- Gamoran, A. (1986). Instructional and institutional effects of ability grouping. *Sociology of Education*, 59(4), 185–198.
- Goodman, R. (2001). Psychometric properties of the strengths and difficulties questionnaire. *Journal of the American Academy of Child and Adolescent Psychiatry*, 40(11), 1337–1345.
- Goodman, R., & Scott, S. (1999). Comparing the Strengths and Difficulties Questionnaire and the Child Behavior Checklist: Is small beautiful? *Journal of Abnormal Child Psychology*, 27(1), 17–24.
- Gordon-Larsen, P., McMurray, R. G., & Popkin, B. M. (2000). Determinants of adolescent physical activity and inactivity patterns. *Pediatrics*, 105(6), E83.
- Grahn, P., Mårtensson, F., Lindblad, B., Nilsson, P., & Ekman, A. (1997). *'Ute på dagis'—Hur använder barn daghemsgården?* [Outside at the day care center—How do children play outside?]. Alnarp: Movium förlag.

- Gustafsson, J.-E., Allodi, M. W., Alin Åkerman, B., Eriksson, C., Eriksson, L., Fischbein, S., et al. (2010). *School, learning and mental health: A systematic review*. Stockholm: Health Committee, Royal Swedish Academy of Sciences.
- Hattie, J., Marsh, H. W., Neill, J. T., & Richards, G. E. (1997). Adventure education and outward bound: Out-of-class experiences that make a lasting difference. *Review of Educational Research*, 67(1), 43–87.
- Hawkins, J. D., Von Cleve, E., & Catalano, R. F., Jr. (1991). Reducing early childhood aggression: Results of a primary prevention program. *Journal of the American Academy of Child and Adolescent Psychiatry*, 30(2), 208–217.
- Humberstone, B., Brown, H., & Richards, K. (2003). *Whose journeys?: The outdoors and adventure as social and cultural phenomena: Critical explorations of relations between individuals, 'others' and the environment*. Penrith: The Institute for Outdoor Learning.
- Johnson, D. L., & Breckenridge, J. N. (1982). The Houston Parent–Child Development Center and the primary prevention of behavior problems in young children. *American Journal of Community Psychology*, 10(3), 305–316.
- Kellam, S. G., Ling, X., Merisca, R., Brown, C. H., & Ialongo, N. (1998). The effect of the level of aggression in the first grade classroom on the course and malleability of aggressive behavior into middle school. *Development and Psychopathology*, 10(2), 165–185.
- Larun, L., Nordheim, L. V., Ekeland, E., Hagen, K. B., & Heian, F. (2006). Exercise in prevention and treatment of anxiety and depression among children and young people. *Cochrane Database of Systematic Reviews*, 3, CD004691.
- Lee, A. M., Carter, J. A., & Xiang, P. (1995). Children's conceptions of ability in physical education. *Journal of Teaching in Physical Education*, 14(4), 384–393.
- Leiberman, G., & Hoody, L. (1998). *Closing the achievement gap: Using the environment as an integrated context for learning*. San Diego, CA: State Education and Environmental Roundtable.
- Lipsey, M. W., & Wilson, D. B. (1993). The efficacy of psychological, educational, and behavioral treatment. Confirmation from meta-analysis. *American Psychologist*, 48(12), 1181–1209.
- Malmberg, M., Rydell, A. M., & Smedje, H. (2003). Validity of the Swedish version of the Strengths and Difficulties Questionnaire (SDQ-Swe). *Nordic Journal of Psychiatry*, 57(5), 357–363.
- Masten, A. M. (2003). Commentary: Developmental psychopathology as a unifying context for mental health and education models, research, and practice in schools. *School Psychology Review*, 32(2), 169–173.
- Moore, R., & Cosco, N. (2000, September). *Developing an earth-bound culture through design of childhood habitats*. Paper presented at the Conference on people, land, and sustainability: A global view of community gardening, Nottingham, UK.
- Morris, S. B., & DeShon, R. P. (2002). Combining effect size estimates in meta-analysis with repeated measures and independent-groups design. *Psychological Methods*, 7(1), 105–125.
- National Environmental Education & Training Foundation (2000). *Environment-based education*. Washington, DC: The National Environmental Education & Training Foundation.
- Neill, J. T., & Richards, G. E. (1998). Does outdoor education really work? A summary of recent meta-analyses. *Australian Journal of Outdoor Education*, 3(1), 1–9.
- 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(1), 55–65.
- Ridgers, N. D., Stratton, G., & Fairdough, S. J. (2006). Physical activity levels of children during school playtime. *Sports Medicine*, 36(4), 359–371.
- Ringeisen, H., Henderson, K., & Hoagwood, K. (2003). Context matters: Schools and the 'research to practice gap' in children's mental health. *School Psychology Review*, 32(2), 153–168.
- Rutter, M. (1980). School influences on children's behavior and development: The 1979 Kenneth Blackfan Lecture, Children's Hospital Medical Center, Boston. *Pediatrics*, 65(2), 208–220.

- Rutter, M., Caspi, A., & Moffitt, T. E. (2003). Using sex differences in psychopathology to study causal mechanisms: Unifying issues and research strategies. *Journal of Child Psychology and Psychiatry*, 44(8), 1092–1115.
- Rutter, M., & Taylor, E. (2002). *Child and adolescent psychiatry* (4th ed.). Bath: Blackwell Science.
- Salmon, P. (2001). Effects of physical exercise on anxiety, depression, and sensitivity to stress: A unifying theory. *Clinical Psychology Review*, 21(1), 33–61.
- Sameroff, A. J. (2000). Developmental systems and psychopathology. *Development and Psychopathology*, 12(3), 297–312.
- Smedje, H., Broman, J. E., Hetta, J., & von Knorring, A. L. (1999). Psychometric properties of a Swedish version of the 'Strengths and Difficulties Questionnaire'. *European Child and Adolescent Psychiatry*, 8(2), 63–70.
- Statistics Sweden (1984). *Swedish socioeconomic classification. Reports on statistical co-ordination 1982: 4*. Stockholm.
- Szczepanski, A. (2008). *Knowledge through action: Teachers' perceptions of the landscape as a learning environment*. Linköping: Department of Culture and Communication, National Center for Outdoor Education, Linköping University.
- Taylor, A. F., Kuo, F. E., & Sullivan, W. C. (2002). Views of nature and self-discipline: Evidence from inner city children. *Journal of Environmental Psychology*, 22(1–2), 49–63.
- Watt, T. T. (2003). Are small schools and private schools better for adolescents' emotional adjustment? *Sociology of Education*, 76(4), 344–367.
- Wells, N. M. (2000). At home with nature, effects of 'greenness' on children's cognitive functioning. *Environment & Behavior*, 32(6), 775–795.
- Wells, N. M., & Evans, G. W. (2003). Nearby nature: A buffer of life stress among rural children. *Environment & Behavior*, 35(3), 311–330.
- Årlemalm-Hagsér, E. (2006). Gender, playing and learning in natural outdoor environments. In J. Brodin & P. Lindstrand (Eds.), *Interaction in outdoor play environments: Gender, culture and learning* (pp. 23–44). Stockholm: Stockholm Institute of Education.