

Influencing antecedents of adolescent risk-taking behaviour in elementary school: results of a 4-year quasi-experimental controlled trial

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Abstract

Effects of the life skills programme ‘Eigenständig werden’ (Becoming independent) on life skills and on identified antecedents of adolescent health risk behaviour, childhood internalizing and externalizing behaviour were tested in an elementary school setting. A quasi-experimental controlled trial with five repeated measures was conducted. Participants were 919 students from 50 elementary schools in Saxony, Germany. Outcomes were assessed by teachers’ ratings. Growth-curve models revealed that the rate of decline in internalizing and externalizing behaviour was significantly higher in the intervention group—especially for students with high baseline levels of externalizing behaviour ($P < 0.01$). No general programme effects on the development of skills could be found ($P = 0.22$). The current study provides evidence that life skills programmes in elementary school may be an effective strategy in reducing antecedents of adolescent risk-taking behaviour.

Introduction

Deleterious effects of adolescent risk-taking behaviour like violence and drug use are well documented [1, 2]. One promising approach to prevent risk-taking behaviour is to target antecedents identified in childhood, e.g. childhood problem behaviour, and thereby to improve developmental trajectories [3, 4].

Childhood problem behaviour can be split into two domains [5, 6]. The first term ‘Externalizing’ is characterized by aggressiveness, lack of control and troublemaking, whereas the second term ‘Internalizing’ comprises shy, anxious and inhibited patterns [6, 7]. Whereas externalizing patterns in children, especially in boys, were found to precede even more serious antisocial behaviours like violence and delinquency in youth and early adulthood [3, 8–10], both, children’s externalizing and internalizing behaviour problems, were linked empirically with onset and severity of later drug use [11, 12].

Problem behaviour usually has a certain functionality for the affected person to handle demanding developmental tasks and every day situations [13]. Since its occurrence often indicates a lack of—from an objective point of view—more appropriate behaviour, fostering the latter seem to be a promising strategy to reduce and prevent the former. One widely known approach that might lead to the desired result is the life skills approach [13, 14]. It promotes skills which either enable and facilitate healthy relationships with other persons, e.g. effective communication (social skills), or to oneself, e.g. self-awareness (intrapersonal skills). Thereby, the approach focuses on those skills that have consistently been identified as essential for the health and well-being of children, e.g. problem solving and empathy, and are therefore recommended by the World Health Organization (WHO) [15]. It is assumed that equipping children with these so-called ‘life skills’ will lead to a reduced onset of

new and to a successive decrease of already existing problem behaviour in further development.

This assumption has not been consistently confirmed yet. In fact, there has been strong disagreement about the effectiveness of life skills programmes in the prevention of adolescent risk-taking behaviour like smoking [16, 17]. Concerning the improvement of already existing childhood problem behaviour, little research has been conducted. Nevertheless, results of studies on more general approaches implemented in elementary school with life skills training as one component suggest that life skills might be essential in influencing developmental trajectories in an affirmative way [4]. For example, the Seattle Social Development Project (SSDP), the Good Behaviour Game and the Positive Action Program could be shown to be effective in reducing childhood problem behaviour [18–20] and to lower the risk for the uptake of several risk-taking behaviours in childhood, in youth and even in young adulthood [21–26].

Aim of the current study is to introduce the life skills programme ‘Eigenständig werden’ (‘Becoming independent’, EW) and to evaluate its effects on life skills and the two domains of childhood problem behaviour and externalizing and internalizing behaviour in elementary school.

Methods

The programme

EW is a life skills programme implemented in elementary school aiming at the promotion of health and personality development and the universal prevention of multiple forms of addiction and violence with special focus on substance-related addiction and bullying, potentially occurring in middle and late adolescence [27, 28]. It seeks to achieve these goals through the training of life skills, e.g. self-awareness and empathy, basing on recommendations of the WHO ([15], see above).

On the whole, it consists of 42 predominantly 90-min units, of which ~10 units distributed over the whole duration of one school year are realized per grade. They are implemented in regular class by

specially trained teachers, who are provided with a manual including detailed descriptions of the particular units in respect of background, aims, activities, etc., and the respective materials. The content of the programme comprises, besides general life skills, other skills, e.g. media-related critical thinking as well as substance-specific resistance skills.

To foster skills, interactive didactics, whose superiority in comparison with non-interactive ones has been shown [17], are used. Special techniques and methods employed in the units are working in small groups, discussion groups, relaxation exercises, role plays, identification figures, puppet shows and active games, songs and experiments.

Study design

The study was conducted in Saxony, a German state, in the period of 2001–2005, i.e. over the course of elementary school, which lasts from Grades 1–4 in Saxony. At entry, children are ~6 years old. A quasi-experimental controlled trial with five repeated measures was realized with schools as level of sample recruitment. Study and questionnaire were approved by the responsible data protection commissioner of the Saxony Ministry for Culture.

Sample recruitment

As illustrated in Fig. 1, 150 schools in Saxony were randomly selected and allocated to intervention and control group. Afterwards, headmasters of the selected schools were informed about the group their school was assigned to and asked for participation in the study. Additionally, teachers of both group conditions were offered 50 € as incentive. Nineteen schools in the intervention group compared with 31 schools in the control group finally agreed to participate in the study, suggesting a bias in allocation due to the employed procedure of sample recruitment.

Of 1046 eligible students, 13% had no parental permission; hence, at baseline, 941 students (88%), 341 in the intervention group and 600 in the control group, took part in the survey. Of these, 22 students (2%), 14 students in the intervention group and 8 students in the control group, with only baseline data

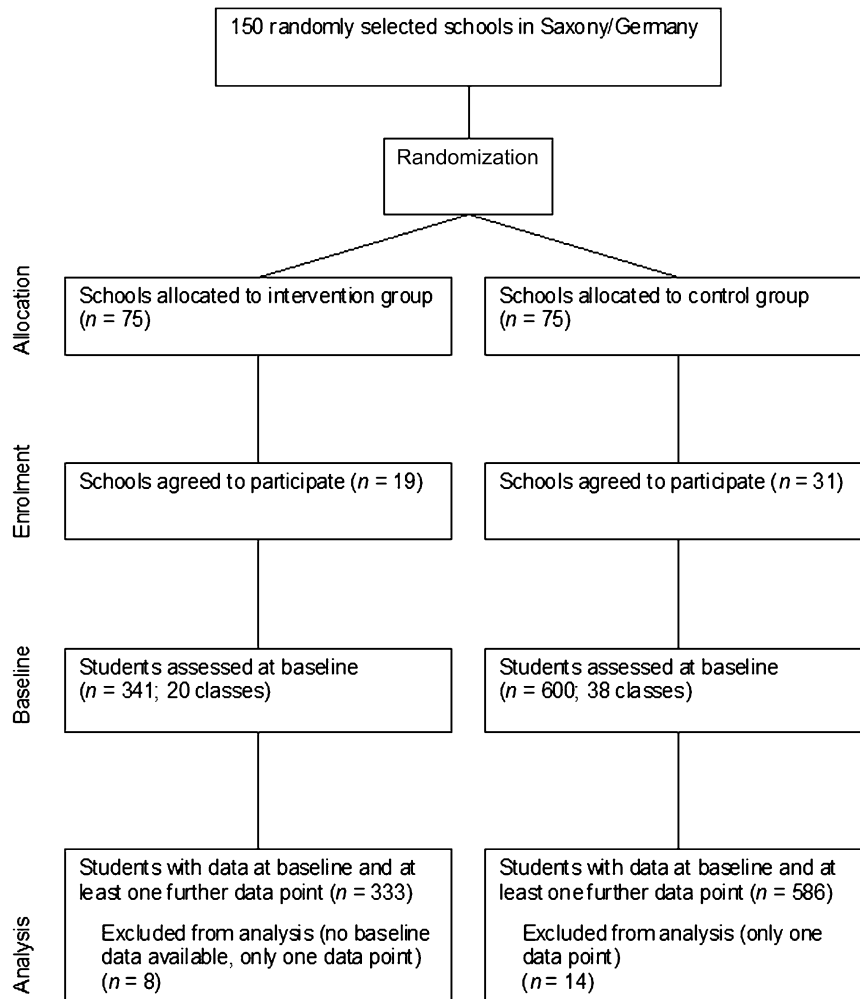


Fig. 1. Flow chart.

or with missing data at baseline were excluded from further analyses. Therefore, the final sample consisted of 919 students (98%), 333 in the intervention group and 586 in the control group, with existing data at baseline and at least one further data point.

Procedure

In the intervention group, EW was implemented by teachers in regular class for 4 years. Teachers of intervention classes had to participate in a 2.5-day training, in which the theoretical background and

the goals of the programme were introduced and performance of the units was practiced. Besides this initial training, more trainings were conducted at further four occasions during programme implementation. The control group received no intervention.

Data were collected through teachers' ratings of their students' behaviour at five occasions: at baseline (2 months after first grade had started) and at the end of each grade, respectively. Teachers of intervention and control classes were trained in

the rating technique. The assessments were done by the teachers. To permit following students over the course of the study, questionnaires were marked with a code indicating wave, group condition and class. Additionally, teachers provided a student code for each participant corresponding to student's occupied number in the class book.

Measures

Besides main outcomes, gender, year of birth and nationality of the students were assessed. Main outcomes of the current study were students' problem behaviour and life skills. They were measured by teachers' rating of the frequency and intensity of 10 listed behaviours, respectively.

The 10 items assessing childhood problem behaviour originated from a scale with 21 items of Berg *et al.* [29]. Eleven items were dropped since they covered more pathological behaviour patterns, e.g. depressive disorder, and other areas, e.g. impairment of performance. Further, one more rating category was introduced to allow for a higher sensitivity for change and to standardize rating of problem behaviour and skills creating a 4-point scale varying from 'never conspicuous' (0) to '(almost) ever conspicuous' (3). Measured skills like 'assertiveness', 'autonomous behaviour' and 'critical thinking and judgement' were chosen depending on the recommendations of WHO [15] and the learning targets formulated in the units of EW. Concrete wording was based on operationalizations of educational objectives by Janowski *et al.* [30]. The rating categories of the 4-point scale varied from 'not at all competent' (0) to 'outstanding competent' (3). Each of the overall 20 items was made up of the name of the respective behaviour of interest, e.g. assertiveness, and a list of observable behaviour patterns, e.g. 'the student advances her/his view against opposite views', as examples to facilitate teachers' rating.

Principal component analyses (rotation method: varimax) based on the data of the first assessment ($N = 941$) were conducted to confirm the three constructs of interest of the current study. The analyses resulted in the expected three-component solution (Eigenvalue > 1) explaining 65% of the

variance, with each of the components representing one of the theoretically interesting domains, skills, externalizing behaviour and internalizing behaviour [4, 12, 14, 15]. The scale 'skills' comprised the intended 10 items. Corresponding to previous research on childhood problem behaviour [5, 6] and consistent with the findings of previous conducted factor analyses on the employed instrument [31], the 10 items assessing problem behaviour loaded differently on two distinct components composing the two scales 'externalizing behaviour' with seven items (e.g. 'disobedience' and 'aggressive behaviour towards classmates') and 'internalizing behaviour' comprising the remaining three (e.g. 'lack of self-confidence' and 'hypersensitivity'). All three scales had moderate to high internal consistency (skills: Cronbach's $\alpha = 0.93$; externalizing behaviour: Cronbach's $\alpha = 0.88$ and internalizing behaviour: Cronbach's $\alpha = 0.64$).

For statistical analyses, mean scores of the three scales were calculated per student and wave. The scores ranged from 0 to 3 with lower scores indicating lower intensity and frequency of the respective behaviour.

Statistical analyses

Comparisons of the students included in the analysis sample (AS) with those excluded from further analyses as well as the testing for baseline differences between intervention and control group were conducted using χ^2 -test and t -test. If preconditions for the application of parametric tests were violated, the respective non-parametric alternatives were used to conduct the analyses. Tests were two sided and considered significant at the 0.05 level.

To test for programme effects, i.e. to test how the intervention has influenced the changes of the three outcomes over time, growth-curve models using maximum likelihood estimation were used. Concerning the given unbalanced design, i.e. the fact that not all data points were existent for all students, using growth-curve models had the advantage that all available data could be used resulting in estimates less susceptible to bias [32]. Data were analyzed with Stata 10.0 (StataCorp,

College Station, TX, USA). Multilevel growth-curve models were computed using the Stata `xtmixed` command.

Model development

To model change in the outcomes over the course of the study, analyses started with simple models whose complexity was increased stepwise to test for programme effects.

In the initial model, wave, gender and interaction between both—to account for possible gender differences in developmental pathways over time—were entered as covariates while controlling the three levels of student, class and school. Wave was entered in the regression equation as continuous variable centred at baseline, so its intercept indicated the baseline level of the respective outcome and its coefficient, the rate of change per interval between two measurement occasions. In the first step, a random-coefficient model with wave as random slope was specified. This step took account of possible individual differences in developmental trajectories of skills as well as childhood problem behaviour. Secondly, a quadratic term of wave was entered into the equation to test if the relationship between wave and outcome was non-linear. Finally, in two further steps, the model was extended by intervention and interaction between intervention and wave, generated by multiplying both variables, to test for the effects of EW.

To assess if EW was especially effective in helping children at higher risk, i.e. in children with an adverse baseline level in the respective outcome, additional analyses were conducted extending the regression equation by the baseline level of the respective outcome and the baseline level by intervention interaction, generated by multiplying both variables. After every step, advanced and previous model were compared using the likelihood ratio test to test for model improvement.

Finally, the analyses on programme effects were repeated with 19 randomly selected schools in control group to be compared with the 19 schools in intervention group to assess if the unequal group sizes due to possible bias in allocation could have influenced results.

Results

Descriptive analysis

Comparison of AS and excluded students

No significant differences were found between the students constituting the AS ($n = 919$) and the ones who have been excluded from further analyses because of too many missing data points ($n = 22$; 'excluded sample') concerning group condition [χ^2 ($df = 1, N = 941$) = 0.00, $P = 0.99$] and gender [χ^2 ($df = 1, N = 941$) = 0.69, $P = 0.41$]. In contrast, students in the AS and the excluded ones differed significantly in age [$M_{AS} = 6.61$ versus $M_{ES} = 7.05$, t ($df = 939$) = -3.66 , $P < 0.001$] and in the baseline levels of each outcome (skills: $M_{AS} = 1.60$ versus $M_{ES} = 1.19$, $z = 2.78$, $P < 0.01$; externalizing behaviour: $M_{AS} = 0.31$ versus $M_{ES} = 0.83$, $z = -3.69$, $P < 0.01$ and internalizing behaviour: $M_{AS} = 0.34$ versus $M_{ES} = 0.83$, $z = -3.97$, $P < 0.01$).

Description of the AS

Fifty-three per cent ($n = 175$) of the students in the intervention group and 48% ($n = 283$) of the students in the control group were female. In both groups, only 1% (intervention group: $n = 3$ and control group: $n = 8$) of the students had another nationality than German. No significant differences between intervention group (IG) and control group (CG) could be found. Distribution of gender [χ^2 ($df = 1, N = 919$) = 1.54, $P = 0.22$] and nationality [χ^2 ($df = 1, N = 919$) = 0.39, $P = 0.53$] as well as age [$M_{IG} = 6.63$ versus $M_{CG} = 6.60$, t ($df = 917$) = -0.84 , $P = 0.40$] and baseline levels of the three outcomes [skills: $M_{IG} = 1.61$ versus $M_{CG} = 1.60$, t ($df = 917$) = -0.15 , $P = 0.88$; externalizing behaviour: $M_{IG} = 0.32$ versus $M_{CG} = 0.30$, t ($df = 917$) = -0.40 , $P = 0.69$; internalizing behaviour: $M_{IG} = 0.32$ versus $M_{CG} = 0.35$, t ($df = 917$) = 1.05, $P = 0.29$] equalled for both groups.

Programme effects

Effects on skills

Both, inclusion of wave as random slope [χ^2 ($df = 2$) = 186.30, $P < 0.001$] and inclusion of wave

squared [χ^2 (df = 1) = 29.00, $P < 0.001$] significantly improved model fit. In contrast, extensions of the model by intervention [χ^2 (df = 1) = 0.24, $P = 0.63$] and by interaction term between wave and intervention [χ^2 (df = 1) = 1.51, $P = 0.22$] did not. Estimates of the final model are presented in Table I. Also presented in Table I are the intraclass correlation coefficients for the levels of student, class and school in the respective final model of skills and the following outcomes.

Both, the coefficient of intervention ($\beta = 0.02$, $P = 0.83$) and the coefficient of intervention by wave interaction did not reach significance ($\beta = 0.01$, $P = 0.22$), indicating that developmental trajectories of skills were quite similar for both groups (see Fig. 2).

The additional step of entering baseline level of skills and baseline level by intervention interaction improved model fit [χ^2 (df = 2) = 1874.53, $P < 0.001$]. However, the coefficient of the baseline

level by intervention interaction ($\beta = 0.05$, $P = 0.05$) just missed significance.

Effects on externalizing behaviour

Both, specification of a random-coefficient model [χ^2 (df = 2) = 63.14, $P < 0.001$] and quadratic relationship between wave and growth in skills [χ^2 (df = 1) = 9.41, $P < 0.01$] contributed significantly to improvement of model fit. Inclusion of intervention did not further improve model fit [χ^2 (df = 1) = 0.38, $P = 0.54$], whereas inclusion of the intervention per wave interaction term did [χ^2 (df = 1) = 9.02, $P < 0.01$]. The coefficients of all included covariates are presented in Table I. Intervention and control group having almost the same baseline level cognizable by the insignificant coefficient of intervention ($\beta = -0.00$, $P = 0.97$) differed significantly in the developmental trajectories of externalizing problem behaviour as indicated by the significant intervention by wave interaction ($\beta = -0.02$,

Table I. Results from the growth-curve models of the three outcomes and intraclass correlation coefficients

	Skills			Externalizing behaviour			Internalizing behaviour		
	Estimate	SE	P-value	Estimate	SE	P-value	Estimate	SE	P-value
Fixed effects									
Intercept	1.692	0.051	<0.001	0.196	0.036	<0.001	0.316	0.035	<0.001
Wave ^a	0.163	0.015	<0.001	0.032	0.010	0.001	0.009	0.006	0.168
Wave squared	-0.017	0.003	<0.001	-0.007	0.002	0.002			
Gender	-0.171	0.037	<0.001	0.222	0.026	<0.001	0.077	0.023	0.001
Gender $\times$ wave	-0.051	0.011	<0.001	0.003	0.007	0.605	0.004	0.008	0.562
Intervention ^b	0.017	0.079	0.824	-0.002	0.056	0.969	-0.044	0.056	0.428
Intervention $\times$ wave	0.014	0.011	0.219	-0.020	0.007	0.003	-0.027	0.008	0.001
Variance components									
Student									
Intercept	0.487	0.016		0.353	0.011		0.280	0.011	
Wave slope	0.110	0.006		0.054	0.004		0.070	0.006	
Class									
Intercept	0.245	0.048		0.177	0.021		0.183	0.021	
School									
Intercept	0.361	0.253		0.000	0.000		0.000	0.000	
Residual	0.314	0.005		0.217	0.003		0.240	0.004	
Intraclass correlation coefficients									
Student	0.610			0.620			0.478		
Class	0.147			0.153			0.193		
School	0.003			0.000			0.000		

^aWave was centred at baseline and coded 0–4.

^bIntervention was coded 0 and 1 with one indicating the intervention group.

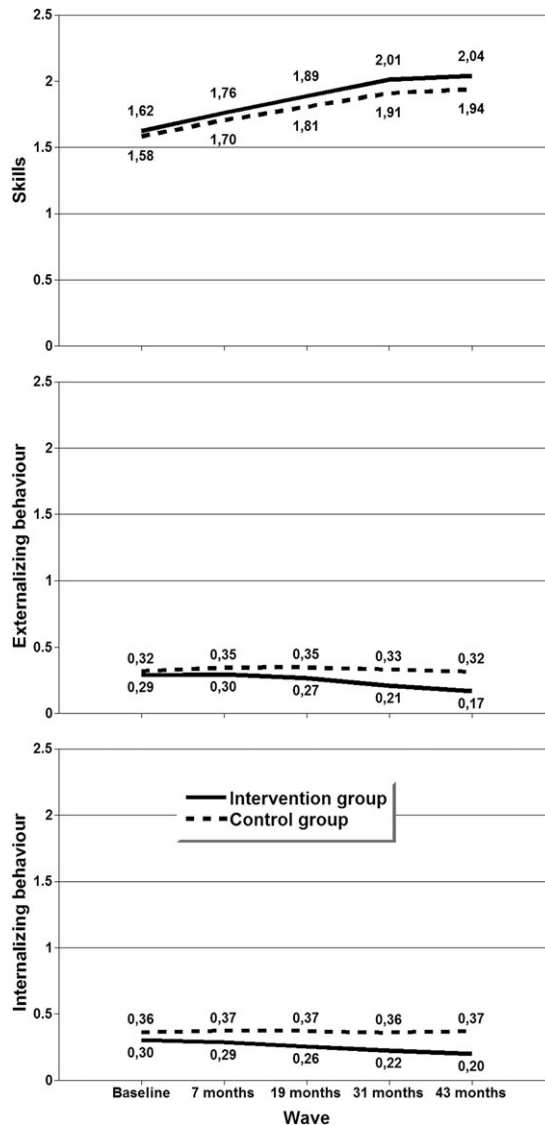


Fig. 2. Average developmental trajectories of skills, externalizing behaviour and internalizing behaviour in intervention and control group. The y-axis represents the adjusted means of the respective outcome. The numbers next to the graphs indicate the values of the adjusted means per group and wave.

$P < 0.01$; see Fig. 2). Inferring from the negative sign of the coefficient and its value, externalizing behaviour decreased somewhat faster, i.e. on an average of ~ 0.02 units per wave, in the intervention group over the course of the study.

Extending the regression equation by the level of externalizing behaviour at baseline and baseline level by intervention interaction improved model fit [χ^2 (df = 2) = 1836.91, $P < 0.001$]. The two significant coefficients of baseline level ($\beta = 0.90$, $P < 0.001$) and baseline level by intervention interaction ($\beta = -0.07$, $P < 0.01$) as well as the negative sign of the latter indicated that the decrease in externalizing behaviour in the intervention group was especially pronounced for children with higher baseline levels.

Effects on internalizing behaviour

Inclusion of wave as a random slope contributed to model improvement [χ^2 (df = 2) = 106.65, $P < 0.001$], whereas inclusion of wave squared did not [χ^2 (df = 1) = 1.06, $P = 0.30$], indicating a linear relationship between time and internalizing behaviour. Entering intervention into model equation as a further covariate also did not enhance model fit [χ^2 (df = 1) = 2.51, $P = 0.11$]. However, extension of the model by intervention by wave interaction did [χ^2 (df = 1) = 11.49, $P < 0.001$]. The estimates of the final model are presented in Table I. Both groups had comparable baseline levels as cognizable by the insignificant coefficient of intervention ($\beta = -0.04$, $P = .43$). However, as indicated by the significant coefficient of intervention by wave interaction, its negative sign and its value ($\beta = -0.03$, $P = 0.001$) internalizing behaviour decreased apparently faster, i.e. on an average of ~ 0.03 units per wave, in the intervention group (see Fig. 2).

Although model fit was improved by entering baseline level of internalizing behaviour and baseline level by intervention interaction [χ^2 (2) = 1374.56, $P < 0.001$], no significant interaction between level of internalizing behaviour at baseline and intervention was found ($\beta = -0.05$, $P = 0.10$).

Repeating the analyses with equalized sizes in intervention and control group, no differences in the results on general group effects were found. However, the additional analyses on the respective interactions between the baseline levels of the outcomes and the intervention detected two discrepancies: the interaction between baseline level of skills and intervention was significant ($\beta = 0.06$,

$P < 0.05$), while the one between baseline level of externalizing behaviour and intervention was insignificant ($\beta = -0.05$, $P = 0.09$).

Discussion

Aim of the current study was to introduce and to evaluate the life skills programme EW in elementary school. Programme effects on life skills and on externalizing and internalizing behaviour, both proven antecedents of adolescent risk-taking behaviour, were tested.

Participation in EW led to a significant reduction in both dimensions of childhood problem behaviour. Compared to students in the control group, students in the intervention group showed a faster decline in externalizing as well as in internalizing behaviour patterns. The decline was especially pronounced for students with higher levels of externalizing behaviour at baseline. Concerning the development of life skills, no group effect could be found.

The results on externalizing and internalizing behaviour are in line with the findings of short-term studies on the Good Behavior Game, the Positive Action Program and the SSDP [18–20]. However, programme effects not only on certain types but also on the two global domains of childhood problem behaviour were only investigated by Hawkins *et al.* [19]. In contrast to the current study, only effects on externalizing behaviour of boys could be found [19]. Differences between the results might be due to the employment of different measurement instruments—the Teacher Report Form of the Child Behavior Checklist [33] by Hawkins *et al.* [19] versus scales by Berg *et al.* [29] in the current study—and the focus of life skills promotion. While the SSDP focuses on the promotion of social skills, EW targets at both inter- and intrapersonal skills. Since in the current study, both, externalizing and internalizing behaviour, were positively affected, one might conclude that training of both type of skills might be essential for achieving this result.

In contrast, the findings concerning skills contradict held expectations. Primarily, shortcomings in

the measurement are discussed. One might argue that the skills actually targeted by the content of the programme were not assessed validly by the employed instrument. The field of research on life skills is still lacking validated measurement instruments, which complicates the undertaking of detecting any programme impact [34]. That the measurement could be biased due to the Rosenthal effect [35] is regarded as unlikely since both, teachers of intervention and of control classes, could have rated their students' skills according to certain expectations. Due to the fact that no programme effects on life skills could be found, no conclusion on the mechanisms through which EW affects childhood problem behaviour could be drawn. The assumption that the decrease of problem behaviour would be mediated through an increase in life skills could not be tested since the presumed mediator was not affected by the programme.

Strengths of the study are the repeated trainings of teachers of the intervention classes to provide them with continued monitoring and guidance during programme implementation. The used growth-curve models for statistical analyses of programme effects enabled—because of allowing varying numbers of data points between individuals—a participation rate at the repeated surveys of 98% in the current study. The scales that assessed the two domains of childhood problem behaviour were based on validated measures that were developed for the survey of teachers [29].

There are also several limitations. First of all, the methodological deficiencies resulting from the employed quasi-experimental controlled design should be mentioned. Since enrolment took place after random allocation of schools to intervention and control groups and participation was voluntary, equality of the groups cannot be assured. Indeed, the respective number of schools—19 in the intervention group versus 31 in the control group—agreeing to participate in the study concluded that the knowledge of the assigned group and the effort to expect might have affected the decision. However, preliminary analyses revealed that both groups did not significantly differ in main outcomes and covariates at baseline. Other

possible group differences due to the employed procedure of allocation and enrolment were statistically accounted for by using multilevel analyses. Finally, successful replication of the general group effects in additional analyses with equalized group sizes supported the assumption that the gained results were not falsified due to systematic differences between the groups. However, concerning the results on interactions between intervention and the baseline levels of skills and of externalizing behaviour, findings of the additional analyses advised caution for interpretation.

Secondly, bias in attrition cannot be excluded. The results of the comparison of AS and excluded students concluded that the reason for missing data is related to the outcomes and therefore not completely at random. However, the attrition rate was very small (only 2%) and therefore listwise deletion as chosen method to handle the missing data quite acceptable [36].

Thirdly, due to deficient literacy of the students, data solely based on teachers' reports of their students' behaviour. However, studies on agreement between multiple reporters indicate that teachers' reports, e.g. internalizing and externalizing patterns, are quite similar to parents' and children's ratings especially in elementary school [37, 38].

Finally, reported results were based on the investigation of a sample of elementary school children in Saxony, therefore generalizability of the results is restricted.

In summary, the life skills programme EW seems to be successful in reducing both domains of childhood problem behaviour, externalizing and internalizing behaviour. This finding is very promising—with implications for the prevention of a variety of risk-taking behaviours in adolescence.

However, results of the current study need to be replicated in carefully designed studies such as randomized controlled trials with long-term follow-ups employing validated assessment instruments for multiple data sources. One's focus should be on possible mechanisms through which EW impacts its proximal as well as its long-term targets.

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Conflict of interest statement

None declared.

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