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Busch, Vincent; De Leeuw, Johannes Rob Josephus; Zuithoff, Nicolaas P A; Van Yperen, Tom Albert; Schrijvers, Augustinus Jacobus Petrus

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A Controlled Health Promoting School Study in the Netherlands: Effects After 1 and 2 Years of Intervention

Vincent Busch, PhD¹

Johannes Rob Josephus De Leeuw, PhD¹

Nicolaas P. A. Zuithoff, PhD¹

Tom Albert Van Yperen, Prof, PhD²

Augustinus Jacobus Petrus Schrijvers, Prof, PhD¹

Purpose. Many unhealthy behavioral habits often originate in adolescence. In the literature, the school-based whole school approach is stated to be the most promising way to promote healthy behavior. Herein, interventions are evidence based and integrated into the curriculum, while embedded in complementary healthy school policies and environment. This study evaluates the effects of such an intervention on Dutch high schools. Methods. Two Dutch high schools and two controls were followed to evaluate the intervention's effects on health behaviors, body mass index, and psychosocial problems after 1 year (N = 969) and 2 years (N = 605). Outcomes were measured via self-report surveys and analyzed with mixed methods regression analyses. To complement information on intervention effects, structured interviews were held with a representative sample of teachers per intervention school to map their respective whole school approach implementation success. Results. After 2 years, one intervention school showed significant improvements: Body mass index and excessive screen time use were reduced. In the other intervention school, priority targets did not improve. These findings reflected their respective success in intervention implementation, for example, differences in intervention integration and tailoring. Conclusions. This study shows that it is feasible for schools to implement a comprehensive Health Promoting School intervention themselves and that, when successful, effects in terms of improving behaviors

and health outcomes are promising. The process evaluation helped understand these findings in context.

Keywords: *behavior change; health promotion; school health*

► BACKGROUND

Many present-day illnesses, such as diabetes, cardiovascular disease, and psychiatric disorders, often have their origin in unhealthy behaviors. For instance, smoking, alcohol use, and a lack of physical exercise often originate in adolescence and lead to an unhealthy adult lifestyle (Kemper, Snel, Verschuur, & Storm-Van Essen, 1990; World Health Organization, 2011). In the 1990s, the WHO stated that schools are the optimal place to promote the health of children, since children already spend a great deal of their time there, and it is their prime place of learning and development (World Health Organization, 1997; World Health Organization,

¹Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Utrecht, Netherlands

²Faculty of Behavioral and Social Sciences, State University of Groningen, Groningen, Netherlands

Authors' Note: The authors declare that they have no conflicts of interest. The main author, Vincent Busch, hereby declares to have listed everyone who contributed significantly to the work. Address correspondence to Busch, Vincent, PhD, Julius Center for Health Sciences and Primary Care, University Medical Center Utrecht, Street 5.121, Universiteitsweg 100, 3508 GA Utrecht, Netherlands; e-mail: v.busch@umcutrecht.nl.

UNESCO, & UNICEF, 1992). Over the years, this has led to the development of new school health promotion models and programs (Barnekow Rasmussen & Rivett, 2000; Clift & Bruun Jensen, 2005). The European initiative Schools for Health in Europe supports health promotion efforts, referred to as Health Promoting Schools (HPS), via the comprehensive total-life approach called the whole school approach (Barnekow Rasmussen, 2005; Barnekow Rasmussen & Rivett, 2000; Jensen & Simovska, 2002). In this approach, schools are viewed as a common meeting ground for the domains of children's health, education, and social development (Jensen & Simovska, 2002). This is different from earlier school health promotion approaches, because in the whole school approach health-promoting initiatives are not seen as "projects" but rather as integrated, structural parts of the curriculum. This approach is most promising when (1) complementary healthy school policies support health education, for example, a zero tolerance for bullying; (2) a healthy school environment is present, for example, a no-smoking schoolyard; (3) parents and the neighborhood actively participate in school projects, (4) health education focuses on developing skills and competences rather than on one-sided information transfer, and (5) health education and health promotion activities are designed by school and health professionals in collaboration to ensure that activities are evidence based as far as possible (Barnekow Rasmussen & Rivett, 2000).

In addition to these general characteristics, HPS interventions are expected to be more effective and are more likely to be properly implemented if they are tailored to a specific school in terms of content and format (Lynagh, Knight, Schofield, & Paras, 1999; Patton, Bond, Butler, & Glover, 2003; Powers, Bowen, & Bowen, 2010; Samdal & Rowling, 2013). As Piper, King, and Moberg (1993) stated: "Schools that run on 9-week quarters don't take kindly to 4-week programs." Thus, a school should prioritize the topics it will focus on (e.g., via a student survey) and should make sure that the selected intervention suits the school. Also, a tailored approach is more likely to result in an intervention that is of relevance to a specific school, because only topics that are a priority for *that* school are addressed, as Patton et al. explained in their Gatehouse Project study (Patton et al., 2003). School-tailoring an intervention results in achieving a more appropriate format and better implementation strategies, which in turn leads to a wider support for the intervention among the teachers, students, and others involved, than would have been the case with an intervention with a highly standardized format and a preset set of topics to tackle (Baer & Brown, 2012). In their recent

work on the implementation on HPS Samdal and Rowling extensively illustrated this need for, and added value of, applying a tailored approach via several empirical examples of HPS projects in different European countries (Samdal & Rowling, 2013). They showed, for example, that a tailored approach leads to a stronger feeling of psychological ownership of an intervention among its implementers and others involved and stronger commitment because the intervention is about them. Such characteristics were said to lead to a higher success of implementation and in time structural retaining of the intervention.

The Current Study

The aim of the current study was to evaluate the effects of a school-tailored HPS intervention, the Utrecht Healthy School (UHS), which integrated all five whole school characteristics. From 2007 to 2011, the UHS intervention was piloted in one Dutch high school. After the pilot, the UHS was successfully implemented and shown to significantly improve students' psychosocial health and to reduce alcohol use, smoking, sedentary time, and bullying (i.e., all the school's "priority targets"; Busch, de Leeuw, & Schrijvers, 2012a). After the pilot study, the current study was carried out to (1) investigate the effects of the intervention in a controlled follow-up study (the UHS) on students' health and health behavior, (2) determine the feasibility of implementing the UHS as a complex HPS intervention at regular Dutch high schools, and (3) study the value of a mixed methods approach for evaluating the complex UHS intervention.

► METHOD

Design

The study had a mixed methods design and evaluated the effects of the UHS on students' health and health behaviors, as assessed in surveys held at baseline September 2011, 2012, and 2013. (This study has been approved by the institutional review board of the University Medical Center Utrecht, the Netherlands. METC-protocol number 11-397/C). Because understanding the context in which interventions are implemented is imperative for effective pragmatic research (Albright, Gechter, & Kempe, 2013), a comprehensive, qualitative process evaluation was undertaken to monitor the intervention's implementation in order to interpret the quantitative data in context. This use of mixed methods is critical to understanding intervention results and the success or failure of implementation efforts (Albright et al., 2013).

FIGURE 1 Utrecht Healthy School Study Time Line

The Schools

During the school year 2010-2011, the UHS was implemented in two Dutch high schools (the intervention schools “A” and “B”), with two other schools serving as control schools. All schools were selected as a convenience sample. All four schools were located in suburban areas of middle-large cities and were of a middle-large size for Dutch high schools (≈ 700 students each). The average socioeconomic status (SES) of the students was comparable to that of the students periodically assessed in the Dutch Health Behavior in School-Aged Children (HBSC) study survey (van Dorsselaer et al., 2010). School B had a relatively high percentage of students of non-Dutch origin, whereas in School A, most students were of Dutch origin. The two control schools had similar characteristics, one resembling School A and the other School B.

The intervention schools had a year to incorporate the UHS in their curriculum and statutes (see Figure 1). The schools only used publicly available information about the pilot without active involvement of the UHS research staff, thereby ensuring that the schools were representative, in terms of implementation feasibility, for other schools with similar HPS ambitions. This approach also ensured that the intervention would be “their” intervention, not influenced by others. This approach has been shown to create support and psychological ownership among staff, thereby facilitating implementation (Lynagh et al., 1999; Patton et al., 2003).

Survey Data Collection

Survey Sample. In September 2011, 2012, and 2013, students from all four participating schools were asked to fill in an online survey. The survey was completed by 1,716 students in 2011, by 1,692 students in 2012, and by 2,393 students in 2013. The different number of students reflects the different numbers of students at school in any

1 year and the different number of students leaving school. The effect of the intervention was assessed by comparing the scores of a group of students ($n = 969$) who completed the survey before (T0, 2011) and 1 year after intervention implementation (T1, 2012). Overall, 605 students completed the survey at T0 (2011) and 2 years after intervention implementation (T2, 2013). Per moment of data collection, approximately 80% of the eligible students filled out the survey (see Survey Procedures).

Survey Procedures. The survey was completed individually, online, in class with teacher supervision. Participation was voluntary, and students were told that all data would be handled confidentially, processed anonymously, and stored in a password-protected database that could only be accessed by the involved researchers. Prior to participation, students and parents were told about the survey, that participation was voluntary, and that there were no consequences for not participating. The Medical Ethics Council of the University Medical Center Utrecht considered that informed consent was not needed because of the anonymity of the data and the transparency of the procedures. Each year, approximately 80% of the eligible students completed the survey, and only those with conflicting course schedules or who were absent on the day of the survey did not participate. Since the day and timing of each survey was unannounced, selection bias were avoided.

Survey Content. The self-report student survey was based on the Dutch version of the HBSC questionnaire (Currie, 1998). This survey asks questions about alcohol and marijuana use, smoking, nutritional habits, physical exercise, weekly time spent watching television, and using the Internet, sociodemographic factors (SES, ethnicity, gender, age, and school level), and body mass index (BMI). Readers are referred to the published study protocol for a detailed overview of the operationalization of the survey items (Busch, de Leeuw, & Schrijvers, 2012b).

Students were considered to eat healthily if they met the combined norm of eating breakfast, and fruit and vegetables at least five times a week on average (Dutch Norm Healthy Nutrition; van Dorsselaer et al., 2010). To meet the criterion for healthy physical exercise, students had to be physically active at moderate intensity for least 1 hour every day, while at least twice a week aiming to improve or maintain physical fitness (Dutch Norm Healthy Physical Exercise; van Dorsselaer et al., 2010). Some behaviors were measured more comprehensively than is the case in the HBSC; these are elaborated upon below.

Screen time. We measured two characteristics of screen time–related behavior (watching television, using the Internet, and playing video games). One refers to the time spent on “screens” per week, which is defined to be *excessive* when occurring on average more than 2 hours/day (Meerkerk, van den Eijden, Vermulst, & Garretsen, 2009; van Dorsselaer et al., 2010; Van Rooij, Schoenmakers, Vermulst, Van Den Eijden, & van de Mheen, 2011). The second characteristic refers to compulsive behavior. Compulsive behavior was measured with the Videogame Addiction Test (Van Rooij et al., 2011) and the Compulsive Internet Use Scale (Meerkerk et al., 2009). Both these scales contain 12 questions scored on a 5-point Likert scale. A mean score higher than 3 was defined as problematic. These two screen time characteristics are related to different health outcomes and should therefore be viewed separately (Van Rooij et al., 2011).

Bullying. Olweus’ conceptual definition of bullying and its operationalization via the Olweus Bully Score and the Olweus Bully Victim Score were used to determine whether students were perpetrators and/or victims of peer bullying (Solberg & Olweus, 2003). If students bullied or were bullied at least twice a month, they were considered a bully or bully victim, respectively.

Psychosocial problems. Psychosocial problems were measured as in the HBSC study, with the Strengths and Difficulties Questionnaire (Goodman, Meltzer, & Bailey, 1998). This is a valid and reliable measure of emotional problems, inattention-hyperactivity, peer relationship problems, conduct problems, and prosocial behavior (Goodman et al., 1998; Muris, Meesters, & van den Berg, 2003). The subscales emotional problems, hyperactivity, peer problems, and conduct problems are composed of 20 items in total (each separate subscale consists of 5 items) scored on a 3-point Likert scale (0, 1, or 2 points can be scored per question); the total Strengths and Difficulties Questionnaire score can add up to a maximum of 40 points, and a score higher than 15 points is categorized as “(potentially) problematic.”

Statistical Analyses

The effects of the UHS on students’ health behaviors, BMI, and psychosocial problems were analyzed by means of regression analyses. All analyses were corrected for confounding by SES, gender, age, school level, and ethnicity. The hierarchical data structure (students within classes within schools) made it necessary to apply

multilevel regression models, since students within the same class are more alike than those from different classes, which might affect overall effect estimates and significance (Hox, 2010). In the analyses, the classes and schools were the cluster levels for the main unit of analyses, the individual student. Analyses were performed using statistical analysis software R (R Development Core Team, 2010). R packages that were used were *linear*, *generalized linear*, and *nonlinear mixed models* (i.e., “LME4”), and “GLMER” for generalized linear mixed model analyses (logistic mixed models).

Sensitivity analyses were performed by comparing the current model with multilevel models that included random effects for baseline behavior within school class (Level 2) and/or within schools (Level 1), but this did not significantly improve model performance (results not shown). Thus, the final model included random intercepts for school class and school with correction for baseline behavior.

Qualitative Data Collection

When assessing the effects of comprehensive HPS interventions, it is difficult to be certain whether effects (or a lack thereof) are an inherent result of the intervention or of (partly) failed implementation. For this reason, various investigators have advocated performing a structured, comprehensive process evaluation at the same time as measuring the quantitative effects of complex interventions, in order to be able to draw valid conclusions (Campbell et al., 2007; Parsons & Stears, 2002; Patton et al., 2003; Pawson, Greenhalgh, Harvey, & Walshe, 2005). Therefore, the UHS was evaluated via a mixed methods approach by structurally mapping the implementation processes alongside the quantitative data collection to better comprehend these quantitative findings.

This process evaluation consisted of 28 structured interviews with teachers from both intervention schools. A representative sample of teachers was interviewed per school, hereby preventing selection bias via “purpose sampling with maximal variation” (Boeije, 2005). The HPS coordinator ensured a mixture of interviewees in terms of gender, age, and work experience at the school; information on their personal or demographic characteristics was not provided. This process was identical at both intervention schools.

A literature search and the pilot study that preceded the UHS provided a set of important characteristics by which to study the implementation and effects of an HPS intervention (Busch, De Leeuw, & Schrijvers, 2014). These characteristics served as the topic list for the structured interviews that formed the qualitative

data for this study. They consisted of the five whole school approach characteristics plus four additional characteristics. The first of these was having a healthy school coordinator who is familiar with the HPS topics and who has the executive power to introduce and execute policies for UHS implementation and to steer and motivate teachers (Busch et al., 2014; Rowling, 2009; Rowling & Samdal, 2011; Samdal & Rowling, 2013). The second characteristic regarded the tailoring of HPS content and format to ensure school-specific relevance and appropriateness (Busch et al., 2012a, 2014; Franks et al., 2007; Patton et al., 2003). The third characteristic regarded investing in teacher development via in-service training so that they become competent and confident in teaching in HPS settings and serve as health promoters (Busch et al., 2014; Franks et al., 2007; Gugglberger & Dür, 2011; Jourdan, Mannix McNamara, Simar, Geary, & Pommier, 2010; Jourdan, Samdal, Diagne, & Carvalho, 2008; Rowling & Samdal, 2011). The fourth characteristic regarded whether the HPS initiatives become a structural, rather than temporary, part of the curriculum (Samdal & Rowling, 2013).

The interview structure, themes, and coding strategy were designed by two researchers. The interview typically lasted about 45 to 60 minutes, after which the interviewer checked the answers for completeness and correctness with the interviewees. The interviewees were not involved in further analyses. One researcher transcribed the interviews, both researchers decided on the coding, and then the interviews were analyzed by one of the researchers in NVIVO 7 (Richards, 2011). Afterward, both researchers jointly interpreted the coding and drew conclusions.

► RESULTS

Effects on Health Behavior, BMI, and Psychosocial Health

The two intervention schools had different priorities, as assessed via the annual student survey held 1 year before baseline ($T - 1$). The priorities of School A were (1) having a less sedentary lifestyle by stimulating physical activity patterns and reducing excessive screen time use, (2) stimulating a healthy weight, (3) stimulating healthy nutritional habits, and (4) preventing and reducing smoking. After 1 year, School A students' average weight (-0.48 BMI point) and excessive internet use (OR 0.63, 95% CI 0.44-0.98) were reduced, but other behaviors did not change relative to those of control school students (Table 1). These effects were still seen after 2 years but were slightly stronger than the effects seen after 1 year.

School B chose nutrition and physical exercise as their priority topics. Neither was improved after 1 or 2 years, although alcohol use was less prevalent than in the control schools (Table 1).

Intervention Implementation

The implementation of the UHS at both intervention schools was mapped by a set of structured interviews. The interview results are a summary of implementation status per whole school approach topic, as described in the Methods, per intervention school (Table 2). Only a summary of the interviews is presented, because of their goal to complement the quantitative behavioral data and not to form a full qualitative study. School A successfully implemented all UHS components, except for structurally organizing teacher in-service training (Table 2). In contrast, School B implemented only the two components of creating healthy school policies and assigning a healthy school coordinator (Table 2). Overall, School A implemented the UHS more successfully than School B, even though their start-up situations were identical. Both schools had the opportunity to use the results of the annual student survey in order to see whether the intervention still addressed the most relevant health behavior issues at school and to fine-tune their UHS efforts accordingly.

► DISCUSSION

This study evaluated the effects of a controlled double case study of a Dutch HPS intervention, implemented according to the whole school approach with tailoring to the needs of individual schools. After implementation of the intervention for 2 years, the BMI and excessive screen time use of School A's students were reduced, but other priorities (healthier eating habits and exercise patterns) did not improve. The priority targets in School B did not improve. However, alcohol use was significantly reduced in this school relative to the control schools, but this is probably because of the relatively high percentage of students with an Islamic background (alcohol consumption is more common among teenagers from a non-Islamic than Islamic background; van Tubergen & Poortman, 2010). The difference in outcome between the two intervention schools reflects their success in implementing the intervention. In School A, the intervention was structurally embedded in the curriculum—an HPS coordinator structured and guided all HPS activities, policy changes, and efforts; priorities were set with help of the annual student survey; and new educational modules were implemented with help of local public health professionals. These

TABLE 1
**The Effects on Health-Related Behaviors and Health Outcomes in Students of Two Utrecht Healthy Schools:
Intervention Schools and Control Schools**

	<i>School A (OR)^a Compared With Controls</i>		<i>School B (OR) Compared With Controls</i>	
	<i>1 Year vs. Baseline</i>	<i>2 Years vs. Baseline</i>	<i>1 Year vs. Baseline</i>	<i>2 Years vs. Baseline</i>
Alcohol user	0.86 (0.50-1.49)	0.55 (0.17-1.69)	0.59 (0.21-1.71)	0.23 (0.07-0.78)*
Binge drinking	1.17 (0.67-2.04)	0.85 (0.29-2.45)	0.33 (0.08-1.29)	0.50 (0.03-9.07)
Smoker ^c	2.02 (0.93-4.42)	2.45 (0.99-6.39)	1.84 (0.39-8.64)	0.16 (0.02-1.22)
Ever used marijuana	1.33 (0.57-3.15)	1.39 (0.45-4.32)	1.54 (0.47-5.12)	0.48 (0.11-2.15)
Meeting nutrition norm ^c	0.79 (0.48-1.29)	1.08 (0.64-1.84)	0.61 (0.27-1.34)	1.03 (0.41-2.59)
Meeting physical activity norm ^{c,d}	0.83 (0.48-1.44)	0.96 (0.41-2.26)	1.09 (0.51-2.34)	0.65 (0.27-1.57)
Being bullied ^{c,d}	2.01 (0.74-5.96)	1.33 (0.40-4.44)	1.09 (0.33-3.57)	2.01 (0.47-9.00)
Bullying ^{c,d}	2.39 (0.88-6.46)	1.66 (0.49-5.64)	0.44 (0.07-2.72)	0.60 (1.97-6.01)
Excessive TV	0.80 (0.49-1.31)	0.87 (0.51-1.51)	0.92 (0.46-1.83)	1.18 (0.53-2.60)
Excessive Internet	0.63 (0.44-0.98)*	0.49 (0.26-0.91)*	0.75 (0.37-1.52)	0.67 (0.31-1.47)
Compulsive Internet	1.22 (0.58-2.58)	1.65 (0.44-6.17)	1.73 (0.31-9.03)	0.98 (0.15-6.64)
Excessive gaming	0.67 (0.30-1.54)	0.51 (0.20-1.34)	0.51 (0.16-1.62)	0.93 (0.30-2.83)
Compulsive gaming	1.04 (0.50-2.14)	0.47 (0.11-2.03)	1.32 (0.55-8.08)	0.56 (0.11-2.90)
BMI ^{b,c}	B -0.48*	B -0.58*	B -0.05	-0.43
SDQ score ^b	B 1.27*	B 1.00	B -0.12	0.44

NOTE: BMI = body mass index. SDQ = Strengths and Difficulties Questionnaire.

a. OR = odds ratio, provided with a 95% confidence interval. All ORs are corrected for age, socioeconomic status, gender, ethnicity, and educational level.

b. These values represent B-values from linear regressions, not ORs.

c. Priority topic for School A.

d. Priority topic for School B.

* $p < .05$. ** $p < .01$.

characteristics were implemented in addition to the five whole school approach characteristics (Barnekow Rasmussen & Rivett, 2000). In contrast, despite having an enthusiastic, willing teaching staff, implementation efforts were not successful in School B (Table 2). The approaches that were used in the design of this intervention (a tailored HPS intervention) and evaluation study (mixed methods) are uncommon in the present literature, which makes the basis of comparison to others difficult. What can be said is that according to Samdal and Rowling the used approach on both accounts corresponds with the latest thoughts on HPS developments (Samdal & Rowling, 2013).

The Value of a Complementary Qualitative Process Evaluation

The ability to interpret the survey findings in the context of the implementation process provided valuable

lessons and insights. For example, the annual survey measured whether students were eating healthier by measuring intake of fruit, vegetables, and breakfast, and this was not the case. However, the process evaluation revealed that efforts with respect to healthy nutrition had been focused on getting students not to eat junk food and other unhealthy foods, such as candy and potato crisps, which might explain the effects on BMI yet a lack thereof on nutritional habits. Another example of how quantitative data can be better understood after process evaluation is the lack of effect on physical exercise at School A, even though all implementation efforts went well and improving physical exercise was a priority target. As it turned out, the survey focused on exercise outside of schools (e.g., whether students take the bike or bus to school), while the UHS introduced additional gym classes to improve students' physical activity. An additional hour of physical education for example is known to affect exercise levels, but the survey did not

TABLE 2
The Implementation of the Utrecht Healthy School on the Intervention Schools

<i>Topic</i>	<i>Status on School A</i>	<i>Status on School B</i>
1. Create healthy school policies	Succeeded: All priority topics were complemented with healthy school policies.	Neutral: Some policies were implemented but not coordinated to complement priority topics.
2. Create a healthy school environment	Succeeded: Healthy environment changes were realized with regard to the priority topics (smoke-free school yard and a healthy school canteen).	Failed: No environment changes were made as part of the UHS.
3. Involve parents, teachers, and neighborhood	Succeeded: Parents were informed and actively involved. There was resistance to teachers serving as role models. Nevertheless, HPS policies were implemented.	Failed: Parents and neighborhood were only informed about the project, as were most teachers who were less “directly” involved.
4. Focus health education on skill and competency development	Succeeded: Cooperation with public health professionals led to curricular changes with regard to several priority topics.	Failed: No structural change in teaching methods was realized.
5. Integrate health professionals, services, and evidence-based methods	Succeeded: The HPS coordinator set up and maintained contact with professionals from the municipal health services.	Failed: Minimal contact existed with public health professionals, which limited the use of evidence-based practices.
6. Tailor intervention content and format	Succeeded: Teachers, school board, student and parent councils, and public health professionals were jointly involved in tailoring the UHS to ensure relevant, feasible, and evidence-based initiatives. The student survey played a crucial informative role in this process.	Failed: The student survey was only used to inform involved teachers and limitedly to create priority topics <i>stimulating physical exercise</i> and <i>reduce bullying</i> .
7. The HPS coordinator	Succeeded: A HPS coordinator was present and facilitated with the executive power to get things done. He had vast teaching experience and a background in health-related education.	Neutral: A HPS coordinator with a background in health-related education was present. However, necessary power structures were missing, which hampered implementation.
8. Teacher competency development and in-service trainings	Neutral: In-service trainings were sporadically, not structurally organized.	Failed: Teachers did not receive additional training.
9. Treating a HPS as a comprehensive system change	Succeeded: All HPS efforts and changes were embedded in the school curriculum, so that the UHS could not be seen as a “project.” Also, circumstances in terms of organizational stability and competing problems favored HPS implementation.	Failed: The HPS coordinator treated the UHS as a project in which few responsibilities were shared and few institutionalization efforts were undertaken.

NOTE: HPS = Health Promoting Schools; UHS = Utrecht Healthy School.

measure the at school exercise behavior, which leads to the suggestion that it was not improved. Such discrepancies between implementing an effective inter-

vention (module) and measuring no effect are more likely to be understood when using a mixed methods approach as was done in the current study. Although

these examples do not provide direct evidence for or against the effectiveness of the intervention, they do provide insight into why certain effects were observed and ideas for future research. According to Samdal and Rowling (2013) this context information is needed to better understand study results, improve implementation processes, influence school policy on different levels, and possibly improve school health promotion models in general. Yet few studies thus far have undertaken such evaluations aimed at both quantitative findings and parallel implementation monitoring.

Strengths and Limitations

Strengths of this study include its controlled design, the use of a zero measurement among students for optimal measurement of effects, the use of validated survey instruments to assess students' health outcomes and behaviors, and the use of multilevel regression models for data analysis. Another strength is the mixed methods approach, which combined quantitative data with structured implementation monitoring. Furthermore, the schools in this study tailored and implemented their own HPS program without outside help, which provides insight into whether the approach can be applied to other schools.

A notable weakness of the study is that the control schools, being a convenience sample, were likely to bias effects to the null, because they are more likely to "perform" better than random controls would have. Therefore, the intervention was probably less effective than would have been the case with a random control sample. Also, the study's reliability would have benefited from a larger sample.

► CONCLUSIONS

This study evaluated the effects of a controlled double case study of a whole school HPS intervention. After 2 years of the HPS intervention, School A had improved several of its priorities (reducing BMI and excessive screen time) compared with the control schools. Intervention School B did improve its priority targets.

To better enable interpretation of the quantitative data on students' behavioral changes, a structured implementation monitoring was undertaken. Overall, the changes in health behaviors and outcomes reflected the success of the implementation of the intervention. Although School B had motivated teachers and implemented some HPS characteristics, for example, a healthy canteen, their policy was not very different from that of other Dutch schools. Dutch high schools usually do not structurally pay attention to the health

of their students in a way that is comparable to the embedding of a HPS structure in the school curriculum as was the case on School A. In addition to the structural character of the HPS on School A, it was tailored to the school's specific needs and was organized by a central, empowered HPS coordinator who worked together with partners from inside and outside the school. Usually, health promotion in Dutch high schools is of a less structural and less evidence-based nature, but rather more incidental and part of a "temporary project." The process evaluation enabled us to see how well Dutch high schools can design, tailor, and implement a complex intervention such as the UHS in real life instead of in an experimental study setting.

Overall, this study's used mixed methods approach helped us understand why an intervention might or might not work. This approach should be used in larger studies in the future to determine the effects of school-level factors and to better understand how to effectively intervene in complex systems such as schools.

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