

Social emotional learning in the classroom:

Study protocol for a randomized controlled trial of PERSPEKT 2.0

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Abstract

Background

Social emotional learning programs have been found to lead to immediate improvements in cognitive, social and emotional competences. Meanwhile, most evidence to date refers to the United States, and most other countries lack locally tailored teaching materials for socio-emotional learning. Further, there is a lack of knowledge about which subgroups benefit more. Such knowledge is important, because it could provide evidence relevant for both explaining and addressing inequality in educational achieving across subgroups of pupils. Knowledge about longer-term impacts on academic achievement is also called for. This protocol describes an experimental evaluation of a recently developed social emotional learning program implemented in Denmark. The evaluation combines survey data with register-based data, where the latter source allows for tracking of participant outcomes with minimal risk of attrition.

Methods/design

Participants are around 7,000 pupils enrolled in Grades 4 and 5 in the 2018/2019 school year at Danish public elementary schools. All classrooms except special education groups are included. Schools were recruited by the Danish Center of Educational Environment (DCUM) during the fall of 2017. We employ a two-level cluster randomized trial for children in two adjacent school cohorts (grades 4 and 5) in the same school. At each school, one grade is randomly allocated to treatment, while the other serves as control. There is otherwise no blocking. Treatment classes receive instruction using PERSPEKT 2.0. This is a set of teaching materials aimed at training pupils' emotional, personal and social skills. The ultimate goals of the program are to improve individual well-being as well as the social and learning environment in the classroom. Analyses will employ survey data and administrative register-based data from Statistics Denmark. All data sources will be linked via the unique Danish Civil Registration Register (CPR) identifier. Our primary outcome will be based on nationally collected indicators of elementary school well-being and social well-being. Our secondary outcomes consist of measures of academic achievement, also in the longer run, problem behavior, SEL competencies, and emotional distress.

Discussion

The protocol describes an experimental evaluation of a school-based social emotional learning program.

Trial registration

<https://www.socialscienceregistry.org/trials/3565>, RCT ID: AEARCTR-0003565.

Keywords

Social emotional learning – well-being – academic achievement – problem behavior – subgroups – longer-term follow up.

Background

Specific background

Children spend a large fraction of their time in school, where the main objective traditionally has been to enhance their academic skills. There is a growing consensus among educational policy makers and human development researchers on the importance of integrating social and emotional learning with academic learning to improve overall pupil outcomes [1], [2]). However, many countries are still short of evidence-based social emotional learning (SEL) programs to include as part of their suggested elementary school curricula. This is a study protocol for such a social emotional learning program; PERSPEKT 2.0, developed for a Danish elementary school context.

Most educational systems in OECD countries recognize that fostering social emotional skills as part of the broader human development among their pupils is an integral part of the overall objectives of education [3]. Meanwhile, there is a variety of ways in which stimulating these skills is translated into school practice. Most notably, there is no coherent use of well-designed and well-executed, evidence-based SEL programs. There is thus a clear gap between the evidence about what works and what happens in practice.

It is widely recognized among human development researchers that the major domains of human development are the social, emotional, cognitive, linguistic and academic domains. These domains are intertwined in the brain and in behavior and they are all central to learning. Strengths or weaknesses in one domain can therefore promote or limit development in other domains [2]. For example, cognitive skills that matter for learning include executive functions such as working memory, attention, inhibition, and planning, as well as beliefs and attitudes that guide one's sense of self and of approaches to learning and growth. Emotional competencies important for learning are those that enable one to cope with frustration, recognize and manage emotions, and understand others' emotions and perspectives. In addition, social and interpersonal skills are also central to children as these skills enable them to navigate the social context of the class room. They include the ability to read social cues, navigate social situations, resolve interpersonal conflicts, cooperate with others and work effectively in a team, and demonstrate compassion and empathy toward others [4], [1], [2].

The lack of structured and systematic focus on developing cognitive, social and emotional skills in schools may therefore have impeded progress in academic skills among pupils. Over the past two decades, there has been an increasing supply of evidence-based SEL programs, especially in the U.S.

[4], [3]. However, the systematic and structured fostering of social emotional skills among pupils in many countries is lacking due to the fact that SEL is seldom a subject per se in which teachers have specialized as they do in languages, math or science, and where there are readily available textbooks and well-defined national curricula outlining specific skills children should master by different grades.

SEL programs are exactly tools for educators to support the development of social emotional skills among pupils in a school setting. Social and emotional development refers to the process through which one acquires and effectively applies a specific range of knowledge, attitudes and skills in the social and emotional domains. According to the Collaborative for Academic, Social and Emotional Learning (CASEL), these are the skills, knowledge and attitudes necessary to understand and manage emotions, set and achieve positive goals, appreciate the perspective of others, feel and show empathy for others, establish and maintain positive relationships and make responsible decisions [5]. CASEL has identified five interrelated sets of cognitive, social, and emotional competencies, some or all of which different SEL programs seek to strengthen: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. Various sources of theory and evidence suggest that these social and emotional skills may be related to academic performance because they strengthen the executive control, well-being, ability to cope and engagement of the child [1]. A similar survey of the economics of education literature finds a link between ‘soft skills’ – personality traits not adequately measured by achievement tests – and educational achievement [6].

Several papers review the impact of SEL programs on a variety of outcomes, including academic attainment, and more are coming, including recent overviews and meta-analyses [1], [7], [8]. A much cited study finds that universal school-based SEL programs, which are both well-designed according to best-practice criteria for SELs and well-implemented, lead to immediate improvements in cognitive, social and emotional competences [4]. They also prompt direct improvements in attitudes about self, others, and school. In turn, this drives the improvements also found in well-being, positive social behavior, less emotional distress, fewer conduct problems, and increased academic success. Improvements were later found on a smaller sample of studies to last also beyond the intervention period, both in terms of the social and emotional competencies, well-being, and academic attainment [8].

Although there is a growing number of rigorous SEL impact studies, there is a need for more studies in non-U.S. contexts. Moreover, we need further sub-group analyses to understand which pupils

benefit most from SEL programs as well as analyses of which social emotional skills act as mediators for improved academic outcomes. Finally, additional analyses of longer-term impacts are called for [9], [3], [8].

Objectives

Our overall objective is to study the impact of a universal classroom-based and teacher-instructed Danish SEL program, PERSPEKT 2.0, among 4th and 5th graders (10-12-year-olds) in Danish elementary schools. PERSPEKT 2.0 is a SEL program developed for the Danish school context.ⁱ

Through a cluster randomized controlled trial, we will analyze the impact on a similar set of outcome measures as those reviewed previously [5], [4], [8]. Our primary outcome will be based on nationally collected indicators of elementary school well-being, developed by the Danish Ministry of Education with the purpose of tracking pupils' well-being. This outcome will measure attitudes towards school and emotional well-being. Our secondary outcomes consist of measures of academic achievement, also in the longer run, problem behavior, SEL competencies, and emotional distress.

In addition, to arrive at a better understanding of who may benefit most from a SEL program as PERSPEKT 2.0, we will undertake sub-group analyses on gender, grade, ethnicity, and parental background and we will look for heterogeneous effects across the distribution of our primary outcome measured at baseline. Below, we describe the methods and data employed.

Methods

Trial Design

We employ a two-level cluster randomized trial with individual level outcomes for children in two school cohorts (Grades 4 and 5) in the same school. At each school, one entire cohort is randomized into PERSPEKT 2.0, the other to treatment as usual (TAU).

Participants

Inclusion criteria

We include regular classrooms in Grades 4 and 5 in public schools, which systematically collect the national well-being indicators that are crucial to the construction of our primary outcome. We include children who are enrolled in a regular classroom, but sometimes participate in special education.

Exclusion criteria

We exclude pure special education classrooms because the intervention is designed with a particular focus on regular classrooms. We also exclude schools that teach mixed grades to minimize contamination between PERSPEKT 2.0 and TAU cohorts.

Study settings

In Denmark, compulsory education comprises primary and lower secondary education (ISCED 1 and 2) and lasts 10 years, from grade 0 to grade 9, with the possibility of attending an optional 11th year (grade 10). Children enter school in the year they turn six years old.

In 2017, 79 percent of children in grades 0-9 attended the municipal public school, *Folkeskolen*, [10]. In public schools, as well as in the majority of private schools, children are divided into classes of maximum 28 pupils during grade 0. Typically, children stay together in these classes until they leave school. A class receives education in all subjects together, and is headed by a “class teacher”, who follows the class for several years. This teacher, who is usually also the Danish or Math teacher of the class, coordinates the activities of the group of subject teachers associated with the class, and is the primary point person in cases of academic, behavioral or social problems. While a teacher is usually only class teacher for one class, subject teachers teach their subjects to several classes. It is common for classes within a grade to share subject teachers, and for class- and subject teachers to work together in grade-teams. In 2017, the average class size in public schools was 21.5 [11].

The majority of public schools are divided into three, often physically separated, sections: the preparatory section, *indskoling*, which encompasses grades 0 to 3; the intermediate section, *melletrinnet*, which encompasses grades 4-6; and the lower secondary stage, *udskoling*, which

encompasses grades 7 to 9. Each section will typically have a section leader and/or coordinator and teachers primarily teach classes within one section.

Intervention

Treatment

Treatment classes receive instruction using PERSPEKT 2.0 - a set of teaching materials aimed at training pupils' emotional, personal and social skills to improve individual well-being as well as the social and learning environment in the classroom. It fulfills the four criteria for best implementation practice, SAFE; it is **S**equenced in that there is coordinated progression of activities and practices to build competencies of the pupils; it is **A**ctive as it includes a number of participatory elements, such as role plays; it is **F**ocused in terms of having allocated specific time and program elements to build specific SEL competencies; and it is **E**xplicit in terms of having identified specific SEL competencies, that it aims to strengthen [12]. The material bears resemblance to PATHS (Promoting Alternative Thinking Strategies) and Second Step, both widely used social-emotional learning programs developed in the US, which have been subjected to several RCT based evaluations.ⁱⁱ

PERSPEKT 2.0 exists in three age-appropriate modules (Module I, II and III), targeting respectively grades 0-3, 4-6 and 7-9. Treatment classes are instructed using module II, which targets grades 4-6 and consists of 15 chapters, each of which is designed to take 45-60 minutes to complete. An overview of the chapters and their objectives can be found in Table 1 below. Exercises in the material are a variation over conversations, classroom exercises and small group activities. Some chapters offer specific tools, such as key phrases or steps, for children to use in different situations. Roleplaying and games are included as a means of drawing attention to and practicing different skills.

In treatment classes, instruction in PERSPEKT 2.0 is initiated in August 2018, at the beginning of the school year. To the extent possible, instruction in successive chapters will be spaced by one week, however schools are allowed some flexibility in timing, in order to accommodate other planned activities (e.g. thematic weeks or class trips) and teacher absences. The entire course must be completed by the end of February 2019. Instruction can be provided by either teachers or pedagogues associated with the class. While it is recommended that the same instructor, typically the class teacher, teaches the entire course, up to two teachers may, under special circumstances, be involved.

PERSPEKT 2.0 is designed to require no special training of instructors. A pilot study conducted in three Danish primary schools during the school year 2017/18 has confirmed that the teaching materials are self-contained, and that teachers typically spend less than half an hour to prepare for each chapter. Instructors in treatment classes are introduced to the materials exclusively through a video that demonstrates classroom practice. The teaching material itself is available through a custom-built web application, though a printed version of the material is also available upon request. Teachers are equipped with personal usernames and passwords and once logged in, instructors can read the chapter and exercise instructions and display project exercise materials on a smartboard in the classroom. In addition, instructors can easily keep track of the progression of their class(es) through the material at the level of individual exercises. This delivery of the program through a user-friendly online platform is intended to make it easy to implement and scale the program.

Table 1. Overview of PERSPEKT 2.0 chapters in Module II

Chapter: Title	Objectives
1: Thoughts and emotions	Pupils understand that different people may perceive the same situation differently, and how emotions are closely related to perceptions.
2: Body language	Pupils become aware of body language and its importance in communication.
3: Communication	Pupils are introduced to the concepts of passive, aggressive, and assertive communication, and learn that they can affect situations by actively choosing communication strategy. They are introduced to and practice a strategy for assertive communication.
4: Digital communication	Pupils learn that “faceless” communication places special requirements on both sender and recipient.
5: Saying “no”.	Pupils are introduced to and practice a strategy for saying “no” in difficult situations involving peer pressure.
6. Facts and assumptions	Pupils understand the difference between facts and assumptions and learn how to identify facts. In addition, they learn why we sometimes need to rely on assumptions and why it is important to be aware that they are not facts
7: Opinions	Pupils understand how opinions differ from assumptions and facts and practice distinguishing between the three.
8: From thoughts to emotion and action	Pupils gain awareness of the relationship between thoughts, emotions and actions and reflect on how their own thoughts and emotions are related to actions.
9: Consequences	Pupils reflect on how actions, including online behavior, as well as lack of action can have consequences – for one self and for others.
10: Rules, agreements and expectations.	Pupils gain awareness of the role of rules in society and in the classroom, and understand that rules are often created for the sake of the community.
11: Admitting something	Pupils are introduced to and practice a strategy for formulating an apology if, for example, rules, agreements or expectations have been broken.
12: Roles	Pupils gain awareness of how people can have different roles in different contexts, and how this influences behaviors and expectations.
13: Other people’s point of view	Pupils gain awareness of the importance of taking other people’s viewpoints into consideration, and practice understanding other people’s points of view.
14: Negotiation and compromise	Pupils practice negotiation and compromise and learn that sometimes we have to set aside our own wishes for the sake of the community.
15: Completion / summary	Pupils reflect on what they have learned through the course.

Treatment as Usual

Classrooms allocated to the control group receive “treatment as usual”. The content of this varies across schools as well as classrooms within schools, as there is no national curriculum or common goals for social skills training. The Danish Education Act stipulates that teaching of obligatory subjects and themes must be supplemented by “supportive teaching”, which may include courses or activities aimed at strengthening social skills and well-being [17]. However, no requirements regarding form, content or extent are specified. Similarly, a national Act on Educational Environment stipulates that schools undertake assessments of the educational environment at least every third year and formulate a set of school values, including an anti-bullying strategy, but requirements for content are minimal [18].

To document the content of “treatment as usual” in the control classes and whether PERSPEKT 2.0 replaces or adds to existing efforts, we collect information on activities and courses undertaken to improve well-being and socio-emotional skills through a survey targeted at teachers responsible for class-well-being. Surveys are administered to class teachers once a year during the study period, concurrently with the administration of a well-being survey to pupils (see section 5 below).

At participating schools, all classes that are not part of the trial, i.e. those that are grades 0-3 or 6-9 in the 2018/2019 school year, are allowed to implement PERSPEKT 2.0 throughout the trial period. We release PERSPEKT 2.0 for use in all schools and across all classes from the beginning of the school year 2020/21.

Adherence

A set of procedures will ensure that the program is delivered to meet the standardized version of PERSPEKT 2.0. Program fidelity is supported by the self-contained teaching materials provided through the online platform (described above) that includes clear instructions on how to conduct each separate exercise. Further, the platform enables the collection of a fidelity measure that is tied to the individual teacher and class through a digital checklist where the instructor marks off completed exercises at the end of each session. The checklist data will be monitored during the treatment period, and the implementing organization, DCUM, will follow up with the schools if program delivery seems to be diverging from the standardized version. Specifically, DCUM will continuously contact

schools who delay implementation of PERSPECT by more than two weeks. DCUM will also contact schools that halfway through the project period have not completed the first six out of the 15 chapters of the program. Finally, a mixed-methods implementation evaluation consisting of qualitative interviews and observation studies will be undertaken to assess program fidelity at a randomly selected subset of representative schools.

Data

Our impact evaluation will employ a series of data sources with individual level information about children, their families, and teachers: 1) nationally administered well-being surveys developed by the Danish Ministry of Education, 2) nationally administered IT-based tests of Danish reading skills and Math, 3) register-based data maintained by Statistics Denmark, 4) administrative data linking instructors to classes, and 5) data from a pupil survey developed specifically for this trial (see questions in Table 3 below).

The first three categories of data are available for all public schools and pupils, regardless of whether they participate in the study. Data in the third and fourth categories are only gathered at participating schools. To minimize interference with regular school activities and promote high response rates, schools are strongly encouraged to implement the trial specific survey concurrently with the compulsory national well-being survey. Pupils and their parents can choose to opt out of the trial specific survey. In practice, the survey is administered to pupils by a teacher during school hours. It is web based and was created using the survey tool SurveyXact. Pupils access the survey through a common link which takes them to a page where they must log on using their national pupil IDs (UNI-Login). This enables us to link responses to CPR identifiers, and through this to data from the other three categories.

Outcomes

Primary study outcome

Our primary outcome is a measure of attitudes towards school and emotional well-being in the classroom. We base the measure on the recently implemented national well-being indicators that are collected during the first quarter of each calendar year [19], [20]. For our primary outcome we use

responses to the survey from the calendar year following the provision of treatment (i.e. within the same school year as treatment is administered).

Among the full list of 40 questions in the national well-being survey, we use only the ten questions that enter into the Social Well-being subscale [20]. The answers to all questions are coded to range from one to five, with five being the most positive.ⁱⁱⁱ We present the ten included questions in Table 2.

Table 2. Social Well-being indicator questions included in primary study outcome

Question:
How well do you like your school?
How well do you like the other children in your classroom?
Do you feel lonely?
Are you afraid of being ridiculed at school?
Do you feel safe at school?
Since the start of the school year, did anyone bully you?
I feel I belong at my school.
I like the breaks at school.
Most of the pupils in my classroom are kind and helpful.
Other pupils accept me as I am.

Secondary study outcomes

Pupil academic performance. We measure academic performance in Grade 6 using nationally administered IT-based tests of Danish reading skills and Math. These have been shown to correlate highly with later higher-stakes tests [21]. In addition, we consider high-stakes tests at the end of lower secondary school (Grade 9) that determine enrollment into tracks in upper secondary school.

Problem behavior. Our first measure of problem behavior is number of days absent from school (due to sickness or unauthorized absence), both during the intervention period and one year later. It is based on monthly school reports at the pupil level. Our second measure stems from the pupil survey, collected in the first quarter of the calendar year following the provision of treatment. The item we will use asks about the degree to which the child is likely to pick up fights with other children. Specifically, we ask the child to state to what extent he or she agrees with the statement “I initiate

fights with other children”. Again, the answer is coded to range from one to five, with five being the most positive.

Social emotional learning skills. PERSPEKT 2.0 seeks to improve the five SEL skills. In the PERSPEKT curriculum, the focus is especially on strengthening relationship skills and responsible decision making and certain aspects of self-awareness, self-management and social awareness. Table 3 lists each of the SEL skills, how they are described in the SEL literature, the degree to which they are covered in the PERSPEKT curriculum, and how we will measure each of the five skill areas in the pupil survey. In practice, we will construct scores within each skill that sum the answers from the separate items.

Table 3. Measuring social emotional learning, CASEL (2013)

<u>SEL skill:</u>	<u>Description of skill:</u>	<u>PERSPEKT 2.0:</u>	<u>Questions:</u> (Responses range from one to five, with five being the most positive)
<u>Self-awareness</u>	The ability to accurately recognize one’s own emotions, thoughts, and values and how they influence behavior. The ability to accurately assess one’s strengths and limitations, with a well-grounded sense of confidence, optimism	PERSPEKT covers the ability to accurately recognize one’s own emotions and thoughts and how they influence behavior. PERSPEKT does not directly cover the ability to assess one’s strengths and weaknesses	<ul style="list-style-type: none"> • If I am sad, I let the other children know • I reach out to an adult if I need help during sessions • I reach out to other children if I need help during sessions • If I am sad, I keep my thoughts and feelings to myself
<u>Self-management</u>	The ability to successfully regulate one’s emotions, thoughts, and behaviors in different situations — effectively managing stress, controlling impulses, and motivating oneself, setting and working towards achieving personal and academic goals.	PERSPEKT covers the ability to regulate one’s emotions, thoughts and behaviors in different situations, and it also covers the ability to control one’s impulses. PERSPEKT does not cover the ability to manage stress	<ul style="list-style-type: none"> • I stay calm if someone says or writes something negative about me • If I get angry, I think before I react • I quickly forget if something bad happens • I stay calm even though other children are upset

		or motivate oneself or to set personal and academic goals.	
<u>Social awareness</u>	The ability to take the perspective of and empathize with others, including those from diverse backgrounds and cultures, to understand social and ethical norms for behavior and to recognize family, school, and community resources and supports.	PERSPEKT covers the ability to take the perspective of and empathize with others. PERSPEKT does not focus specifically on diversity and different cultures or on recognizing family, school and community resources and support.	<ul style="list-style-type: none"> • I do my best to understand the other children in my classroom even if I disagree with them • I feel sad if other children in my classroom are sad
<u>Relationship skills</u>	The ability to establish and maintain healthy and rewarding relationships with diverse individuals and groups, including communicating clearly, listening actively, cooperating, resisting inappropriate social pressure, negotiating conflict constructively, and seeking and offering help when needed.	PERSPEKT covers the ability to maintain healthy relationships through clear communication and active listening, resisting inappropriate social pressure and negotiating conflict constructively. PERSPEKT has a strong focus on relationship skills. PERSPEKT does not directly cover seeking and offering help.	<ul style="list-style-type: none"> • I do my best to help the other children in my classroom whenever they have a problem • It is easy for me to find new friends in school • I do my best to help the other children in my classroom when they end up in conflicts with each other
<u>Responsible decision-making</u>	The ability to make constructive choices about personal behavior and social interactions based on ethical standards, safety concerns, and social norms. The realistic evaluation of consequences of various actions, and a consideration of the well-being of oneself and others.	PERSPEKT covers the ability to evaluate consequences of various actions, and the ability to make constructive choices about personal behavior.	<ul style="list-style-type: none"> • I do my best to forgive the other children in my classroom when they apologize • I reach out to an adult if someone bullies a child in my classroom • I reach out to an adult if someone misbehaves towards me

Emotional distress. Emotional distress is to some extent covered by our primary outcome, for example by the questions related to loneliness, the feeling of being safe, and to exposure to bullying. In the pupil survey, we ask the children to rate two further statements: 1) I often worry and 2) I am often sad.

Tertiary study outcomes

Teacher absentness. Not only may pupils' problem behavior change with PERSPEKT, teachers' may too. To detect this, we consider teacher absentness, both during the intervention period and one year later. This measure is constructed using register data that comprises all absence periods of teachers throughout the year.

Figure 1 illustrates the timing of enrolment, allocation to treatment, the intervention, and collection of baseline and endline outcome measures.

Figure 1. Schedule of enrolment, intervention and primary assessments

TIMEPOINT	STUDY PERIOD						
	Enrolment		Allocation	Post-allocation			Close-out
	<i>Q1 2018</i>	<i>Q2 2018</i>	May 2018	<i>Q3 2018</i>	<i>Q4 2018</i>	<i>Q1 2019</i>	<i>Q2-Q4 2019</i>
ENROLMENT:							
Recruitment & eligibility screen	X						
Informed consent (through parents)	X						
Allocation			X				
INTERVENTIONS:							
<i>PERSPEKT teaching</i>				←————→			
ASSESSMENTS:							
<i>Pupil well-being (national survey)</i>	X						X
<i>SEL skills and emotional stress (own survey)</i>		X					X
<i>Teacher's well-being work (own survey)</i>		X					X
<i>National test scores*</i>							X*
<i>Pupil absenteeism**</i>				X**			X

* National test scores cover the subjects ‘Danish’ and ‘Mathematics’ and will be measured in the 6th grade, which will be during the school year 2019/2020 and 2020/2021 for the pupils participating in the trial.

** Baseline absenteeism data is collected in August 2018 and covers the school year 2017/2018, which is before the PERSPEKT teaching began.

Recruitment

School level participation was voluntary and the decision to enroll was made by school principals. Recruitment was carried out by the DCUM during spring to fall of 2017. The recruitment process followed four tracks:

The first track targeted the municipal administration. Relevant departments of all Danish municipalities were contacted with information about participation in the research project through telephone and/or e-mail, and information meetings were held with those that showed interest.

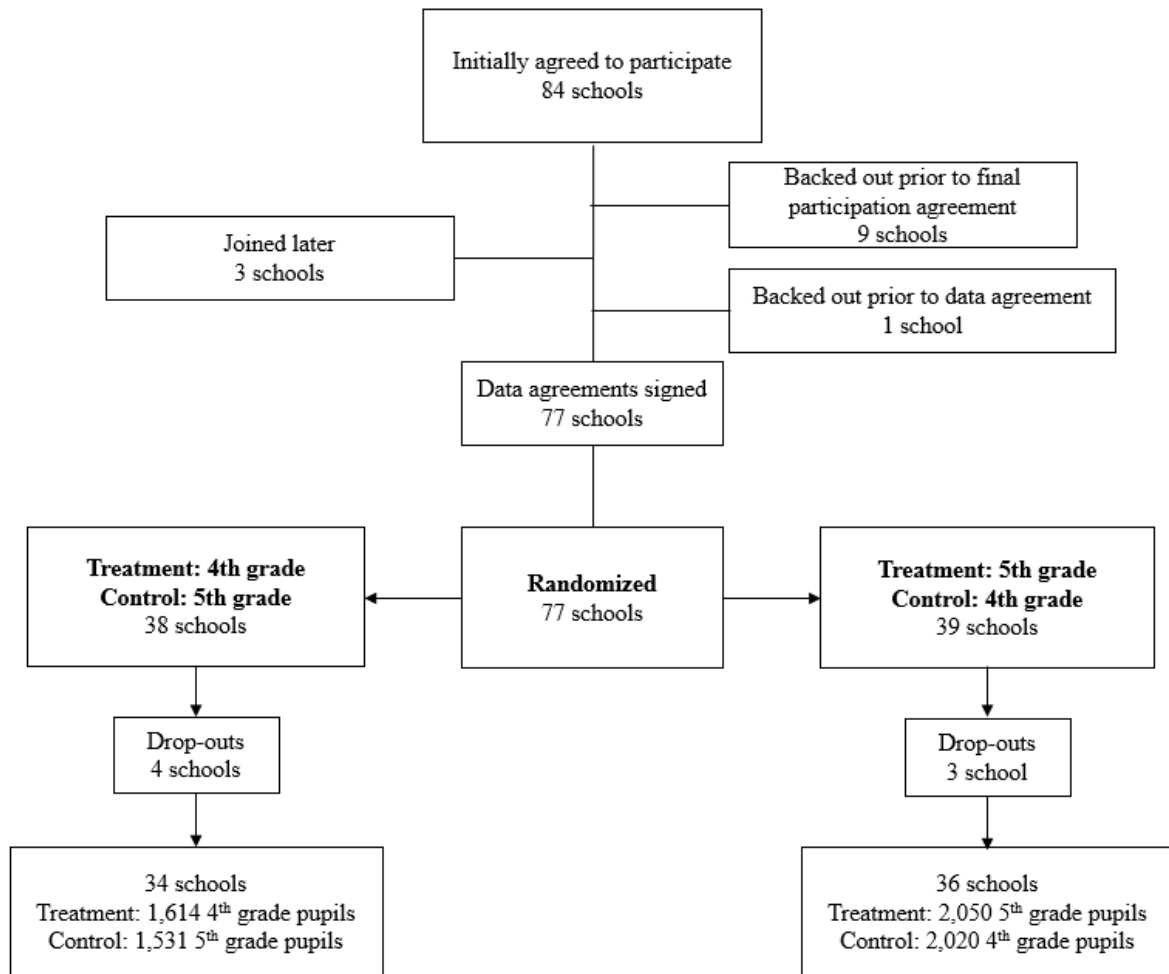
The second track targeted school principals. Principals of all Danish public schools were contacted by e-mail. Further, principals of schools that the municipal administrations named as potential candidates, that had previously collaborated with DCUM, or that had otherwise shown interest in the project, were contacted by telephone. In addition, the trial was advertised at the annual meeting of the principals' trade union.

The third track targeted teachers with advertisements in the teachers' trade unions' magazine "*Folkeskolen*", on the magazine's website, and on Facebook.

The fourth track advertised the trial more generally on DCUMs own website and annual conference, as well as on the website and magazine of the national association of school boards and parents "*Skole og Forældre*".

Figure 2 illustrates the recruitment process, randomization and attrition. Initially, 84 schools agreed to participate. As some schools backed out and others joined later, 77 schools signed the final data agreements. These schools together enroll 7,962 pupils who will be in 4th or 5th grade at the time of implementation. The schools were randomized into teaching PERSPEKT 2.0 at either 4th or 5th grade using the other grade year as control group. After randomization further seven schools dropped out leaving 34 schools with treatment at the 4th grade level and 36 schools with treatment at the 5th grade level. This results in a total number of 3,664 pupils in the treatment group and 3,551 pupils in the control group.

Figure 2. Flow chart of participating schools

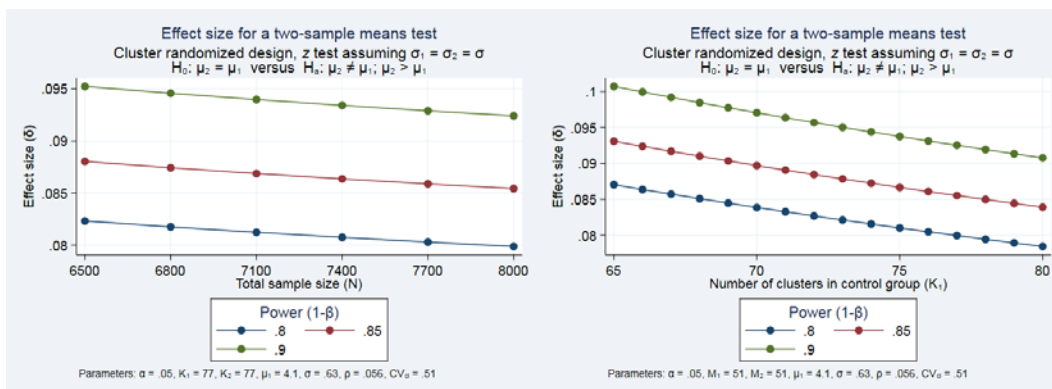


Power analysis

Our power analyses use STATA 15. Since treatment in this project is carried out at the cohort level, we use a two-level cluster randomized trial with individual level outcomes and conservatively control for cohort indicators, the outcome measured at baseline, and the interaction between these two. Our power analysis uses data for 4th and 5th graders in the 2016/2017 academic year at the 77 schools enrolled in the study with consent to share administrative data. We measure the intraclass correlation coefficient to .056 and the coefficient of variation to .51. With a power of 0.80 and a significance level of 0.05, using a two-sample means t-test without conditioning on covariates results in a Minimum Detectable Effect (MDE) of 0.080 on our main outcome variable, the social well-being indicator. Conditioning on grade level (4th or 5th grade), the baseline outcome and the interaction

between the two yields an MDE of 0.070. In both calculations we cluster standard errors at the school-grade-level.^{iv} An MDE of 0.07 corresponds to 0.110 standard deviations on the social well-being indicator. In terms of the underlying questions on social well-being, this translates into e.g. 70 percent of the treated children scoring *one* of the ten questions *one* level higher or 35 percent of the treated children scoring two of the questions one level higher. Allowing for 25% non-compliance increases the MDE with covariates to .09. Figure 3 shows that the MDE is not very sensitive to missing observations on the outcome as long as this is not driven by entire schools not responding. About 90% of the pupils at the participating schools filled out the national well-being indicators in 2016/2017.

Figure 3. Sensitivity to missing values on the outcome.



Interim analyses and stopping guidelines

PERSPEKT 2.0 is implemented at the same time in all schools, which leaves no room for interim analyses in some schools. Moreover, we expect the intervention to be associated with very low risk for participants, which reduces the need for stopping guidelines. There may be smaller inconveniences, at least for some, associated with the level of time consumption from participating in PERSPEKT 2.0.

Randomization

We employ a two-level cluster randomized trial for children in two adjacent school cohorts (Grades 4 and 5) within the same school. There is otherwise no blocking. This means that we have randomly

allocated schools into teaching PERSPEKT 2.0 in either 4th grade or 5th grade such that all schools implement PERSPEKT 2.0 in only one of the two grade levels. We computerized the randomization via an unpredictable random sequence using STATA. In practice, we generated a sequence of 77 uniformly distributed random numbers on the (0,1) interval corresponding to the number of schools at the time of randomization. This sequence was applied to an ordered list of the numerical school identifiers. Values larger than 0.5 indicate that 5th grade pupils are offered PERSPEKT 2.0, while 4th grade pupils are offered TAU, and vice versa for values lower than 0.5.

In May 2018, we informed DCUM of which schools were randomly allocated to implement PERSPEKT 2.0 in grade 4, and which schools were allocated to implement the program in grade 5. DCUM immediately informed the schools and subsequently followed up with them to ensure that there had been no miscommunications, and that implementation of PERSPEKT 2.0 would be taking place in the correct grades.

Blinding

The study condition was revealed after recruitment and receipt of consent. Hence, blinding after this point in time was not possible.

Statistical methods

Reporting of results will follow the guidelines of the CONSORT- statement. Statistical analysis will be intention to treat. The level of significance will be 0.05. The analysis of intention-to-treat effects will compare PERSPEKT 2.0 with TAU using both simple two-sample t-tests and non-parametric rank-based tests (Wilcoxon). Further, we will apply linear regressions that control for pre-randomization variables. We will choose the list of control variables based on the post-double-Lasso method [22]. This method selects a set of control variables that predict treatment (in case treatment is unbalanced on any of the control variables) and additional control variables that predict the outcome in order to keep the residual variance small. As a sensitivity analysis, we will report results from linear regressions including grade level, baseline measures of the primary outcome, interactions between these two, child gender, and exact birthdate as control variables. All linear regressions will cluster errors at the classroom level.

In order to test whether different subgroups experience differential effects from participation, we will define subgroups based on pre-randomization variables. The null hypothesis is that subgroups are affected equally by PERSPEKT 2.0. The alternative hypothesis is that subgroups experience differential effects. We will split children into subgroups based on their baseline value of the social well-being indicator (our primary outcome). We will consider children above and below the median value, and children in the 1st and 2nd quartile of the distribution separately. In addition, we will consider subgroups based on gender, grade (4th or 5th grade), parents' country of origin (both Danish or at least one parent non-Danish), and mother's education level (High school/less than high school or more than high school)^v. In practice, we will test for significance of subgroup-treatment interactions using t-tests and perform a joint F-test for significance of the entire set of interactions [23]. To further explore heterogeneity in the effects of PERSPEKT 2.0 beyond these pre-registered subgroups, we will employ machine learning inference [24]. This method will allow us to find the difference in average treatment effects between the most and least affected groups as determined by a machine learning proxy and to characterize pupils in the most and least affected group. We will compare results across different machine learning predictors such as elastic net, neural network, and random forest.

Because our study collects multiple outcomes, permutation testing methods, and a step-down procedure will be applied to account for the increased likelihood of false discoveries [25]. This is adopted in combination with a naïve evaluation strategy (which examines each outcome individually).

Finally, in sensitivity analyses, we plan to use schools that initially showed interest but subsequently dropped out as pure control school for those outcome measures where no school specific consent is needed (national tests and national well-being scores). We can use the baseline social well-being score to test if drop-out schools resemble the remaining schools. We do not expect strong selection, as the drop-out decisions were primarily driven by uncertainties about data sharing and data collection, and not by the level of existing efforts to improve pupils' social well-being

Harms

Potential harms from PERSPEKT 2.0 might occur if the program merely substitutes for ordinary instruction and thus reduces the number of lectures in, say, Danish language. To address this issue, we gather information about in which lectures PERSPEKT 2.0 was carried out.

Discussion

This protocol describes an experimental evaluation of a social emotional learning program targeted at pupils in a Danish elementary school setting. Despite a growing number of studies of SEL programs, there is still lack of knowledge about effects in non-U.S. contexts, about which sub-groups benefit the most, and about longer-term impacts. Our study will provide such analyses.

Potential biases may arise if PERSPEKT 2.0 directly affects control cohorts, for example, because of improved behavior among treatment cohorts in shared activities. To minimize this, we exclude schools that employ mixed-grade teaching.

It is possible that schools that sign up for the research project enroll different pupil populations and employ other types of teachers than schools outside of the project. As such, our results may lack external validity. To explore this, we will use population-wide register-based data to characterize project participants in terms of school and pupil characteristics and compare these to other schools to better understand the external validity of the evaluation.

Registration

The study is registered with <https://www.socialscisceregistry.org/trials/3565>, RCT ID: AEARCTR-0003565.

Declarations

Ethics approval and consent to participate

The project has been approved by Danish data protection agency; registration number 2017-41-5146.

School principals gave consent to share administrative school data, including national pupil and teacher identifiers (UNI-login). All parents of the participating classes received an information letter regarding the intervention program, the study project and data collection of and by their children in early March 2018. In this letter, parents were informed that their children's participation in the trial specific survey is voluntary and that they should inform their children's class teacher if they do not want their children to answer the survey. Children were further informed that participation in the survey is voluntary both orally by their class teachers and in writing on the first page of the survey.

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Competing interests

The authors declare that they have no competing interests.

Authors' contributions

Helene Bie Lilleør obtained funding for the research. All authors contributed to the final manuscript and all authors can be held accountable for the accuracy or integrity of any part of the work. All authors read and approved the final manuscript.

Funding

The ROCKWOOL Foundation originally funded the development of PERSPEKT. In June 2016, PERSPEKT was handed over to DCUM. During 2016 and 2017, DCUM revised and adapted PERSPEKT into PERSPEKT 2.0, with some financial assistance from the ROCKWOOL Foundation. DCUM owns all rights to PERSPEKT 2.0 and can freely distribute PERSPEKT 2.0 to all schools in Denmark in 2020 once the trial period is completed and the results of the evaluation are known.

The impact and implementation evaluations of PERSPEKT 2.0, including researcher time, are funded by the ROCKWOOL Foundation.

None of the members of the research team are employed by DCUM.

Availability of data and materials

Results are intended to be published in international peer-reviewed journals and on the Rockwool Foundation's web page. All results will be published, regardless of whether they are positive, negative, or inconclusive.

The PERSPEKT 2.0 material will be made publicly available at the webpage of DCUM in 2020 once the trial period is completed and the results of the evaluation are known.

All data will be kept in a secure server maintained by Statistics Denmark. Data are stored under project 706711. The data can, however, be accessed remotely from within Danish universities and research institutions. If a researcher at a university or other research institution outside Denmark wishes to use these data, this may be accomplished by visiting a Danish research institution or by cooperating with researchers or research assistants working in Denmark. Of course, we will provide all programs and instructions to any researcher who should wish to replicate our future analyses. Table 4 provides details of key administrative data sources.

Table 4. Key administrative data sources

Data from the Ministry of Education, National Agency for IT and learning		
<i>English</i>		<i>Danish</i>
Pupil well-being		Trivselsmåling
Pupil absence		Elevfravær
Teacher register		Register for lærernes kompetencer
National test scores		Nationale tests
School data		
Class division and link between instructors and classes		Klasseopdeling, samt link mellem lærere og klasser
Data from Statistics Denmark		
<i>Register name</i>	<i>English description</i>	<i>Danish description</i>
	Demography, family and household characteristics	Demografi, familie og husstandsforhold
BEF	Population	Befolkning
BARNFORA	Reference between child and parents	Henvisning mellem barn og forældre
	Labor market attachment, position, field and degree of unemployment	Arbejdsmarkedstilknytning, stilling, branche, ledighedsgrad
IDAP	IDA individual data	IDA persondata
IDAN	IDA employments	IDA ansættelser
IDAS	IDA work places	IDA arbejdssteder
RAS	The population's attachment to the labor market	Befolkningens tilknytning til arbejdsmarkedet
DREAM/ DREAM EKSTRA	Employment information	Beskæftigelsesoplysninger
IND	Income	Indkomst
FRPE	Periods of absence	Fraværsperioder
SGDP	Sickness benefits - cases	Sygedagpenge - sager
	Education information and grades	Uddannelsesoplysninger og karakterer
UDDA/ UDDANY	Education register	Uddannelsesregister
UDFK	Grades	Karakterer
KOTRE	Compressed pupil register	Komprimeret elevregister
INST	Institutions register	Institutionsregister
UDSP	Special needs education	Specialundervisning
DUB	Danish teaching database	Danskundervisningsdatabasen
	Health and usage of hospitals	Helbred og sygehusbenyttelse

LPRDIAG	National patients register of diagnoses	Landspatientregistret diagnoser
LPRPOP/ LPR_ADM	National patients register of admissions	Landspatientregistret indlæggelser
LPSYDIAG	National patients register of psychiatric diagnoses	Landspatientregistret psykiatri, diagnoser
LPSYPOP/ LPSYADM	National patients register of psychiatric admissions	Landspatientregistret psykiatri, indlæggelser
MFR	Live-born from the medical birth register	Levendefødte fra det medicinske fødselsregistre
Charges and rulings in criminal cases		Sigtelser og afgørelser i kriminalitetssager
KRMS	As-if charges against minors	Sigtelser for mindreårige
KRSI	Criminal statistics, charges	Kriminalstatistik sigtelser
KRAF	Criminal statistics, rulings	Kriminalstatistik afgørelser
Preventive efforts for children and adolescents		Forebyggende indsatser for børn og unge
BUFO	Children and adolescents' preventive measures	Børn og unge forebyggende foranstaltninger
Immigrants basis for residence in Denmark		Indvandreres grundlag for ophold i Danmark
OPHG	Basis for residence	Opholdsgrundlag

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Appendix A

Table A1. List of schools in the two treatment groups

Schools with: Treatment in 4th grade Control in 5th grade	Schools with: Control in 4th grade Treatment in 5th grade
Valhøj Skole	Herlev byskole
Blovstrød Skole	Ishøj Skole
Bramsnæsvisgskolen	Vibeholmskolen
Allerslev Skole	Vejlebroskolen
Osted Skole	Solvangskolen
Trællerupskolen	Maglehøjskolen
Peder Syv Skolen	Kirke Saaby Skole
Hedegårdenes Skole	Himmelev Skole
Strøbyskolen	Ulegårdsskolen
Skolecenter Jetsmark	Lyreskovskolen
Kongeskærskolen	Haverslev-Ravnkilde Skole
Svartingedal Skole	Tranbjergskolen
Paradisbakkeskolen	Limfjordsskolen Struer
Båring Skole	Nymarksskolen
Nørre Aaby Skole	Sorø Borgerskole
Vibeskolen	Søndermarksskolen
4kløverskolen	Aavangsskolen
Kollund Skole	Hans Rømer Skolen
Sjølund-Hejls Skole	Birkhovedskolen
Skærbæk Distriktsskole	Danehofskolen
Hovedgård Skole, folkeskoleafdeling	Ørstedskolen
Thyregod Skole	Carl Nielsen-Skolen
Østerhåbskolen	Lynghedskolen, afdeling Søndre
Brændkjærskolen	Højvangskolen, folkeskoleafdeling
Sdr.Bjert Centralskole	Vamdrup Skole
Kongsbjergskolen	Langhøjskolen
Skanderup-Hjarup Forbundsskole	Toubroskolen
Mølleskolen	Vestre Skole
Vestskolen	Hvinningdalskolen
Allingåbroskolen	Sjørring Skole
Højslev Skole	Fjerritslev Skole
Vester Hornum Skole	Distrikt Øst, Frydenstrand skoleafdeling
Distrikt Vest, Bangsbostrand afdeling	Sortebakkeskolen
Distrikt Vest, Ravnhøj skoleafdeling	Skørping Skole
	Øster Hornum Skole
	Østermarksskolen

ⁱ The programme was originally developed by Allan Knægt and Jane Vinter and has later been adapted for implementation at scale by DCUM.

ⁱⁱ Both PATHS and Second Step are included in the 2013 CASEL guide “Effective Social and Emotional Learning Programmes – Preschool and Elementary School Edition [5]. PATHS is further listed as a recommended, effective program by Blueprints of Violence Prevention at the University of Colorado [13]. A recent meta-analysis of the effects of classroom management strategies and programs on students academic, behavioral, emotional and motivational outcomes (Korpershoek et al 2016) found significant average effects of both programs on student behavior and socio emotional outcomes of between 0.16 and 0.26 standard deviations (Hedges’*d g*) [14]. It has also been found effective in RCT-based studies in numerous contexts. For example, For Second Step, results have been mixed: a recent study of Second Step in kindergarten to 2nd grade found positive effects on socio-emotional competencies for children who started the school year with skill deficit relative to their peers, but few and small significant results for students overall [15]. A study of Second Step amongst sixth grade students found significant effects on self-reported physical aggression, but no effects on verbal/relational bullying, physical aggression, homophobic name-calling, or sexual violence victimization or perpetration [16].

ⁱⁱⁱ For positive questions like “Do you feel safe at school?” the value five means to “very often”. For negative questions like “Do you feel lonely?” five means to “never”. In this sense, five is always the best outcome.

^{iv} Clustering at the school-grade level instead of the class-level is conservative, but we did not have access to data on pupil class assignment at baseline when performing the power analysis.

^v High school includes both academic and vocational tracks.