

HEALTH PSYCHOLOGY

BULLETIN

EDITORIAL HISTORY

Testing the effectiveness of a short-term stress prevention programme in primary school students

Chris Englert, Aline Bechler, Sarah Singh & Alex Bertrams

This document contains the editorial history, organized into three sections. This first section, section 0, provides background information about the paper and the review procedure. Section 1 is organized chronologically and contains the editorial communication and peer review history. Section 2 contains the successive preprints and is organized anti-chronologically.

DOI of article:	10.5334/hpb.11
DOI of this editorial history:	10.5334/hpb.11.pr1
Article submitted:	2017-11-10
Revisions submitted:	2018-05-14, 2018-06-22
Article accepted:	2018-06-22
Editors:	Phil Jefferies & Ad Kaptein
Peer reviewer A:	Nathalie Michels
Peer reviewer B:	Gjalt-Jorn Peters

Cite this document as:

Englert, C., Bechler, A., Singh S., & Bertrams, A. (authors); Michels, N. & Peters, G.J.-Y. (reviewers); Jefferies, P. & Kaptein, A. (editors) (2018) Editorial history for 'Testing the effectiveness of a short-term stress prevention programme in primary school students'. *Health Psychology Bulletin*, 1(1). doi:[10.5334/hpb.11.pr1](https://doi.org/10.5334/hpb.11.pr1)

Paper abstract

The present study tested the effectiveness of a four-week, school-based, universal cognitive-behavioural stress prevention programme. The prevention programme included short daily exercises which were adopted from two well-validated anti stress trainings. The daily exercises took approximately 10–15 minutes on average and were performed during regular classroom sessions. Half of the classes were randomly assigned to the prevention group ($n = 80$), while the other half were sorted into the non-treatment control group, which did not take part in the stress prevention programme ($n = 73$). The students' physical and psychological stress-related symptoms were assessed five times (i.e., prior to the training and after each week of training). Their coping strategies, self-efficacy and self-control were also measured. It was hypothesized that in the prevention group students' physical and psychological stress-related symptoms would significantly decrease over time, compared to the non-treatment control group. Contrary to our predictions, the prevention programme did not lead to statistically significant changes in physical or psychological stress-related symptoms. The students' coping strategies, self-efficacy and self-control did not have an influence on the result patterns. The results indicate that short-term stress prevention programmes may not be as effective as long-term programmes.

Background

This peer review history is published under Health Psychology Bulletin's peer review policy. Peer review at Health Psychology Bulletin (HPB) is blind, but upon acceptance of an article, the entire peer review history is made public. This policy has two aims. First, it makes the reviews citable, rewarding reviewers for their reviews, incentivizing thorough, thoughtful reviews, and stimulating constructive, considerate reviews and responses. Second, to yield the best of both worlds in terms of design of the review procedure. The common procedure of shielding authors' and peer reviewers' identities aims to prevent undue harshness or leniency. However, this anonymity also protects reviewers who make unreasonable requests or statements that are inconsistent with the literature, and authors who refuse to respond adequately to reviewers' requests. These risks are ameliorated by unblinding and publishing the peer review procedure upon paper acceptance.

Health Psychology Bulletin

Health Psychology Bulletin (HPB) is an official journal of the European Health Psychology Society (EHPS). It implements a number of innovative practices such as this peer review procedure, a strong full disclosure policy, a two-tiered review procedure, and explicitly welcoming null findings, replications, and reports of lessons learned such as failed manipulations or measurement instruments, as well as regular articles.

Section 1: editorial communication

Round 1: reviewer A

2018-04-10 07:03 AM

Abstract: The sample size is missing

Methods:

-How will the classes be divided over intervention and control group: e.g. will classes from the same school be classified together or not? How much classes will you allow to be from the same school? Have you registered whether there are ongoing stress-related reducing activities (structured) in the school?

- Timing from January to March: are there any 'exams' during this period (same timing for intervention and control region)

-Sampling: you sample third- and fourth-grade students: is this the same age as for which the stress reduction programs were developed?

- baseline assessment: in the demographic information, will you also consider socio-economic status?)

-Used questionnaires: can you give data about reliability? Will sum scores be used or how will the questionnaire data be handled?

-Implementation by the teachers: will there be an implementation check (whether the teachers really gave all classes, whether students received the foreseen 'dose')

Language:

-abstract line 9 (and methods line 24): were assessed at five time times of measurement -> five times

Round 1: reviewer B

2018-04-16 07:05 AM

OVERALL

These introduction and methods sections describe a stress reduction program for children. This is a very important topic, and the intervention and evaluation are well designed. The authors went to admirable length to fully disclose this study (although I have some suggestions for improving this even more). All in all, I am very much looking forward to seeing the results and discussion. I have listed suggestions for improvement of the manuscript below.

FULL DISCLOSURE / OPEN SCIENCE

(copy of information entered in the dedicated portion of the review form)

NO - Includes protocols for recruitment of participants and guiding participants through the study

NO - Includes templates for communications with participants (if applicable)

YES - Includes operationalisations of measurements (e.g. questionnaires, source code)

YES - Includes operationalisations of manipulations (e.g. intervention manuals, stimuli, etc)

YES - Includes analysis plan

NO - Includes proposal for ethical approval

NO - Includes confirmation of ethics approval/Institutional Review Board (IRB) approval

In case any protocols existed to guide selecting and approaching schools, interacting with schools, parents, and participants, and other operational aspects of the study, it would be great if these could be included. If they are no longer available, please state this. Note that the protocols do not have to be translated to English; researchers who wish to examine the materials yet do not speak whichever language they were written in can decide for themselves whether to translate the materials.

Regarding the last two points, it's quite possible that no ethical approval was sought (and therefore, obtained; also see the review comments); in that case, please state so in the manuscript, because some readers will wonder about this.

ABSTRACT

p. 2, l. 16: The phrasing 'it was assumed' strikes me as a bit odd. It sounds a bit trivial (the alternative, after all, is that the authors assumed that the stress prevention programme would not work). I assume that the authors mean to make their hypothesis explicit, which is sensible, but in that case I think explicitly naming the hypothesis as hypothesis would be useful.

INTRODUCTION

p. 3, l. 37: I'm not sure it's correct to say 'suffer under'. Perhaps 'suffer of'? I'm not a native speaker, mind, so this may be incorrect; in any case, I'd double-check! [ED: just 'suffer' works well]

p. 3, l. 46: Instead of 'highly', perhaps the authors mean 'very'? Again, 'highly' may also be correct; it strikes me as a bit odd, but I'm not a native speaker. [ED: Yes, if 'very' doesn't suit, don't include an adjective]

p. 3, l. 47: The term 'life event' is normally reserved for specific high-impact events, such as moving to another city, changing jobs, or losing a loved one. Is this what is meant here, or do the authors mean 'stressor' in general?

p. 3, l. 49: Developmental psychology is not my field, but aren't childhood and adolescence *different* periods?

p. 3, l. 53: "most" and "often" seems a bit double.

p. 4, l. 55: I first read this 'this' as referring to the exercises interfering with classroom sessions. As I said, I'm not a native speaker, so it might be me - but on the other hand, other native speakers may misunderstand the reference at first, too.

p. 4, l. 60: Was the goal of the present study to develop this programme, to evaluate it, or both?

p. 4, l. 61: Where it says 'including', the authors may mean 'that includes'

p. 4, l. 65: 'Kids' strikes me as a bit informal.

p. 4, l. 71: 'Respective' is usually used to distinguish one of several elements; it seems out of place here. It can probably be omitted without loss of meaning.

p. 4, l. 72: A bit more theoretical background as to the intervention components and other logic underlying the programme would be nice. At this point, the reader has no idea what exactly this programme will be. What are the theoretical underpinnings, of the programme? Which aspects of the target individuals' psychology does the programme target (coping, I assume? Other variables or processes, too, perhaps?)? Which methods does the programme use to target these components, and on what was the assumption that they would be effective based? A logic model would be very helpful to help the readers understand this. I'm not sure how familiar the authors are with logic models, and the same concept can have different names in different fields, so I'll take the liberty to briefly describe them. Basically, a logic model as I mean here is a visualisation of the relevant aspects of target individuals' psychology as well as the causal assumptions underlying the programme. For example, an intervention that would aim to decrease stress by teaching children coping skills and assisting them in monitoring their stress levels perhaps assumes that adequate signaling of high stress levels and adequate coping with that stress guards against too high stress levels and the negative consequences this may have. A logic model illustrating this would contain 'boxes' for the stress levels and consequences, as well as the assumed determinants (self-monitoring and coping skills), and methods employed to target those determinants. Unidirectional arrows illustrate the assumed causal links (e.g. from the methods to the targeted determinants and from the determinants to actual experienced stress levels, and from those stress levels to the undesirable consequences of high stress levels). So, a logic model is a visualisation of the application theory to the problem at hand. It quickly gives the reader an overview of why the different components of the program can be expected to be effective. In addition to helping the reader understand the programme and its theoretical basis, grounding the introduction in theory also provides grounds for thinking about the effects of the intervention in the discussion section, as well as allow inclusion of the study in meta-analyses where stress reduction interventions with different components are compared. Note that a lot of the theoretical basis for the intervention is included in the methods section, specifically on pages 7 and 8, but there, it is interspersed with information about the practical application of the methods. It would be helpful for the readers to separate the theoretical and operational aspects.

METHODS

p. 4, l. 74: Perhaps it is a good idea to start the methods section with the sampling and recruitment. Currently, the reader encounters schools in the procedure section, without knowing how schools fit in the study exactly.

p. 4, l. 74: How was randomization applied exactly? Was a computer programme used, or random.org, or another procedure?

p. 5, l. 79: Could the authors be a bit more specific about these organisational difficulties? It seems like an important lesson may be here, and future researchers could benefit from the lessons learned here by the authors. Discussing the situation in a bit more detail allows elaborating on potential preventive measures that may be taken in planning future similar studies in the discussion section. If the authors already plan to (or discuss) these difficulties in more detail in the results section, please disregard this comment.

p. 5, l. 81: How was this unique, anonymous code generated, exactly? Could other researchers benefit from applying the same procedure? Are there any supplemental materials the authors happen to have available, inclusion of which may save other researchers time? Note that if the authors happen to have something ready in another language than English, it's ok to include it in that language. The goal is to minimize total effort; even when the materials are published in another language, future researchers can decide whether it pays off to translate the materials or not on a study-by-study basis. Instead of having uploaded the baseline questionnaire, the authors seem to have uploaded the manuscript file again (I found another copy of the manuscript file in the supplemental materials). Had the baseline questionnaire been available to me, this comment may have been resolved already; so in that case, please disregard this comments.

p. 5, l. 82: Were there missing values? How were those dealt with? Were the questionnaires inspected for whether the students completed them seriously or not? Note that it's possible that this was not done; there are many considerations that may justify such a decision. But it is important for readers to know the planned data cleaning procedures. For example, meta-analyses may want to code aspects of data cleaning in a risk of bias measure. This information can be included in the 'preliminary analyses' section on page 9.

p. 6, l. 106: I'm not sure that 'outlined' is the right word here; perhaps the authors mean 'suggested'?

p. 8, l. 159-160: isn't this information duplicating what was already reported in lines 145-156 on page 7?

p. 8, l. 174: how many schools were contacted, and how many responded positively?

p. 9, l. 178: Please include the power protocol as generated by G*Power in the supplementary materials, so that readers have additional details about, for example, the analysis type and whether covariates were specified.

p. 10, l. 204: Is it correct that this study has not been presented to (and therefore, was not approved (or disapproved)) an ethical board? In any case, I think it is useful to be explicit as to whether this happened. Legislation regarding ethics in research with humans developed at differential rates in different countries, but in some countries such a study with children would have to be approved by an ethical board first, so some readers will wonder about this.

Round 1: editor decision

2018-04-25 02:57 PM

Dear Dr Englert,

Apologies again for the delay with the processing of your manuscript.

After review, we have reached a decision regarding your submission to Health Psychology Bulletin, "Testing the effectiveness of a short-term stress prevention programme in primary school students". Our decision is to request revisions of the manuscript prior to acceptance for publication.

The full review information should be included at the bottom of this email. There may also be a copy of the manuscript file with reviewer comments available once you have accessed the submission account. A summary of the requested edits from the editorial team can be found below. Please consider these points and revise the file accordingly.

To access your submission account, follow the below instructions:

- 1) login to the journal webpage with username and password
- 2) click on the submission title
- 3) click 'Review' menu option
- 4) download Reviewed file and make revisions based on review feedback
- 5) upload the edited file
- 6) Click the 'notify editor' icon and email the confirmation of re-submission and any relevant comments to the journal.

Please ensure that your revised files adhere to our author guidelines, and that the files are fully copyedited/proofed prior to upload. Please also ensure that all copyright permissions have been attained. This is the last opportunity for major editing, therefore please fully check your file prior to re-submission.

If you have any questions or difficulties during this process, please do contact us.

Please could you have the revisions submitted by 10th May. If you cannot make this deadline, please let us know as early as possible.

Kind regards,

Dr Phil Jefferies

Dalhousie University

Round 2: cover letter

2018-05-14 09:09 AM

Dear Phil,

Thank you for your constructive review concerning our paper entitled "Testing the effectiveness of a short-term stress prevention programme in primary school students" submitted to Health Psychology Bulletin.

We hereby submit the full paper including the results and discussion section. As requested, we also uploaded the raw data, syntax and output online (https://figshare.com/articles/Untitled_Item/6264767). We again thank you for your constructive review. We hope for further positive comments from you, and we would be honored if you were to consider our paper for publication in Health Psychology Bulletin.

Sincerely,
Chris Englert, Aline Bechler, Sarah Singh and Alex Bertrams

P.S. Could you send me conformation that you received the submission in good order?

Round 2: responses to reviewers

Our response to the comments of reviewer 1:

Reviewers' comments	Our response
1. These introduction and methods sections describe a stress reduction program for children. This is a very important topic, and the intervention and evaluation are well designed. The authors went to admirable length to fully disclose this study (although I have some suggestions for improving this even more). All in all, I am very much looking forward to seeing the results and discussion. I have listed suggestions for improvement of the manuscript below.	First, we would like to thank the reviewer for his/her constructive review. We have the impression that his/her work has helped us to improve the quality of the paper significantly.
2. In case any protocols existed to guide selecting and approaching schools, interacting with schools, parents, and participants, and other operational aspects of the study, it would be great if these could be included. If they are no longer available, please state this. Note that the protocols do not have to be translated to English; researchers who wish to examine the materials yet do not speak whichever language they were written in can decide for themselves whether to translate the materials.	Thank you for this suggestion, unfortunately, these protocols are no longer available, as the interactions mostly took place via telephone.
3. Regarding the last two points, it's quite possible that no ethical approval was sought (and therefore, obtained; also see the review comments); in that case, please state so in the manuscript, because some readers will wonder about this.	Thank you, we received ethical approval from our university. We added this information and also uploaded the supporting decision letter of our local ethic board.
4. Abstract: p. 2, l. 16: The phrasing 'it was assumed' strikes me as a bit odd. It sounds a bit trivial (the alternative, after all, is that the authors assumed that the stress prevention programme would not work). I assume that the authors mean to make their hypothesis explicit, which is sensible, but in that case I think explicitly naming the hypothesis as hypothesis would be useful.	We agree and rephrased it accordingly: "It was hypothesized, that..."
5. p. 3, l. 37: I'm not sure it's correct to say 'suffer under'. Perhaps 'suffer of'? I'm not a native speaker, mind, so this may be incorrect; in any	Thank you, we changed it accordingly.

case, I'd double-check! [ED: just 'suffer' works well]	
6. p. 3, l. 46: Instead of 'highly', perhaps the authors mean 'very'? Again, 'highly' may also be correct; it strikes me as a bit odd, but I'm not a native speaker. [ED: Yes, if 'very' doesn't suit, don't include an adjective]	Thank you, we changed it accordingly.
7. p. 3, l. 47: The term 'life event' is normally reserved for specific high-impact events, such as moving to another city, changing jobs, or losing a loved one. Is this what is meant here, or do the authors mean 'stressor' in general?	We agree with the reviewer and changed "life events" to "stressful situations."
8. p. 3, l. 49: Developmental psychology is not my field, but aren't childhood and adolescence *different* periods?	We agree and now stick to the proper term "adolescence."
9. p. 3, l. 53: "most" and "often" seems a bit double.	We agree and deleted "often."
10. p. 4, l. 55: I first read this 'this' as referring to the exercises interfering with classroom sessions. As I said, I'm not a native speaker, so it might be me - but on the other hand, other native speakers may misunderstand the reference at first, too.	We added "this limitation" and have the impression that it is easier to understand now.
11. p. 4, l. 60: Was the goal of the present study to develop this programme, to evaluate it, or both?	The goal was to develop and to evaluate an anti-stress training. We added "evaluate."
12. p. 4, l. 61: Where it says 'including', the authors may mean 'that includes'	Thank you, we changed it accordingly.
13. p. 4, l. 65: 'Kids' strikes me as a bit informal.	We agree and changed "kids" to "children."
14. p. 4, l. 71: 'Respective' is usually used to distinguish one of several elements; it seems out of place here. It can probably be omitted without loss of meaning.	Thank you, we deleted "respective."
15. p. 4, l. 72: A bit more theoretical background as to the intervention components and other logic underlying the programme would be nice. At this point, the reader has no idea what exactly this programme will be. What are the theoretical underpinnings, of the programme?	We would like to thank the reviewer for this important recommendation! We added more information on the theoretical underpinnings of the intervention. We also tried to illustrate the logical model of our intervention, which is also in line with the

Which aspects of the target individuals' psychology does the programme target (coping, I assume? Other variables or processes, too, perhaps)? Which methods does the programme use to target these components, and on what was the assumption that they would be effective based? A logic model would be very helpful to help the readers understand this. I'm not sure how familiar the authors are with logic models, and the same concept can have different names in different fields, so I'll take the liberty to briefly describe them. Basically, a logic model as I mean here is a visualisation of the relevant aspects of target individuals' psychology as well as the causal assumptions underlying the programme. For example, an intervention that would aim to decrease stress by teaching children coping skills and assisting them in monitoring their stress levels perhaps assumes that adequate signaling of high stress levels and adequate coping with that stress guards against too high stress levels and the negative consequences this may have. A logic model illustrating this would contain 'boxes' for the stress levels and consequences, as well as the assumed determinants (self-monitoring and coping skills), and methods employed to target those determinants. Unidirectional arrows illustrate the assumed causal links (e.g. from the methods to the targeted determinants and from the determinants to actual experienced stress levels, and from those stress levels to the undesirable consequences of high stress levels). So, a logic model is a visualisation of the application theory to the problem at hand. It quickly gives the reader an overview of why the different components of the program can be expected to be effective. In addition to helping the reader understand the programme and its theoretical basis, grounding the introduction in theory also provides grounds for thinking about the effects of the intervention in the discussion section, as well as allow inclusion of the study in meta-analyses where stress reduction interventions with different components are compared. Note that a lot of the theoretical basis for the intervention is included in the

original versions of the two anti-stress programs. We basically postulate, that the components of our training (i.e., cognitive-behavioral techniques) improve emotion-focused as well as problem-focused coping skills, which should in turn reduce physical as well as psychological stress-related symptoms. We have the impression that this additional information improves the paper tremendously, thank you.

<p>methods section, specifically on pages 7 and 8, but there, it is interspersed with information about the practical application of the methods. It would be helpful for the readers to separate the theoretical and operational aspects.</p>	
<p>16. p. 4, l. 74: Perhaps it is a good idea to start the methods section with the sampling and recruitment. Currently, the reader encounters schools in the procedure section, without knowing how schools fit in the study exactly.</p>	<p>Thank you for this suggestion. We followed the HPB-instructions on how to structure the paper. If the reviewer and/or editor have the impression that it would make more sense to start the methods section with the sampling and recruitment, we can, of course, change it accordingly.</p>
<p>17. p. 4, l. 74: How was randomization applied exactly? Was a computer programme used, or random.org, or another procedure?</p>	<p>Yes, we used random.org for the randomization process.</p>
<p>18. p. 5, l. 79: Could the authors be a bit more specific about these organisational difficulties? It seems like an important lesson may be here, and future researchers could benefit from the lessons learned here by the authors. Discussing the situation in a bit more detail allows elaborating on potential preventive measures that may be taken in planning future similar studies in the discussion section. If the authors already plan to (or discuss) these difficulties in more detail in the results section, please disregard this comment.</p>	<p>The reviewer raises an important issue. It was already extremely difficult to convince these schools to participate in the 4-week training and the principals of the schools were simply not interested in continuing the study for an even longer period of time. The principals did not want to “sacrifice” any more of their resources. Regarding preventive measures, it might be helpful to offer schools some kind of incentive, however due to financial restrictions of our university, we were not allowed to offer any monetary incentives. The fact that we offered a “free” training apparently was not convincing enough.</p>
<p>19. p. 5, l. 81: How was this unique, anonymous code generated, exactly? Could other researchers benefit from applying the same procedure? Are there any supplemental materials the authors happen to have available, inclusion of which may save other researchers time? Note that if the authors happen to have something ready in another language than English, it's ok to include it in that language. The goal is to minimize total effort; even when the materials are published in another language, future researchers can decide whether it pays off to translate the materials or not on a study-by-study basis. Instead of having uploaded the baseline questionnaire, the authors seem to have</p>	<p>Thank you for this comment. We asked the children to generate their code by writing down the first letter of their father's name, the first letter of their mother's name, and the date of the day they were born. For instance, if the name of the father was Tom, the name of the mother was Ann, the kid was born on the 10th of May, then the anonymous code would be TA10. We added this information.</p>

uploaded the manuscript file again (I found another copy of the manuscript file in the supplemental materials). Had the baseline questionnaire been available to me, this comment may have been resolved already; so in that case, please disregard this comments.	
20. p. 5, l. 82: Were there missing values? How were those dealt with? Were the questionnaires inspected for whether the students completed them seriously or not? Note that it's possible that this was not done; there are many considerations that may justify such a decision. But it is important for readers to know the planned data cleaning procedures. For example, meta-analyses may want to code aspects of data cleaning in a risk of bias measure. This information can be included in the 'preliminary analyses' section on page 9.	Yes, there were missing values in our datasheet. We decided a-priori to allow two missing values max for each questionnaire. We also inspected all questionnaires for whether the students completed them seriously or not. In case the students did not complete them seriously, we had to exclude these students from our analyses.
21. p. 6, l. 106: I'm not sure that 'outlined' is the right word here; perhaps the authors mean 'suggested'?	We changed it to "previous research has shown..."
22. p. 8, l. 159-160: isn't this information duplicating what was already reported in lines 145-156 on page 7?	Thank you for this remark. In lines 145-156 we aim at giving an overview of the training as a whole, while in lines 159-160 we exclusively focus on the first day of the training. We would like to keep this part as it is, but if the reviewer and/ editor have the impression that it is redundant, we can, of course, delete this sentence.
23. p. 8, l. 174: how many schools were contacted, and how many responded positively?	This is an important remark, however according to the HPB submission guidelines, this information should be given in the results section, which we can only submit if this first submission is provisionally accepted. Nonetheless, we can hand out this information now already: We contacted six schools and four schools agreed to participate.
24. p. 9, l. 178: Please include the power protocol as generated by G*Power in the supplementary materials, so that readers have additional details about, for example, the analysis type and whether covariates were specified.	Thank you for this important remark, this will increase the transparency of our research even more. In line with HPB-guidelines, we will upload the power protocol, as generated by G*Power, as soon as this first submission is provisionally accepted!

25. p. 10, l. 204: Is it correct that this study has not been presented to (and therefore, was not approved (or disapproved)) an ethical board? In any case, I think it is useful to be explicit as to whether this happened. Legislation regarding ethics in research with humans developed at differential rates in different countries, but in some countries such a study with children would have to be approved by an ethical board first, so some readers will wonder about this.	We added the missing information: The study was approved by the local ethical board. We also uploaded the decision letter of our local ethic board.
--	---

Our response to the comments of reviewer 2:

Reviewers' comments	Our response
1. Abstract: The sample size is missing	<p>First, we would like to thank the reviewer for his/her constructive review. We have the impression that his/her work has helped us to improve the quality of the paper significantly.</p> <p>According to the guidelines of HPB, "the sample size, nor sample characteristics, are not described in the Methods section, but in the Results section." As we only submitted the introduction and methods sections of the paper yet, we did not include the sample size. If the paper is provisionally accepted, we will, of course, add this information. If the reviewer and/or editor has the impression we should deliver this information, we can, of course, do so.</p>
2. How will the classes be divided over intervention and control group: e.g. will classes from the same school be classified together or not? How much classes will you allow to be from the same school? Have you registered whether there are ongoing stress-related reducing activities (structured) in the school?	Thank you for this remark. Classes from the same school were assigned to the same condition, in order to rule out the possibility that students from different conditions would "influence" each other. We asked all the teachers whether there were any ongoing stress-related reducing strategies, but that was not the case in any of the classes.
3. Timing from January to March: are there any 'exams' during this period (same timing for intervention and control region)	Yes, there were exams during this period at all schools. The timing was the same for the intervention group and the control group.

4. Sampling: you sample third- and fourth-grade students: is this the same age as for which the stress reduction programs were developed?	Yes, both stress reduction programs are suitable for these age groups.
5. baseline assessment: in the demographic information, will you also consider socio-economic status?)	No, unfortunately we did not assess socio-economic status.
6. Used questionnaires: can you give data about reliability? Will sum scores be used or how will the questionnaire data be handled?	According to the HPB guidelines, reliability scores should not be mentioned during the review tier 1. But of course, we are going to report the reliability scores as soon as we are allowed to submit the results and discussion section of our paper. However, all reliability scores for all scales administered were satisfactory. For each questionnaire administered, overall scores were generated by averaging each participant's answers given in the respective questionnaire; that way, higher scores are indicative of a higher value for the corresponding variable.
7. Implementation by the teachers: will there be an implementation check (whether the teachers really gave all classes, whether students received the foreseen 'dose')	Yes, we measured whether the teachers really gave all the classes. This was the case for all classes.
8. Language: abstract line 9 (and methods line 24): were assessed at five time times of measurement -> five times	Thank you, we changed it accordingly. We appreciate the positive feedback and would like to thank the reviewer again for his/her work!

Round 2: reviewer A

2018-05-16, 02:22 PM

- Figure 1/2: please add units (or theoretical range) between brackets e.G. [0-5] so that we can interpret the values: discuss whether this group is scoring already high on mental health (that might be a reason that the intervention is not working: only small window for improvement possible).
- Please, also interpret the alpha values you get
- You can specify whether there was a loss to follow up and/or missing data (thus children that were skipped from analysis)?
- In the methods section, 'N = 141 students to detect at least a medium effect ' is mentioned, could that be a reason why you cannot find a significant effect (that the effect is not medium but small?)
- Although you mention 'While the students expressed satisfaction with the prevention programme and participated in most of the exercises' in the discussion, I do not see numbers in the results on children's satisfaction and whether they thought it influenced their stress (these 2 items were mentioned in the methods section). Other quantitative data: Implementation check: Can you also show data whether all classes were given by all teachers and how much exercises were not done by the students? This might be interesting to find an explanation for the lack of effect.
- In the methods of the intervention, it is mentioned that the intervention is expected to change coping strategies. Did you also measure coping strategies at follow-up?

Round 2: reviewer B

2018-06-10, 04:14 PM

As I indicated in the review, please explain in the manuscript why protocols for recruitment and communication were not included; as well as double-check inclusion of the ethical approval documents. Other than that, the replication package is in order: excellent!

I note the raw data was not included; perhaps because you no longer have it. If so, this is ok, but please explain this either in the manuscript or in the analysis script (or elsewhere).

OVERALL

I would like to thank the authors for their kind words - I'm glad my suggestions were helpful - and for their improvements. I share their impression that their revisions have improved the quality of the paper even further.

RESPONSES TO THE AUTHORS' RESPONSES TO THE REVIEWER COMMENTS

The authors indicate that the protocols for approaching, selecting, and interacting with schools, parents, and participants are no longer available, and in addition, that most interactions took place via telephone. I am grateful for this explanation. I think it would be even better to include this in the paper, because readers may wonder about this, as well. In addition, explicit explanations of why certain materials are omitted from the publication help cement the norm of transparency and full disclosure; it also further emphasizes one of the strengths of this manuscript (the full disclosure of so many other materials).

The authors also indicate that the ethical approval was added. Perhaps I just don't manage to find them in the Journal Management System, but I can't find these. Is it possible you forgot to upload these?

I would also like to thank the authors for having added the logic model. I think this does explain matters a bit more clearly. Ideally, the visualisation would be further separated to show the exact hypothesized effects: i.e. which constructs are targeted by which intervention components? I mean something analogously to a figure recently used in an HPR commentary, see <https://www.tandfonline.com/doi/figure/10.1080/17437199.2018.1454846>. This provides a more comprehensive overview of the theoretical assumptions underlying the intervention. However, I appreciate that this can be a lot of work, so I understand if the editor and authors decide to not implement this in this paper. However, in that case, perhaps it can be something the authors consider for future articles. I find such diagrams very useful to get a complete overview of the hypothesized active ingredients of the intervention; spot strengths and potential weak spots; assess process evaluation completeness (if applicable), and interpret evaluation outcomes in terms of where the intervention may be served by improvement. (Should the authors not be familiar with this approach, it's strongly inspired by the Intervention Mapping approach to intervention development, analysis, and evaluation; see e.g. recent a HPR paper or the book for more info).

Note, by the way, that the term is 'logic model' (I also had to get used to it - two nouns - so basically, it's a model expressing the underlying logic - not a model that is logical, if you know what I mean).

Regarding the authors' response to comment 16: I defer to the editor's decision, of course. And the authors probably also have an idea about what works best in the narrative/flow of the paper. I personally always consider rules as extremely useful instruments, that quickly lose their usefulness if they become the ends instead of the means :) In other words, I think that if reordering is clearer to the reader, deviation from the default prescription is fine.

Regarding the authors' response to comment 17: I realise I have forgotten to include my default 'disclaimer' in this review, my apologies. I usually start by explaining that when I ask a question, I mean to communicate that whatever I'm asking is insufficiently clear - at least to me, so probably also to at least some other readers. So when I ask a question, I don't mean to elicit an answer in the response to readers - instead, it's meant as a prompt to clarify the manuscript. The same goes here: could the authors perhaps explain in the manuscript how they randomized? This is important information (see e.g. https://www.ehps.net/ehp/index.php/contents/article/download/1661/pdf_161).

The same goes to the authors' response to comment 18. Again, my apologies for not having been clear. I think it is important that as many lessons as possible can be taken away from this manuscript, also as they pertain to practical issues. The authors' experiences with obstacles and their interpretation of the potential reasons for those obstacles can be very useful to others planning similar studies. Could you perhaps include the explanation you now included only in the response to the reviewers in the manuscript itself? In addition, it would be useful if you would expand upon this in your recommendations for future research, as well.

And again, in comment 20 - could the authors please add this to the manuscript as well? Alternatively, they could

indicate in the 'preliminary analyses' section that the data cleaning procedures etc are explained in detail in the comments of the syntax file that is available at the FigShare repo.

I almost don't dare to ask this, but could the authors perhaps either upload all materials as supplementary materials (they could be in a zip archive, for example), or to a dataverse or OSF repository? Figshare is a commercial organisation, and I'm not sure that materials posted there will remain freely available forever. Perhaps the editorial staff can also take care of compiling one complete full disclosure package in one location; but perhaps the authors have specific reasons for 'splitting' their full disclosure files, and they want to stick to figshare, so that's why I check.

Regarding comment 23: excellent point, I should have been more alert. My apologies!

I also have one comment relating to the 6th comment by the other reviewer: you can always give the information about reliability that you had available before collecting data in your methods section, when you describe the operationalisations. This information is, after all, if available that is, probably part of your rationale for selecting a given operationalisation. You can then enter the verification results (e.g. reliability coefficients as computed from your sample) to the results section.

Finally, before I start discussing the revised manuscript itself, I want to thank the authors for their constructive responses to the raised issues. As I said, I feel this strengthens the manuscript.

INTRODUCTION AND METHODS

I think the introduction and methods sections have improved, and can improve further if the authors apply some remaining comments as I made them above. I've also looked up 'preventative', and apparently, it's not incorrect - I thought the correct words was 'preventive', but apparently, both can be and are used. The editor is a native speaking; perhaps he can add his advice here.

I notice that in this full version of the manuscript, the authors have removed the 'analysis plan' section. I would suggest they return it, for two reasons. First, when these plans are deviated from, it's useful to have already listed the plans, so that it's more natural to explain the deviations (as the reader is already familiar with the original plans). Second, when sticking to the plans, this is also explicit: it elicits confidence that, for example, no p-hacking was conducted.

RESULTS

Randomization and inferential statistics

The authors compute p-values to compare the two groups. However, the two groups are by definition from the same population - randomization has guaranteed that any difference between the groups reflects noise (see https://www.ehps.net/ehp/index.php/contents/article/download/1661/pdf_161 for a more detailed explanation). Please refrain from reporting p-values and simply report the effect sizes. In addition, when analysing the association between a dichotomous and a continuous variable, Cohen's d is easier to interpret for most readers than eta squared (also, no partial eta squared exists in a oneway anova; that is, it's equivalent to the regular eta squared - after all, it's not a multivariate analysis). You could use the function 'convert.means.to.d' in the 'userfriendlyscience' R package to easily convert the descriptives in Table 1 to effect size measures, for example:

```
convert.means.to.d(means = c(3.09, 3.18), sds = c(.69, .81), ns = c(80, 73));
```

This yields 0.12 (so the groups are practically equivalent for all practical purposes).

(note that you first have to use `install.packages('userfriendlyscience')` to install the package, and then `require('userfriendlyscience')` to load it)

Normally I'd suggest computing the confidence intervals as well, but these are nonsensical given that there exists no population parameter you're estimating - this is one of the rare situations where you are actually interested in the effect size as it occurs in the sample, so the point estimate is actually informative.

Including self-efficacy as a covariate

I am not convinced the difference in self-efficacy between the groups ($d = .40$) means that it is wise to include self-efficacy as a covariate. I am not sure the self-efficacy construct is conceptually completely orthogonal to the dependent variable (stress related symptoms). If these operationalisations do overlap, then inclusion of self-efficacy as a covariate (i.e. removal of all self-efficacy-related variance in the dependent variable) may decrease the validity of the data series that remains as representation of stress-related symptoms. This is not my field - so I'm simply suggesting this for the authors to reflect on. If they share this concern, they could repeat the analysis both including and excluding SE as a covariate, reporting whether this matters for the results.

Main analyses

Could the authors please report p-values in three decimals? I know that given the fully disclosed analysis package, this seems like nitpicking, but it's a convention that may be useful to retain until full disclosure becomes the norm rather than the exception in the literature at large.

I would greatly appreciate a visualisation of the results; i.e. a plot with time on the X axis, the aggregated stress-related symptoms measure (i.e. the DV) on the Y axis, dots for each participants' observations, and separate lines to connect the means of the two groups. But depending on the software the authors are familiar with, this may not be easy to realise (as the authors will have noticed I mainly use R, where this is relatively easy). I have taken the liberty to download the dataset and write a bit of R code to create these plots. I will upload the plots and the R script as part of the review; I leave it to the authors' preference whether they want to include the plots in the supplemental materials and/or use or adapt the code and/or include these or different plots.

DISCUSSION

Results

The discussion starts with a description of the design, but this section does not include any results. This seems a bit odd - the limitations are discussed before the results are listed. I would relocate the first half of the first paragraph currently under 'Limitations' to the first section of the discussion.

Explanations of the findings

The findings are extremely interesting. It feels like they are sold short by discussing them as limitations. I suggest splitting this section into two sections: one labelled 'Limitations', where the limitations of the study's design are discussed; and one section that precedes it, labeled, for example, 'Explanations' or so, where the findings are discussed more in details. This first section could then be expanded a bit. After all, the authors have, I assume, a nontrivial amount of expertise regarding stress and stress management in this target population; and I also assume that they developed this program to the best of their ability. The presently discussed explanations for the apparent ineffectiveness of the program seem like things that could have, and probably have, been thought of in advance. These results are quite surprising; I think they can be done more justice by reflecting more thoroughly on what could have caused them. In the 'Limitations' section, I would suggest discussing only limitations of the study; in other words, of the design. For example, the determinants that were targeted by the interventions could have been measured to have an idea of which of the program's components were effective, and which were not. Another example is that fidelity of the program's implementation does not seem to have been assessed. For example, is it possible the teachers, meaning well but unknowingly invalidating the IV's operationalisation, also paid more attention to stress in the control groups?

Recommendations

A closer link between the potential explanations for the findings and the limitations on the one hand, and the recommendations on the other hand, would also be helpful. Ideally, I think these recommendations should connect to the potential explanations and limitations in such a way that they describe which characteristics future designs should have to make sure these potential explanations can be ruled out, and these limitations can be lifted. Ideally, after having read this article, the readers have learned a few useful lessons to improve their own future designs.

Closing the discussion

Finally, one last paragraph labeled e.g. 'Conclusion' could be added, summarizing the results and the most important recommendations. The present final sentence seems a bit odd; since one of the main issues discussed in the discussion is that perhaps short-term interventions can, because of their short-term nature, not have an effect, it seems odd to conclude with recommending more effective short-term programmes. Would it not make more sense to recommend to take a step back, and first conduct more 'basic' research into the used methods, to explore their value in short-term programmes? After all, if there is one lesson we can learn from this study, it is that at least some things the authors (and probably many researchers with them) thought they knew about stress, the determinants of stress/coping, and methods to improve/change those, may be wrong. That seems an extremely important lesson, not to be dismissed lightly. Basically, it suggests "back to the drawing boards"; warning other researchers from moving towards intervention development too quickly seems appropriate?

Round 2: editorial decision

2018-06-19 01:15 PM

Dear Dr Chris Englert,

This is in response to the file: 11-75-3-ED.docx dated 2018-05-15, 15:55. Please let me know if this is incorrect.

After review, we have reached a decision regarding your submission to Health Psychology Bulletin, "Testing the effectiveness of a short-term stress prevention programme in primary school students". Our decision is to request revisions of the manuscript prior to acceptance for publication.

The full review information should be included at the bottom of this email. There may also be a copy of the manuscript file with reviewer comments available once you have accessed the submission account. Please consider these points and revise the file accordingly.

To access your submission account, follow the below instructions:

- 1) login to the journal webpage with username and password
- 2) click on the submission title
- 3) click 'Review' menu option
- 4) download Reviewed file and make revisions based on review feedback
- 5) upload the edited file
- 6) Click the 'notify editor' icon and email the confirmation of re-submission and any relevant comments to the journal.

Please ensure that your revised files adhere to our author guidelines, and that the files are fully copyedited/proofed prior to upload. Please also ensure that all copyright permissions have been attained. This is the last opportunity for major editing, therefore please fully check your file prior to re-submission.

If you have any questions or difficulties during this process, please do contact us.

Please could you have the revisions submitted by 30th June 2018. If you cannot make this deadline, please let us know as early as possible.

Kind regards,

Dr Phil Jefferies
Dublin City University

Round 3: cover letter

2018-06-22 07:14 AM

Dear Phil,

Thank you for your constructive review concerning our paper entitled "Testing the effectiveness of a short-term stress prevention programme in primary school students" submitted to Health Psychology Bulletin.

We considered your remarks and made major changes to the manuscript accordingly (for detailed replies to the several remarks, please see table below).

We again thank you for your constructive review. By incorporating your suggestions, we are confident that the changes we have made to the original version of the paper have improved its quality tremendously. We hope for further positive comments from you, and we would be honored if you were to consider our paper for publication in Health Psychology Bulletin.

Sincerely,

Chris Englert, Aline Bechler, Sarah Singh and Alex Bertrams

P.S. Could you send me conformation that you received the submission in good order?

Round 3: responses to reviewers

Our response to the comments of reviewer 1:

Reviewers' comments	Our response
1. Figure 1/2: please add units (or theoretical range) between brackets e.G. [0-5] so that we can interpret the values: discuss whether this group is scoring already high on mental health (that might be a reason that the intervention is not working: only small window for improvement possible).	<p>First, we would like to thank the reviewer for his/her constructive review. We have the impression that his/her work has helped us to improve the quality of the paper significantly.</p> <p>We guess that the reviewer is referring to Tables 1 and 2 instead of Figure 1? We now report the range of each scale as a note.</p>
2. Please, also interpret the alpha values you get	<p>The internal consistencies were satisfactory for all measures, except for the physical stress-related symptoms measured by the SSKJ 3-8. That is why, we added a paragraph to the limitations section, discussing this limitation (page 14, lines 11-17):</p> <p>“We would also like to mention that the internal consistencies were not satisfactory for all applied measures in the current study. At T1, the α-coefficient for the SSKJ 3–8 measuring physical stress-related symptoms was rather low ($\alpha = .49$). However, previous research has delivered sound empirical evidence for the reliability and the validity of all the scales we administered (Eschenbeck, Kohlmann, Lohaus, & Klein-Heßling, 2006). Furthermore, at the other times of measurement the internal consistencies for the SSKJ 3–8 were all satisfactory.”</p>
3. You can specify whether there was a loss to follow up and/or missing data (thus children that were skipped from analysis)?	<p>We had to exclude an additional 13 students, either because language difficulties precluded following instructions or because they did not appear at more than one time of measurement. We added this information to the methods section (page 5).</p>
4. In the methods section, ‘N = 141 students to detect at least a medium effect ‘ is mentioned, could that be a reason why you cannot find a significant effect (that the effect is not medium but small?)	<p>It might indeed be possible that the effect was rather small in the present study. However, given that previous studies have reported strong effects of the trainings we adopted (Hampel & Petermann, 2003; Klein-Heßling & Lohaus,</p>

	2000), we decided to base our a-priori power analysis on a medium-sized effect in the present study.
<p>5. Although you mention ‘While the students expressed satisfaction with the prevention programme and participated in most of the exercises’ in the discussion, I do not see numbers in the results on children’s satisfaction and whether they thought it influenced their stress (these 2 items were mentioned in the methods section).</p> <p>Other quantitative data: Implementation check: Can you also show data whether all classes were given by all teachers and how much exercises were not done by the students? This might be interesting to find an explanation for the lack of effect.</p>	<p>The students were only asked verbally whether they had the impression that their stress-related experiences had decreased over the four-week period and how they rated the intervention programme. We did not collect any data here but the overall feedback we received was positive. Given that we do not have any data, we decided to omit this part in the revision.</p> <p>We did receive feedback from all the teachers that they followed our intended schedule. However, we allowed the students to keep their training manuals after the study ended, which means that we cannot count how many exercises each student actually completed. However, given that the exercises were performed during the regular classroom lessons and further given the positive feedback from the teachers, we can conclude that the students performed the exercises as intended.</p>
<p>6. In the methods of the intervention, it is mentioned that the intervention is expected to change coping strategies. Did you also measure coping strategies at follow-up?</p>	<p>The reviewer raises an important point. We only measured habitual coping tendencies at baseline. Therefore, we deleted this part from the methods section. However, we discuss this shortcoming in the discussion section (page 15, lines 9-12).</p>

Our response to the comments of reviewer 2:

Reviewers' comments	Our response
<p>1. As I indicated in the review, please explain in the manuscript why protocols for recruitment and communication were not included; as well as double-check inclusion of the ethical approval documents. Other than that, the replication package is in order: excellent!</p> <p>I note the raw data was not included; perhaps because you no longer have it. If so, this is ok, but please explain this either in the manuscript or in the analysis script (or elsewhere).</p>	<p>First, we would like to thank the reviewer for his/her constructive review. We have the impression that his/her work has helped us to improve the quality of the paper significantly.</p> <p>We now added a statement why we did not include any protocols for recruitment and communication (page 5, lines 5-7).</p> <p>Furthermore, the raw data are included in our data sheet. We simply additionally included the mean scores for each scale. We can also upload two separate data sheets if the reviewer and/or editor have the impression that this is necessary.</p>
<p>2. The authors indicate that the protocols for approaching, selecting, and interacting with schools, parents, and participants are no longer available, and in addition, that most interactions took place via telephone. I am grateful for this explanation. I think it would be even better to include this in the paper, because readers may wonder about this, as well. In addition, explicit explanations of why certain materials are omitted from the publication help cement the norm of transparency and full disclosure; it also further emphasizes one of the strengths of this manuscript (the full disclosure of so many other materials).</p> <p>The authors also indicate that the ethical approval was added. Perhaps I just don't manage to find them in the Journal Management System, but I can't find these. Is it possible you forgot to upload these?</p>	<p>Please also see our previous comments. We now explain why we did not included protocols for approaching, selecting and interacting with schools, parents and participants (page 5, lines 5-7).</p> <p>We apologize for this shortcoming and uploaded the ethical approval.</p>
<p>3. I would also like to thank the authors for having added the logic model. I think this does explain matters a bit more clearly. Ideally, the visualisation would be further separated to show the exact hypothesized effects: i.e. which constructs are targeted by which intervention components? I mean something analogously to a figure recently used in an HPR commentary, see https://www.tandfonline.com/doi/figure/10.1080/</p>	<p>We appreciate the positive comments and will consider this article in our upcoming research, thank you!</p>

<p>17437199.2018.1454846. This provides a more comprehensive overview of the theoretical assumptions underlying the intervention. However, I appreciate that this can be a lot of work, so I understand if the editor and authors decide to not implement this in this paper. However, in that case, perhaps it can be something the authors consider for future articles. I find such diagrams very useful to get a complete overview of the hypothesized active ingredients of the intervention; spot strengths and potential weak spots; assess process evaluation completeness (if applicable), and interpret evaluation outcomes in terms of where the intervention may be served by improvement. (Should the authors not be familiar with this approach, it's strongly inspired by the Intervention Mapping approach to intervention development, analysis, and evaluation; see e.g. recent a HPR paper or the book for more info).</p> <p>Note, by the way, that the term is 'logic model' (I also had to get used to it - two nouns - so basically, it's a model expressing the underlying logic - not a model that is logical, if you know what I mean).</p>	
<p>4. Regarding the authors' response to comment 16: I defer to the editor's decision, of course. And the authors probably also have an idea about what works best in the narrative/flow of the paper. I personally always consider rules as extremely useful instruments, that quickly lose their usefulness if they become the ends instead of the means :-). In other words, I think that if reordering is clearer to the reader, deviation from the default prescription is fine.</p>	<p>We agree, thank you!</p>
<p>5. Regarding the authors' response to comment 17: I realise I have forgotten to include my default 'disclaimer' in this review, my apologies. I usually start by explaining that when I ask a question, I mean to communicate that whatever I'm asking is insufficiently clear - at least to me, so probably also to at least some other readers. So when I ask a question, I don't mean to elicit an answer in the response to readers - instead, it's meant as a prompt to clarify the manuscript. The same goes here: could the authors perhaps explain in the</p>	<p>We agree that the randomization procedure is highly important and therefore added this missing information (page 5, line 23).</p>

manuscript how they randomized? This is important information (see e.g. https://www.ehps.net/ehp/index.php/contents/article/download/1661/pdf_161).	
6. The same goes to the authors' response to comment 18. Again, my apologies for not having been clear. I think it is important that as many lessons as possible can be taken away from this manuscript, also as they pertain to practical issues. The authors' experiences with obstacles and their interpretation of the potential reasons for those obstacles can be very useful to others planning similar studies. Could you perhaps include the explanation you now included only in the response to the reviewers in the manuscript itself? In addition, it would be useful if you would expand upon this in your recommendations for future research, as well.	We agree with the reviewer and now included some information regarding the organizational difficulties (page 6, lines 2-4). We also added some information on how to increase compliance to the discussion section (page 13, last paragraph).
7. And again, in comment 20 - could the authors please add this to the manuscript as well? Alternatively, they could indicate in the 'preliminary analyses' section that the data cleaning procedures etc are explained in detail in the comments of the syntax file that is available at the FigShare repo.	Thank you, we added this information to the preliminary analyses section (pages 9-10).
8. I almost don't dare to ask this, but could the authors perhaps either upload all materials as supplementary materials (they could be in a zip archive, for example), or to a dataverse or OSF repository? Figshare is a commercial organisation, and I'm not sure that materials posted there will remain freely available forever. Perhaps the editorial staff can also take care of compiling one complete full disclosure package in one location; but perhaps the authors have specific reasons for 'splitting' their full disclosure files, and they want to stick to figshare, so that's why I check.	We now also uploaded all the data files as supplementary files to the online submission system. That way, all files are accessible directly from the journal homepage.
9. Regarding comment 23: excellent point, I should have been more alert. My apologies!	No problem, thank you!
10. I also have one comment relating to the 6th comment by the other reviewer: you can always	Thank you again, we appreciate your constructive feedback.

<p>give the information about reliability that you had available before collecting data in your methods section, when you describe the operationalisations. This information is, after all, if available that is, probably part of your rationale for selecting a given operationalisation. You can then enter the verification results (e.g. reliability coefficients as computed from your sample) to the results section.</p> <p>Finally, before I start discussing the revised manuscript itself, I want to thank the authors for their constructive responses to the raised issues. As I said, I feel this strengthens the manuscript.</p>	
<p>11. I think the introduction and methods sections have improved, and can improve further if the authors apply some remaining comments as I made them above. I've also looked up 'preventative', and apparently, it's not incorrect - I thought the correct words was 'preventive', but apparently, both can be and are used. The editor is a native speaking; perhaps he can add his advice here.</p> <p>I notice that in this full version of the manuscript, the authors have removed the 'analysis plan' section. I would suggest they return it, for two reasons. First, when these plans are deviated from, it's useful to have already listed the plans, so that it's more natural to explain the deviations (as the reader is already familiar with the original plans). Second, when sticking to the plans, this is also explicit: it elicits confidence that, for example, no p-hacking was conducted.</p>	<p>We added the analyses plan to the results section and adjusted all later parts of the results section accordingly (pages 9-10).</p>
<p>12. The authors compute p-values to compare the two groups. However, the two groups are by definition from the same population - randomization has guaranteed that any difference between the groups reflects noise (see https://www.ehps.net/ehp/index.php/contents/article/download/1661/pdf_161 for a more detailed explanation). Please refrain from reporting p-values and simply report the effect sizes. In addition, when analysing the association between a dichotomous and a continuous variable, Cohen's d is easier to interpret for most readers than eta squared (also, no partial eta squared exists in a</p>	<p>While we appreciate this comment, we do not fully agree. As far as we are aware, for ANOVAs p-values as well as eta square are still the standard parameters that need to be reported. If the editor has the impression that we should omit p-values and report Cohen's d instead, we can of course change it accordingly. We apologize beforehand, but we are no statisticians and are not completely sure which parameters are more appropriate in our specific case. We appreciate the comment nonetheless!</p>

<p>oneway anova; that is, it's equivalent to the regular eta squared - after all, it's not a multivariate analysis). You could use the function 'convert.means.to.d' in the 'userfriendlyscience' R package to easily convert the descriptives in Table 1 to effect size measures, for example:</p> <pre>convert.means.to.d(means = c(3.09, 3.18), sds = c(.69, .81), ns = c(80, 73));</pre> <p>This yields 0.12 (so the groups are practically equivalent for all practical purposes).</p> <p>(note that you first have to use <code>install.packages('userfriendlyscience')</code> to install the package, and then <code>require('userfriendlyscience')</code> to load it)</p> <p>Normally I'd suggest computing the confidence intervals as well, but these are nonsensical given that there exists no population parameter you're estimating - this is one of the rare situations where you are actually interested in the effect size as it occurs in the sample, so the point estimate is actually informative.</p>	
<p>13. I am not convinced the difference in self-efficacy between the groups ($d = .40$) means that it is wise to include self-efficacy as a covariate. I am not sure the self-efficacy construct is conceptually completely orthogonal to the dependent variable (stress related symptoms). If these operationalisations do overlap, then inclusion of self-efficacy as a covariate (i.e. removal of all self-efficacy-related variance in the dependent variable) may decrease the validity of the data series that remains as representation of stress-related symptoms. This is not my field - so I'm simply suggesting this for the authors to reflect on. If they share this concern, they could repeat the analysis both including and excluding SE as a covariate, reporting whether this matters for the results.</p>	<p>We rerun the analyses without self-efficacy as a covariate and the pattern of results remained non-significant. We added this information (page 11, lines 15-16).</p>
<p>14. Could the authors please report p-values in three decimals? I know that given the fully disclosed analysis package, this seems like nitpicking, but it's a convention that may be useful to retain until full disclosure becomes the norm rather than the</p>	<p>We now report the p-values in three decimals.</p> <p>We greatly appreciate it, that the reviewer visualized our results! We are not familiar with R, which is why it would have been extremely</p>

<p>exception in the literature at large.</p> <p>I would greatly appreciate a visualisation of the results; i.e. a plot with time on the X axis, the aggregated stress-related symptoms measure (i.e. the DV) on the Y axis, dots for each participants' observations, and separate lines to connect the means of the two groups. But depending on the software the authors are familiar with, this may not be easy to realise (as the authors will have noticed I mainly use R, where this is relatively easy). I have taken the liberty to download the dataset and write a bit of R code to create these plots. I will upload the plots and the R script as part of the review; I leave it to the authors' preference whether they want to include the plots in the supplemental materials and/or use or adapt the code and/or include these or different plots.</p>	<p>difficult for us to run these analyses. However, apparently we do not have access to these plots. If the editor has the impression that these plots deliver important additional information, we would encourage him to upload these files as part of the supplementary material. Thank you!</p>
<p>15. The discussion starts with a description of the design, but this section does not include any results. This seems a bit odd - the limitations are discussed before the results are listed. I would relocate the first half of the first paragraph currently under 'Limitations' to the discussion.</p>	<p>We agree and moved the first section of "Limitations" section to the first section of the discussion.</p>
<p>16. The findings are extremely interesting. It feels like they are sold short by discussing them as limitations. I suggest splitting this section into two sections: one labelled 'Limitations', where the limitations of the study's design are discussed; and one section that preceeds it, labeled, for example, 'Explanations' or so, where the findings are discussed more in details. This first section could then be expanded a bit. After all, the authors have, I assume, a nontrivial amount of expertise regarding stress and stress management in this target population; and I also assume that they developed this program to the best of their ability. The presently discussed explanations for the apparent ineffectiveness of the program seem like things that could have, and probably have, been thought of in advance. These results are quite surprising; I think they can be done more justice by reflecting more thoroughly on what could have caused them. In the 'Limitations' section, I would suggest discussing only limitations of the study; in other words, of the design. For example, the determinants that were</p>	<p>We agree with the reviewer and added a new section "potential explanations." We have the impression that this additional section makes the paper more comprehensive and also offers implications for future research.</p>

<p>targeted by the interventions could have been measured to have an idea of which of the program's components were effective, and which were not. Another example is that fidelity of the program's implementation does not seem to have been assessed. For example, is it possible the teachers, meaning well but unknowingly invalidating the IV's operationalisation, also paid more attention to stress in the control groups?</p>	
<p>17. A closer link between the potential explanations for the findings and the limitations on the one hand, and the recommendations on the other hand, would also be helpful. Ideally, I think these recommendations should connect to the potential explanations and limitations in such a way that they describe which characteristics future designs should have to make sure these potential explanations can be ruled out, and these limitations can be lifted. Ideally, after having read this article, the readers have learned a few useful lessons to improve their own future designs.</p>	<p>Please see also our previous response. We added an additional explanation section which also offers implications and ideas for future research.</p>
<p>18. Finally, one last paragraph labeled e.g. 'Conclusion' could be added, summarizing the results and the most important recommendations. The present final sentence seems a bit odd; since one of the main issues discussed in the discussion is that perhaps short-term interventions can, because of their short-term nature, not have an effect, it seems odd to conclude with recommending more effective short-term programmes. Would it not make more sense to recommend to take a step back, and first conduct more 'basic' research into the used methods, to explore their value in short-term programmes? After all, if there is one lesson we can learn from this study, it is that at least some things the authors (and probably many researchers with them) thought they knew about stress, the determinants of stress/coping, and methods to improve/change those, may be wrong. That seems an extremely important lesson, not to be dismissed lightly. It suggests "back to the drawing boards"; warning others from moving towards intervention development too quickly seems appropriate?</p>	<p>Thank you for your suggestion, however we do not fully agree. As mentioned in the conclusion, previous research has shown that students are less motivated in participating in long-term stress prevention programs than in short-term programs (Lohaus, 2010). To minimize the dropout rates from stress interventions it seems more useful to improve short-term trainings. We have the impression that we offered some potential implications on how to improve our training and thus future research should focus on developing more effective short-term stress prevention programmes, potentially including e-learning elements. However, if the reviewer and/or editor has the impression that we should discuss this issue in more depth, we can of course do so. But in our eyes, the take-home message should not be that short-term interventions should be completely dismissed but rather that they should be improved in future research.</p>

Round 3: reviewer A

The authors have responded to all comments, the manuscript can be accepted. Please just integrate these aspects (your answers) in the manuscript, so that also the readers have all information:

- All teachers confirmed that all classes were given.
- Classes from the same school were assigned to the same condition, in order to rule out the possibility that students from different conditions would “influence” each other. There were no other ongoing stress-related reducing strategies.

Round 3: editorial decision

2018-06-22 04:49 PM

Dear Dr Chris Englert,

Thank you for submitting the latest revision of your manuscript. I note that all reviewer comments are responded to satisfactorily and I agree with decisions made in this latest version. I would accept the paper if you consider the two additional points:

1. Please see the attached graphics (and code) from reviewer 2 and consider whether you wish to include them.
2. In reference to reviewer 2's final comment, I agree it may be premature to dismiss short-term interventions. However, could you please consider adjusting your conclusion to emphasise that researchers and practitioners developing future interventions who are considering the merits of short-term programmes, ensure these undergo careful development and testing prior to implementation.

I anticipate that this review process will come to a close shortly.

To access your submission account, follow the below instructions:

- 1) login to the journal webpage with username and password
- 2) click on the submission title
- 3) click 'Review' menu option
- 4) download Reviewed file and make revisions based on review feedback
- 5) upload the edited file
- 6) Click the 'notify editor' icon and email the confirmation of re-submission and any relevant comments to the journal.

Please ensure that your revised files adhere to our author guidelines, and that the files are fully copyedited/proofed prior to upload. Please also ensure that all copyright permissions have been attained. This is the last opportunity for major editing, therefore please fully check your file prior to re-submission.

If you have any questions or difficulties during this process, please do contact us.

Please could you have the revisions submitted by 06.07.18. If you cannot make this deadline, please let us know as early as possible.

Kind regards,

Dr Phil Jefferies
Dublin City University

Round 4: cover letter

2018-06-22 05:47 AM

Dear Phil,

Thank you for your constructive review concerning our paper submitted to Health Psychology Bulletin. Regarding your last two comments:

Comment 1: Please see the attached graphics (and code) from reviewer 2 and consider whether you wish to include them.

Response: Yes, I think it would make sense to include these additional files, thank you.

Comment 2: In reference to reviewer 2's final comment, I agree it may be premature to dismiss short-term interventions. However, could you please consider adjusting your conclusion to emphasise that researchers and practitioners developing future interventions who are considering the merits of short-term programmes, ensure these undergo careful development and testing prior to implementation.

Response: Thank you for this recommendation, we added this information to the conclusion section (page 16, lines 4-8).

Sincerely,

Chris Englert, Aline Bechler, Sarah Singh and Alex Bertrams

Round 4: editorial decision

2018-06-22 06:54 PM

Dear Chris,

After review, we have reached a decision regarding your submission to Health Psychology Bulletin, "Testing the effectiveness of a short-term stress prevention programme in primary school students", and are happy to accept your submission for publication, pending the completion of copyediting and formatting processes.

As there are no further reviewer revisions to make, you do not have to complete any tasks at this point. The accepted submission will now undergo final copyediting. You will be contacted once this is complete to answer any queries that may have arisen during copyediting and to allow a final chance to edit the files prior to typesetting. If you wish to view your submission during this time, you can log in via the journal website.

The review information should be included in this email.

Kind regards,

Dr Phil Jefferies
Dublin City University

Section 2: manuscript iterations

Round 3: full revised manuscript

1

2

3 Testing the effectiveness of a short-term stress prevention programme in primary school

4 students

5

Abstract

The present study tested the effectiveness of a four-week, school-based, universal cognitive-behavioural stress prevention programme. The prevention programme included short daily exercises which were adopted from two well-validated anti stress trainings. The daily exercises took approximately 10–15 minutes on average and were performed during regular classroom sessions. Half of the classes were randomly assigned to the prevention group ($n = 80$), while the other half were sorted into the non-treatment control group, which did not take part in the stress prevention programme ($n = 73$). The students' physical and psychological stress-related symptoms were assessed five times (i.e., prior to the training and after each week of training). Their coping strategies, self-efficacy and self-control were also measured. It was hypothesized that in the prevention group students' physical and psychological stress-related symptoms would significantly decrease over time, compared to the non-treatment control group. Contrary to our predictions, the prevention programme did not lead to statistically significant changes in physical or psychological stress-related symptoms. The students' coping strategies, self-efficacy and self-control did not have an influence on the result patterns. The results indicate that short-term stress prevention programmes may not be as effective as long-term programmes.

Keywords: prevention, school, self-control, self-efficacy, stress

Introduction

Children are frequently confronted with challenges that can tax or exceed their psychological resources, which often elicits heightened levels of stress (Lazarus & Folkman, 1984; Seiffge-Krenke, 2000). These stressors involve, amongst others, daily hassles, academic performance pressure or developmental tasks (de Anda et al., 2000; Donaldson, Prinstein, Danovsky, & Spirito, 2000). The cross-national survey 'Health Behaviour in School-aged Children' (HSBC), which is regularly conducted by the World Health Organization (WHO), revealed that a high percentage of children aged 11–15 years report elevated stress levels (Inchley et al., 2016). For example, in the 2014 Swiss sample of the HSBC survey, over 22% of the 11-year-old boys and over 17% of the 11-year-old girls reported moderate to high stress levels (Blaser & Amstad, 2016).

Chronic stress exposure has been found to be associated with severe short- and long-term psychological (e.g., depression) and physical (e.g., cancer) problems (Cohen, Janicki-Deverts, & Miller, 2007). Furthermore, there is growing evidence that chronic stress exposure during the early years of life can cause severe consequences for one's health across the lifespan (Dube et al., 2009; Matthews, 2005). Considering the potential negative effects of stress on health and wellbeing, it seems very important to support children in developing their abilities to efficiently cope with stressful situations (McNamara, 2000). Given the fact that coping strategies are primarily developed during adolescence, focusing on opportunities to improve coping skills during adolescence is highly important (Currie, Hurrelmann, Settertobulte, Smith, & Todd 2000). Several prevention programmes have been developed and evaluated in previous years, indicating that strategies for improving children's coping capacities are highly important (Grant et al., 2003); however, most of these programmes are performed outside the classroom, as the exercises are too long and may interfere with regular classroom

The goal of the present study was to develop and evaluate a four-week stress prevention programme that includes short daily exercises, which can be easily completed during regular classroom sessions under the supervision of a teacher. The exercises were sourced from two well-validated cognitive-behavioural stress prevention programmes: the Anti-Stress Training for children (AST) (Hampel & Petermann, 2003) and the Stress Prevention Training for primary school children (Klein-Heßling & Lohaus, 2000). Both of these two programmes contain cognitive-behavioural techniques (e.g., cognitive restructuring and problem solving) aimed at helping students to develop emotion-focused coping skills to reduce the actual sensations of psychological stress (e.g., relaxation techniques) and to establish problem-focused coping skills so that they can effectively deal with daily stressors in the future (see Figure 1 for our logical model). The daily exercises we included in the present study took approximately 10–15 minutes on average and were performed during regular classroom sessions led by the respective teachers. This longitudinal study tested the core hypothesis, which was that the students' physical and psychological stress-related symptoms would significantly decrease while participating in the four-week stress prevention programme, compared to a control group which did not take part in the stress prevention programme.

Methods

Participants

An a-priori power analysis was conducted using G*Power, revealing that we needed at least a sample of $N = 141$ students to detect at least a medium effect (parameters: $f = .30$, $\alpha = .05$, $1-\beta = .85$) (Faul, Erdfelder, Lang, & Buchner, 2007). We randomly contacted several schools in Switzerland via telephone and asked them if they were willing to participate in the present study (please note that the protocols for recruitment and communication were deleted after completion of the study and therefore cannot be included). A total of 153 third- and fourth-grade students ($M_{\text{age}} = 9.50$, $SD_{\text{age}} = 0.62$; 78 females) from 10 classes in 4 Swiss schools volunteered to participate. We had to exclude an additional 13 students, either because language difficulties precluded following instructions or because they did not appear at more than one time of measurement.

This study has been approved by the local ethics committee of the faculty of Human Sciences at the University of Bern, Switzerland (see *Ethical Approval* in the Supplemental Material available online). All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments. We obtained written, informed consent from the parents and the students prior to their inclusion in the study. The data collection took place between January and March 2017.

Procedure

Five classes from two schools were randomly assigned to the prevention group ($n = 80$), while five classes from the remaining two schools were sorted into the non-treatment control group, which did not take part in the stress prevention programme ($n = 73$). The randomization procedure was conducted via random.org. The study lasted four weeks and the students in both groups were tested at five time of measurement: prior to starting the programme (T1) and on the Friday of each week the programme was

conducted (T2–5). A follow-up assessment could not be implemented due to organisational difficulties among the respective schools, as –it was already difficult to convince these schools to participate in the 4-week training as the school principals were not interested in continuing the study for an even longer period of time. To match the data with each student, all students generated a unique, anonymous code by writing down the first letter of their father’s name, the first letter of their mother’s name, and the date of the day they were born. For each questionnaire administered, overall scores were generated by averaging each participant’s answers given in the respective questionnaire; higher scores are indicative of a higher value for the corresponding variable.

Operationalisations

Baseline assessment. At the first time of measurement, the students generated their anonymous codes and reported their demographic information (i.e., age, gender and native language; see *Questionnaire_Baseline* in the Supplemental Material available online for the full baseline questionnaire). To assess habitual coping tendencies, the students then worked on the ‘German Coping Questionnaire for Children and Adolescents’ (Stressverarbeitungsfragebogen für Kinder und Jugendliche; SVF-KJ; Hampel & Petermann, 2016). The SVF-KJ requests students to rate a series of 36 possible coping responses to interpersonal stressors and 36 possible coping responses to academic stressors. Each response has to be rated on a scale of 1 (‘not at all’) to 5 (‘all the time’), indicating how likely they would apply the coping response in the respective situation. Considering that the present study examined academic stress, the subscale for interpersonal stress was omitted, a decision that has been made in previous research as well (e.g., Hampel, Meier, & Kümmel, 2008). The scale for academic stress assessed nine coping strategies, each represented by four items, including: minimisation (e.g., ‘I say to myself: “It is not that important”.’), distraction/recreation (e.g., ‘I just do

something that I enjoy.’), situation control (e.g., ‘I do something about it.’), positive self-instruction (e.g., ‘I say to myself: “I can solve this problem”.’), social support (e.g., ‘I talk to someone about the problem.’), passive avoidance (e.g., ‘I like to pretend I am sick.’), rumination (e.g., ‘I worry about the situation the whole time.’), resignation (e.g., ‘I say to myself: “I cannot do anything about it”.’) and aggression (e.g., ‘I get a bad temper.’).

Previous research has shown that self-efficacy and self-control are important internal resources that can act as preventative measures against stress (e.g., Hampel et al., 2008); as such, the participants of the present study completed the ‘Resource Questionnaire for Children and Adolescents’ (Fragebogen zu Ressourcen im Kindes- und Jugendalter; FRKJ 8–16; Lohaus & Nussbeck, 2016). Self-efficacy (e.g., ‘If I set a goal for myself, I will reach it.’) and self-control (e.g., ‘I am good at focusing on a given task.’) were measured with six items each, which were rated on four-point Likert scales (i.e., 1 ‘never’ to 4 ‘always’).

Weekly assessments. To measure stress-related symptoms at each time point (T1–5), we administered the symptom checklist of the revised ‘German Stress and Coping Questionnaire for Children and Adolescents’ (Fragebogen zur Erhebung von Stress und Stressbewältigung im Kindes- und Jugendalter; SSKJ 3–8; Lohaus, Eschenbeck, Kohlmann, & Klein-Heßling, 2006). The students were asked to report how often they experienced the six physical stress-related symptoms (e.g., ‘How often have you experienced dizziness?’) and the twelve psychological stress-related symptoms (e.g., ‘How often have you been sad?’) during the week (i.e., 1 ‘never’, 2 ‘once’, 3 ‘more than once’). The SSKJ 3–8 was first filled out at T1 (physical stress-related symptoms: prevention group, $M = 1.45$, $SD = 0.37$; control group, $M = 1.63$, $SD = 0.34$; $\alpha = .49$. Psychological stress-related symptoms: prevention group, $M = 1.72$, SD

= 0.41; control group, $M = 1.60$, $SD = 0.45$; $\alpha = .78$). The SSKJ 3–8 was also administered to both groups on every Friday during the four weeks of the programme (for descriptive statistics, see Table 1). The students' stress-related symptoms were assessed five times in total for both groups (see *Questionnaire_Weekly* in the Supplemental Material available online for the full weekly questionnaire).

Stress prevention programme. The stress prevention programme lasted four weeks and included exercises adapted from two well-validated cognitive-behavioural stress prevention programmes: AST (Hampel & Petermann, 2003) and Stress Prevention Training (Klein-Heßling & Lohaus, 2000). Both source programmes are based on the concept of stress proposed by Lazarus and Folkman (1984), as well as Meichenbaum's (1985) 'Stress Inoculation Training'. We chose exercises that took, on average, less than 15 minutes to complete, as the goal of the present study was to develop a short stress prevention programme that could be easily integrated into regular classroom sessions. The programme of the present study was highly structured; students in the prevention group received a manual that included all exercises and instructions for every school day during the four weeks, which were conducted during regular classroom lessons (see *Manual_Children* in the Supplemental Material available online for the manual).

The first session of the programme was led by one of the researchers of the present study, while the remaining sessions were led by the respective classroom teachers, who received a thorough introduction to the concept of stress and all exercises depicted in the manual by the researcher before the programme started. The researcher also handed out a four-week schedule to the teachers, showing which exercises to perform on which day (see *Timetable* in the Supplemental Material available online for the four-week schedule). Each session started with a short audio-relaxation technique

(cf. McCallie, Blum, & Hood, 2006), followed by the actual exercise for the given day. At the end of each week, the students reported their stress-related symptoms on the SSKJ 3–8 checklist (Lohaus et al., 2006). Each Monday, the students wrote down their tasks and responsibilities for each day of the upcoming week; previous research has demonstrated that thorough planning can be a helpful strategy for reducing stress-related symptoms (e.g., Misra & McKean, 2000).

On the first day of the programme, the researcher explained the concept of stress in detail (cf. Lazarus & Folkman, 1984), demonstrated how to use the training manual and taught the students how to perform the relaxation techniques. The daily sessions over the following four weeks were led by the respective classroom teachers. The goal for the first week was to increase the students' knowledge and understanding of stress by asking them to brainstorm what they knew about the concept of stress and how they coped with stressful experiences, and to write down situations in which they were proud of themselves for handling a stressful episode. During the next three weeks, the students performed daily exercises designed to a) improve their understanding of the relations between their thoughts and stress ~~and to~~, b) develop a more positive self-evaluation ~~and~~ c) improve their coping skills.

On the final day of the programme, ~~the students were asked to report how they rated the programme and whether they had the impression that their stress-related experiences had decreased over the four-week period. Finally,~~ the students were thanked, debriefed and received a small gift.

Results

Analysis plan

We decided a-priori to allow two missing values for each questionnaire. We also inspected all questionnaires for whether the students completed them seriously or not. In

case the students did not complete them seriously, we had to exclude these students from our analyses. However, this was not the case in our study.

To analyse whether the prevention and the control condition differed in their habitual use of certain coping strategies (as measured by the SVF-KJ; Hampel & Petermann, 2016), in their self-control resources, or in their self-efficacy (as measured by the FRKJ 8–16; Lohaus & Nussbeck, 2016), between-subjects analyses of variance (ANOVA) were conducted.

A mixed 2x4 between-/within-subjects analysis of covariance (ANCOVA) was conducted to test the effect of the stress prevention programme on physical stress-related symptoms. The baseline scores for physical stress-related symptoms were added as a covariate (for details on this procedure, see Lohaus, Fridrici, & Maass, 2009). The experimental condition (i.e., prevention vs. control group) was added as the between-subjects factor, time of measurement (T2–5) as the within-subjects factor, and the physical stress-related symptoms were added as the dependent variables. In the same vein, to test whether the stress prevention programme influenced psychological stress-related symptoms, we conducted a mixed 2x4 between (i.e., prevention group vs. control group) - within-subjects (i.e., time of measurement [T2–5]) ANCOVA. The baseline scores for psychological stress-related symptoms were added as a covariate.

Preliminary analyses

Descriptive statistics resulting from the preliminary analyses are illustrated in Table 1. The full data set is available at https://figshare.com/articles/Untitled_Item/6264767. An ANOVA revealed that the prevention and the control groups did not differ significantly in any of the nine SVF-KJ scales (Hampel & Petermann, 2016), indicating that there were no differences concerning the habitual use of certain coping strategies ($ps > .142$).

Formatted: Font: Not Bold, Not Italic

Formatted: Indent: First line: 0 cm, Space After: 3 pt, Line spacing: 1.5 lines

Furthermore, between-subjects ANOVAs demonstrated that the two conditions did not differ significantly in their self-control resources, $F(1,151) = 0.73$, $p = .39640$, $\eta^2_p = .01$; however, participants from the prevention group displayed significantly higher self-efficacy scores than participants from the control group, $F(1,151) = 5.93$, $p = .0162$, $\eta^2_p = .04$. Therefore, self-efficacy was added as a covariate to the main analyses.

[Table 1 near here]

Main analyses

As previously mentioned, we conducted a mixed 2x4 between-~~(i.e., prevention vs. control group)~~-within ~~(time of measurement)~~-subjects analysis of covariance (ANCOVA) ~~was conducted~~ to test the effect of the stress prevention programme on physical stress-related symptoms (for descriptive statistics, see Table 2). ~~while adding-~~ ~~the baseline scores for physical stress-related symptoms were added as a covariate-~~ ~~(for details on this procedure, see Lohaus, Fridrici, & Maass, 2009).~~ We also added self-efficacy as a second covariate, as the preliminary analysis revealed significant differences in self-efficacy between the two conditions ~~(please note that the following results did not change significantly when excluding self-efficacy as a covariate).~~ ~~The experimental condition (i.e., prevention vs. control group) was the between-subjects factor, time of measurement (T2–5) was the within-subjects factor, and the physical stress-related symptoms were the dependent variables.~~ There was neither a significant main effect of time of measurement, $F(3,146) = 0.38$, $p = .7667$, $\eta^2_p = .01$, nor of experimental condition on physical stress-related symptoms, $F(1,148) = 0.10$, $p = .754$, $\eta^2_p = .00$. The interaction between the two also did not reach statistical significance, $F(3,146) = 0.26$, $p = .851$, $\eta^2_p = .00$, indicating that the prevention programme did not have a significant effect on relieving physical stress-related symptoms ~~(see Figure 2 for~~

a visualisation of the effects of the stress prevention programme on physical stress-related symptoms).

[Figure 2 near here]

Formatted: Centered

~~To test whether the stress prevention programme influenced psychological stress-related symptoms, we conducted a mixed 2x4 between (i.e., prevention group vs. control group) within subjects (i.e., time of measurement [T2–5]) ANCOVA, including the covariates of psychological stress-related symptoms and self-efficacy.~~

Contrary to our predictions, we also found no effect of time measurement, $F(3,142) = 1.17, p = .322$, $\eta^2_p = .02$, no effect of experimental condition, $F(1,144) = 2.32, p = .130$, $\eta^2_p = .02$, and no effect of their interactions on psychological stress-related symptoms, $F(3,142) = 1.00, p = .394$, $\eta^2_p = .02$ (see Figure 3 for a visualisation of the effects of the stress prevention programme on psychological stress-related symptoms).

[Figure 3 near here]

Formatted: Centered, Indent: First line: 0 cm

[Table 2 near here]

Discussion

Chronic stress is related to a wide variety of psychological and physical problems (Cohen et al., 2007), which often translates from adolescence into adulthood (Dube et al., 2009; Matthews, 2005). Several researchers have pointed out the necessity of developing stress prevention programmes for children and implementing these programmes into their daily lives at school (e.g., Lohaus, 2010). The present study investigated the effectiveness of a four-week universal stress prevention programme, which included exercises from two well-validated anti-stress training programmes (i.e., Hampel & Petermann, 2003; Klein-Heßling & Lohaus, 2000). The daily exercises were performed during regular classroom sessions, lasting approximately 10–15 minutes on average. We chose exercises that were relatively short and easy to integrate into regular

1 lessons. We chose this approach because we did not want to interfere with the teacher's
2 tuition and also wanted to minimise programme dropout rates (cf. Lohaus, 2010).

3 While the students expressed satisfaction with the prevention programme and
4 participated in most of the exercises, the results were contrary to our expectations.
5 During the four-week period, psychological and physical stress-related symptoms
6 decreased in both groups; however, we did neither find a statistically significant effect
7 of time of measurement nor of our prevention programme overall. One reason may be
8 that the exercises were simply too short to change the students' pre-existing coping
9 habits. Even though the primary goal of the present study was to develop a short-term
10 stress prevention programme that could be easily integrated into regular classroom
11 sessions, it seems it is more beneficial to implement prevention programmes including
12 exercises of longer durations (see de Anda, 1998).

13 *Limitations*

14 ~~While the students expressed satisfaction with the prevention programme and~~
15 ~~participated in most of the exercises, the results were contrary to our expectations.~~
16 ~~During the four week period, psychological and physical stress related symptoms~~
17 ~~decreased in both groups; however, we did neither find a statistically significant effect~~
18 ~~of time of measurement nor of our prevention programme overall. One reason may be~~
19 ~~that the exercises were simply too short to change the students' pre-existing coping~~
20 ~~habits. Even though the primary goal of the present study was to develop a short term~~
21 ~~stress prevention programme that could be easily integrated into regular classroom~~
22 ~~sessions, it seems it is more beneficial to implement prevention programmes including~~
23 ~~exercises of longer durations (see de Anda, 1998).~~

24 ~~Another~~ An important limitation lies in the fact that we did not include any
25 follow-up assessments after the programme ended. As previously mentioned, this was

due to the fact that the teachers/principals were not interested in investing even more time into the training. It is possible that the programme has an effect only after a certain period. In future studies it might be helpful to offer participating schools some kind of incentive in order to increase their compliance. By doing so, it would be possible to ~~Future research should include additional times of measurement following the programme to~~ determine ~~its~~ the potential long-term effects of the training.

Formatted: Font color: Auto

Furthermore, we exclusively focused on children, even though previous research has outlined that parents play a vital role in their children's stress experiences (e.g., Hampel et al., 2008). For example, the Anti-Stress Training includes information sessions in which parents receive information on the concept of stress, coping strategies and the key components of the stress prevention programme (see Hampel & Petermann, 2003). The idea behind this holistic approach is that parents can help their children implement novel coping strategies, also serving as role models for coping with stress (e.g., Power, 2004).

We would also like to mention that the internal consistencies were not satisfactory for all applied measures in the current study. At T1, the α -coefficient for the SSKJ 3–8 measuring physical stress-related symptoms was rather low ($\alpha = .49$). However, previous research has delivered sound empirical evidence for the reliability and the validity of all the scales we administered (Eschenbeck, Kohlmann, Lohaus, & Klein-Heßling, 2006). Furthermore, at the other times of measurement the internal consistencies for the SSKJ 3–8 were all satisfactory.

Formatted: Font color: Auto

Potential explanations

One potential explanation for the non-significant findings in the current study might be that the teachers were not fully committed to the programme and did not make sure that the exercises were exactly performed as originally intended. We tried to

1 minimize this risk by giving all teachers a proper introduction to the concept of stress
2 before the programme started, by handing out a four-week schedule which explained the
3 training content for each day in detail, and by depicting all exercises in the training
4 manual. Furthermore, the exercises were highly standardized (e.g., audio files for the
5 relaxation units; training manual). We asked each teacher to register if the exercises had
6 been conducted as planned for each day and the feedback we received was consistently
7 positive.

8 In the same vein, it could be argued that the students' compliance to participate
9 in the training was rather low. While we did not explicitly measure compliance, we did
10 assess whether the students had worked on the daily exercises depicted in the manual,
11 which was mostly the case in the present study. We also received verbal feedback from
12 the students which was consistently positive.

13 It might also be possible that the training, while not immediately affecting the
14 stress-related symptoms, did have a positive effect on students' coping skills. However,
15 we only measured habitual coping tendencies at baseline, which is why future studies
16 should consider to also measure coping skills after the four-week training.

17 ***Recommendations for future research***

18 Lohaus (2010) stresses that students' motivation toward participating in stress
19 prevention programmes seems rather weak, and dropouts are a serious problem. He
20 recommended including internet-based e-learning tools in stress prevention
21 programmes, because children and adolescents are often interested in innovative
22 multimedia tools (see also Vandewater et al., 2007). The advantage of using online tools
23 is that they can be easily accessed and learners can decide for themselves how and when
24 they want to access them (Barak, Klein, & Proudfoot, 2009; Taylor, Jobson,
25 Winzelberg, & Abascal, 2002). Internet-based programmes have been developed and

Formatted: Indent: First line: 1.25 cm, Space
After: 0 pt, Line spacing: Double

1 validated for treating several physical and psychological problems (e.g., depression;
2 Richards & Richardson, 2012). In the same vein, a recent study by Lohaus (2010)
3 suggests that e-learning tools may help maximise the effects of traditional stress
4 prevention programmes (see also Lohaus et al., 2009).

5 Given that children and adolescents are often less motivated toward participating
6 in long-term stress prevention programmes, future research should focus on developing
7 more effective short-term stress prevention programmes, potentially including e-
8 learning elements (Lohaus, 2010). However, given the fact that we did not find a
9 statistically significant effect of our short-term intervention on stress-related symptoms,
10 we recommend that researchers and practitioners developing short-term interventions in
11 the future ensure these undergo careful development and testing prior to
12 implementation.

Ethics

This study has been approved by the local ethics committee of the faculty of Human Sciences at the University of Bern, Switzerland see *Ethical Approval* in the Supplemental Material available online). All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments. We obtained written, informed consent from the parents and the students prior to their inclusion in the study.

Data Availability Statement

Full data set available at https://figshare.com/articles/Untitled_Item/6264767

References

- Barak, A., Klein, B., & Proudfoot, J. G. (2009). Defining internet-supported therapeutic interventions. *Annals of Behavioral Medicine*, 38, 4–17. doi:10.1007/s12160-009-9130-7
- Blaser, M., & Amstad, F. (2016). *Psychische Gesundheit über die Lebensspanne* [Psychological Health Across the Lifespan]. Bern: Gesundheitsförderung Schweiz.
- Cohen, S., Janicki-Deverts, D., & Miller, G. E. (2007). Psychological stress and disease. *Jama*, 298, 1685–1687. doi:10.1001/jama.298.14.1685
- Currie, C., Hurrelmann, K., Settertobulte, W., Smith R., & Todd J. (2000). *Health and health behaviour among young people. Issue 1 of the WHO Policy Series: Health policy for children and adolescents*. Copenhagen: World Health Organization.
- de Anda, D. (1998). The evaluation of a stress management program for middle school adolescents. *Child and Adolescent Social Work Journal*, 15, 73–85. doi:10.1023/A:1022297521709
- de Anda, D., Baroni, S., Boskin, L., Buchwald, L., Morgan, J., Ow, J., . . . Weiss, R. (2000). Stress, stressors and coping strategies among high school students. *Children and Youth Services Review*, 22, 441–463. doi:10.1016/S0190-7409(00)00096-7
- Donaldson, D., Prinstein, M., Danovsky, M. & Spirito, A. (2000). Patterns of children's coping with life stress: Implications for clinicians. *American Journal of Orthopsychiatry*, 70, 351–359. doi:10.1037/h0087689

Formatted: German (Germany)

Dube, S. R., Fairweather, D., Pearson, W. S., Felitti, V. J., Anda, R. F., & Croft, J. B.

(2009). Cumulative childhood stress and autoimmune diseases in adults.

Psychosomatic Medicine, 71, 243–250. doi:10.1097/PSY.0b013e318190788

Eschenbeck, H., Kohlmann, C. W., Lohaus, A., & Klein-Heßling, J. (2006). Die Diagnostik von Stressbewältigung mit dem “Fragebogen zur Erhebung von Stress und Stressbewältigung im Kindes-und Jugendalter“ (SSKJ 3-8) [The assessment of coping with the “Questionnaire for the Measurement Stress and Coping in Children and Adolescents” (SSKJ 3-8)]. *Diagnostica*, 52, 131-142. doi:10.1026/0012-1924.52.3.131.

Formatted: German (Germany)

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: a flexible

statistical power analysis program for the social, behavioural, and biomedical

sciences. *Behavior Research Methods*, 39, 175–191. doi:10.3758/BF03193146

Grant, K. E., Compas, B. E., Stuhlmacher, A. F., Thurm, A. E., McMahon, S. D., &

Halpert, J. A. (2003). Stressors and child and adolescent psychopathology:

Moving from markers to mechanisms of risk. *Psychological Bulletin*, 129, 447–

466. doi:10.1037/0033-2909.129.3.447

Hampel, P., Meier, M., & Kümmel, U. (2008). School-based stress management

training for adolescents: Longitudinal results from an experimental study.

Journal of Youth and Adolescence, 37, 1009–1024. doi:10.1007/s10964-007-

9204-4

Formatted: German (Germany)

Hampel, P., & Petermann, F. (2003). *Anti-Stress-Training für Kinder* [Anti-Stress

Training for Children]. Weinheim, Germany: Beltz.

Hampel, P., & Petermann, F. (2016). *Stressverarbeitungsfragebogen von Janke und*

Erdmann angepasst für Kinder und Jugendliche (SVF-KJ) [The German Coping

- Questionnaire by Janke and Erdmann Adapted for Children and Adolescents].
Göttingen, Germany: Hogrefe.
- Inchley, J., Currie, C., Young, T., Samdal, O., Torsheim, T., Auguston, L., . . .
Barnekow, V. (2016). Growing up unequal: Gender and socioeconomic
differences in young people's health and well-being. *Health Behaviour in
School-aged Children (HBSC) Study: International Report from the 2013/14
Survey*. Copenhagen: World Health Organization.
- Klein-Heßling, J., & Lohaus, A. (2000). *Stresspräventionstraining für Kinder im
Grundschulalter* [Stress Prevention Training for Primary School Kids].
Göttingen, Germany: Hogrefe.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York:
Springer-Verlag.
- Lohaus, A. (2010). Stress prevention in adolescence: Evaluation of a multimodal
training approach. *Journal of Public Health, 19*, 385–388. doi:10.1007/s10389-
010-0391-1
- Lohaus, A., Eschenbeck, H., Kohlmann, C. W., & Klein-Heßling, J. (2006).
*Fragebogen zur Erhebung von Stress und Stressbewältigung im Kindes- und
Jugendalter (SSKJ 3-8)* [The German Stress and Coping Questionnaire for
Children and Adolescents]. Göttingen, Germany: Hogrefe.
- Lohaus, A., Fridrici, M., & Maass, A. (2009). Stressprävention im Jugendalter: Effekte
eines Trainingsprogramms mit Internetbegleitung [Stress prevention in
adolescence: Effects of a training program with an accompanying internet
platform]. *Zeitschrift für Gesundheitspsychologie, 17*, 13–21. doi:10.1026/0943-
8149.17.1.13

Formatted: German (Germany)

- 1 Lohaus, A. & Nussbeck, F. W. (2016). *Fragebogen zu Ressourcen im Kindes- und*
2 *Jugendalter (FRKJ 8-16)* [Resource Questionnaire for Children and
3 Adolescents]. Göttingen, Germany: Hogrefe.
- 4 Matthews, K. A. (2005). Psychological perspectives on the development of coronary
5 heart disease. *American Psychologist*, 60, 783–796. doi:10.1037/0003-
6 066X.60.8.783.
- 7 McCallie, M. S., Blum, C. M., & Hood, C. J. (2006). Progressive muscle relaxation.
8 *Journal of Human Behavior in the Social Environment*, 13, 51–66.
9 doi:10.1300/J137v13n03_04
- 10 McNamara, S. (2000). *Stress in young people. What's new and what can we do?*
11 London: Continuum.
- 12 Meichenbaum, D. (1985). *Stress inoculation training*. New York: Pergamon Press.
- 13 Misra, R., & McKean, M. (2000). College students' academic stress and its relation to
14 their anxiety, time management, and leisure satisfaction. *American Journal of*
15 *Health Studies*, 16, 41–51.
- 16 Power, T. G. (2004). Stress and coping in childhood: The parents' role. *Parenting:*
17 *Science and Practice*, 4, 271–317. doi:10.1207/s15327922par0404_1
- 18 Richards, D., & Richardson, T. (2012). Computer-based psychological treatments for
19 depression: a systematic review and meta-analysis. *Clinical Psychology Review*,
20 32, 329–342. doi:10.1016/j.cpr.2012.02.004
- 21 Seiffge-Krenke, I. (2000). Causal links between stressful events, coping style, and
22 adolescent symptomatology. *Journal of Adolescence*, 23, 675–691.
23 doi:10.1006/jado.2000.0352

- 1 Taylor, C. B., Jobson, K. O., Winzelberg, A., & Abascal, L. (2002). The use of the
2 Internet to provide evidence-based integrated treatment programs for mental
3 health. *Psychiatric Annals*, 32, 671–677. doi:10.3928/0048-5713-20021101-06
- 4 Vandewater, E. A., Rideout, V. J., Wartella, E. A., Huang, X., Lee, J. H., & Shim, M. S.
5 (2007). Digital childhood: electronic media and technology use among infants,
6 toddlers, and preschoolers. *Pediatrics*, 119, 1006–1015. doi:10.1542/peds.2006-
7 1804

Table 1

Descriptive Statistics: Means and Standard Deviations for the Control Measures

Variables	α	Experimental Condition			
		Prevention		Control	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
SVF-KJ minimisation	.58	3.09	0.69	3.18	0.81
SVF-KJ distraction/recreation	.67	3.47	0.84	3.48	0.89
SVF-KJ situation control	.71	3.79	0.80	3.60	0.84
SVF-KJ positive self-instructions	.70	3.75	0.71	3.62	0.87
SVF-KJ social support	.70	3.42	0.77	3.41	0.85
SVF-KJ passive avoidance	.53	2.52	0.82	2.71	0.85
SVF-KJ rumination	.73	3.05	0.90	2.96	0.89
SVF-KJ resignation	.57	2.29	0.73	2.31	0.73
SVF-KJ aggression	.60	2.37	0.76	2.49	0.81
FRKJ 8-16 self-efficacy	.83	2.80	0.58	2.59	0.46
FRKJ 8-16 self-control	.66	2.90	0.51	2.82	0.53

Note. $n = 80$ in the prevention group, $n = 73$ in the control group. Overall scores of a psychometric scale were obtained by averaging the responses to the scale items. SVF-KJ refers to the Stressverarbeitungsfragebogen für Kinder und Jugendliche (German Coping Questionnaire for Children and Adolescents; response scale ranging from 1 [not at all] to 5 [all the time]); FRKJ 8–16 refers to the Fragebogen zu Ressourcen im Kindes- und Jugendalter (Resource Questionnaire for Children and Adolescents; response scale ranging from 1 [never] to 5 [always]).

Table 2

Descriptive Statistics: Means and Standard Errors for the Main Measures

Variables	Experimental Condition				
	α	Prevention		Control	
		M	SE	M	SE
T2 SSKJ 3-8 psychological ^{a,b}	.84	1.68	0.04	1.72	0.04
T3 SSKJ 3-8 psychological ^{a,b}	.85	1.55	0.04	1.66	0.04
T4 SSKJ 3-8 psychological ^{a,b}	.87	1.56	0.05	1.61	0.05
T5 SSKJ 3-8 psychological ^{a,b}	.85	1.48	0.04	1.56	0.04
T2 SSKJ 3-8 physical ^{a,c}	.71	1.52	0.04	1.53	0.05
T3 SSKJ 3-8 physical ^{a,c}	.68	1.46	0.04	1.46	0.05
T4 SSKJ 3-8 physical ^{a,c}	.78	1.49	0.05	1.53	0.05
T5 SSKJ 3-8 physical ^{a,c}	.74	1.41	0.04	1.41	0.05

Note. $n = 80$ in the prevention group, $n = 73$ in the control group. Overall scores of a psychometric scale were obtained by averaging the responses to the scale items. SSKJ 3-8 refers to the Fragebogen zur Erhebung von Stress und Stressbewältigung im Kindes- und Jugendalter (response scale: 1 = never, 2 = once, 3 = more than once). T2: Friday of the first week; T3: Friday of the second week; T4: Friday of the third week; T5: Friday of the fourth week. ^a self-efficacy added as covariate. ^b baseline stress-related psychological symptoms added as covariate. ^c baseline stress-related physical symptoms added as covariate.

Figure Captions

Figure 1. Logical model of the present study: It is assumed that practicing cognitive-behavioural techniques and relaxation exercises should improve emotion-focused as well as problem-focused coping skills, which in turn should reduce physical as well as psychological stress-related symptoms.

Figure 2. Visualisation of the effects of the stress prevention programme on physical stress-related symptoms (X-axis = Time of measurement; Y-axis = Aggregated physical stress-related symptoms; purple line = prevention group; yellow line = control group; dots = Physical stress-related symptoms for each participant at each time of measurement).

Figure 3. Visualisation of the effects of the stress prevention programme on psychological stress-related symptoms (X-axis = Time of measurement; Y-axis = Aggregated psychological stress-related symptoms; purple line = prevention group; yellow line = control group; dots = Psychological stress-related symptoms for each participant at each time of measurement).

**Round 2: submitted manuscript
(tier 2, includes results and discussion)**

1

2

3 Testing the effectiveness of a short-term stress prevention programme in primary school

4 students

5

Abstract

The present study tested the effectiveness of a four-week, school-based, universal cognitive-behavioural stress prevention programme. The prevention programme included short daily exercises which were adopted from two well-validated anti stress trainings. The daily exercises took approximately 10–15 minutes on average and were performed during regular classroom sessions. Half of the classes were randomly assigned to the prevention group ($n = 80$), while the other half were sorted into the non-treatment control group, which did not take part in the stress prevention programme ($n = 73$). The students' physical and psychological stress-related symptoms were assessed five times (i.e., prior to the training and after each week of training). Their coping strategies, self-efficacy and self-control were also measured. It was hypothesized that in the prevention group students' physical and psychological stress-related symptoms would significantly decrease over time, compared to the non-treatment control group. Contrary to our predictions, the prevention programme did not lead to statistically significant changes in physical or psychological stress-related symptoms. The students' coping strategies, self-efficacy and self-control did not have an influence on the result patterns. The results indicate that short-term stress prevention programmes may not be as effective as long-term programmes.

Keywords: prevention, school, self-control, self-efficacy, stress

Introduction

Children are frequently confronted with challenges that can tax or exceed their psychological resources, which often elicits heightened levels of stress (Lazarus & Folkman, 1984; Seiffge-Krenke, 2000). These stressors involve, amongst others, daily hassles, academic performance pressure or developmental tasks (de Anda et al., 2000; Donaldson, Prinstein, Danovsky, & Spirito, 2000). The cross-national survey ‘Health Behaviour in School-aged Children’ (HSBC), which is regularly conducted by the World Health Organization (WHO), revealed that a high percentage of children aged 11–15 years report elevated stress levels (Inchley et al., 2016). For example, in the 2014 Swiss sample of the HSBC survey, over 22% of the 11-year-old boys and over 17% of the 11-year-old girls reported moderate to high stress levels (Blaser & Amstad, 2016).

Chronic stress exposure has been found to be associated with severe short- and long-term psychological (e.g., depression) and physical (e.g., cancer) problems (Cohen, Janicki-Deverts, & Miller, 2007). Furthermore, there is growing evidence that chronic stress exposure during the early years of life can cause severe consequences for one’s health across the lifespan (Dube et al., 2009; Matthews, 2005). Considering the potential negative effects of stress on health and wellbeing, it seems very important to support children in developing their abilities to efficiently cope with stressful situations (McNamara, 2000). Given the fact that coping strategies are primarily developed during adolescence, focusing on opportunities to improve coping skills during adolescence is highly important (Currie, Hurrelmann, Settertobulte, Smith, & Todd 2000). Several prevention programmes have been developed and evaluated in previous years, indicating that strategies for improving children’s coping capacities are highly important (Grant et al., 2003); however, most of these programmes are performed outside the classroom, as the exercises are too long and may interfere with regular classroom

An a-priori power analysis was conducted using G*Power, revealing that we needed at least a sample of $N = 141$ students to detect at least a medium effect (parameters: $f = .30$, $\alpha = .05$, $1-\beta = .85$) (Faul, Erdfelder, Lang, & Buchner, 2007). We randomly contacted several schools in Switzerland and asked them if they were willing to participate in the present study. A total of 153 third- and fourth-grade students ($M_{\text{age}} = 9.50$, $SD_{\text{age}} = 0.62$; 78 females) from 10 classes in 4 Swiss schools volunteered to participate.

This study has been approved by the local ethics committee of the faculty of Human Sciences at the University of Bern, Switzerland (see *Ethical Approval* in the Supplemental Material available online). All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments. We obtained written, informed consent from the parents and the students prior to their inclusion in the study. The data collection took place between January and March 2017.

Procedure

Five classes from two schools were randomly assigned to the prevention group ($n = 80$), while five classes from the remaining two schools were sorted into the non-treatment control group, which did not take part in the stress prevention programme ($n = 73$). The study lasted four weeks and the students in both groups were tested at five time of measurement: prior to starting the programme (T1) and on the Friday of each week the programme was conducted (T2–5). A follow-up assessment could not be implemented due to organisational difficulties among the respective schools. To match the data with each student, all students generated a unique, anonymous code by writing down the first letter of their father's name, the first letter of their mother's name, and the date of the day they were born. For each questionnaire administered, overall scores were

generated by averaging each participant's answers given in the respective questionnaire; higher scores are indicative of a higher value for the corresponding variable.

Operationalisations

Baseline assessment. At the first time of measurement, the students generated their anonymous codes and reported their demographic information (i.e., age, gender and native language; see *Questionnaire_Baseline* in the Supplemental Material available online for the full baseline questionnaire). To assess habitual coping tendencies, the students then worked on the 'German Coping Questionnaire for Children and Adolescents' (Stressverarbeitungsfragebogen für Kinder und Jugendliche; SVF-KJ; Hampel & Petermann, 2016). The SVF-KJ requests students to rate a series of 36 possible coping responses to interpersonal stressors and 36 possible coping responses to academic stressors. Each response has to be rated on a scale of 1 ('not at all') to 5 ('all the time'), indicating how likely they would apply the coping response in the respective situation. Considering that the present study examined academic stress, the subscale for interpersonal stress was omitted, a decision that has been made in previous research as well (e.g., Hampel, Meier, & Kümmel, 2008). The scale for academic stress assessed nine coping strategies, each represented by four items, including: minimisation (e.g., 'I say to myself: "It is not that important".'), distraction/recreation (e.g., 'I just do something that I enjoy.'), situation control (e.g., 'I do something about it.'), positive self-instruction (e.g., 'I say to myself: "I can solve this problem".'), social support (e.g., 'I talk to someone about the problem.'), passive avoidance (e.g., 'I like to pretend I am sick.'), rumination (e.g., 'I worry about the situation the whole time.'), resignation (e.g., 'I say to myself: "I cannot do anything about it".') and aggression (e.g., 'I get a bad temper.').

Previous research has shown that self-efficacy and self-control are important internal resources that can act as preventative measures against stress (e.g., Hampel et al., 2008); as such, the participants of the present study completed the ‘Resource Questionnaire for Children and Adolescents’ (Fragebogen zu Ressourcen im Kindes- und Jugendalter; FRKJ 8–16; Lohaus & Nussbeck, 2016). Self-efficacy (e.g., ‘If I set a goal for myself, I will reach it.’) and self-control (e.g., ‘I am good at focusing on a given task.’) were measured with six items each, which were rated on four-point Likert scales (i.e., 1 ‘never’ to 4 ‘always’).

Weekly assessments. To measure stress-related symptoms at each time point (T1–5), we administered the symptom checklist of the revised ‘German Stress and Coping Questionnaire for Children and Adolescents’ (Fragebogen zur Erhebung von Stress und Stressbewältigung im Kindes- und Jugendalter; SSKJ 3–8; Lohaus, Eschenbeck, Kohlmann, & Klein-Heßling, 2006). The students were asked to report how often they experienced the six physical stress-related symptoms (e.g., ‘How often have you experienced dizziness?’) and the twelve psychological stress-related symptoms (e.g., ‘How often have you been sad?’) during the week (i.e., 1 ‘never’, 2 ‘once’, 3 ‘more than once’). The SSKJ 3–8 was first filled out at T1 (physical stress-related symptoms: prevention group, $M = 1.45$, $SD = 0.37$; control group, $M = 1.63$, $SD = 0.34$; $\alpha = .49$. Psychological stress-related symptoms: prevention group, $M = 1.72$, $SD = 0.41$; control group, $M = 1.60$, $SD = 0.45$; $\alpha = .78$). The SSKJ 3–8 was also administered to both groups on every Friday during the four weeks of the programme (for descriptive statistics, see Table 1). The students’ stress-related symptoms were assessed five times in total for both groups (see *Questionnaire_Weekly* in the Supplemental Material available online for the full weekly questionnaire).

Stress prevention programme. The stress prevention programme lasted four weeks and included exercises adapted from two well-validated cognitive-behavioural stress prevention programmes: AST (Hampel & Petermann, 2003) and Stress Prevention Training (Klein-Heßling & Lohaus, 2000). Both source programmes are based on the concept of stress proposed by Lazarus and Folkman (1984), as well as Meichenbaum's (1985) 'Stress Inoculation Training'. We chose exercises that took, on average, less than 15 minutes to complete, as the goal of the present study was to develop a short stress prevention programme that could be easily integrated into regular classroom sessions. The programme of the present study was highly structured; students in the prevention group received a manual that included all exercises and instructions for every school day during the four weeks, which were conducted during regular classroom lessons (see *Manual_Children* in the Supplemental Material available online for the manual).

The first session of the programme was led by one of the researchers of the present study, while the remaining sessions were led by the respective classroom teachers, who received a thorough introduction to the concept of stress and all exercises depicted in the manual by the researcher before the programme started. The researcher also handed out a four-week schedule to the teachers, showing which exercises to perform on which day (see *Timetable* in the Supplemental Material available online for the four-week schedule). Each session started with a short audio-relaxation technique (cf. McCallie, Blum, & Hood, 2006), followed by the actual exercise for the given day. At the end of each week, the students reported their stress-related symptoms on the SSKJ 3–8 checklist (Lohaus et al., 2006). Each Monday, the students wrote down their tasks and responsibilities for each day of the upcoming week; previous research has

demonstrated that thorough planning can be a helpful strategy for reducing stress-related symptoms (e.g., Misra & McKean, 2000).

On the first day of the programme, the researcher explained the concept of stress in detail (cf. Lazarus & Folkman, 1984), demonstrated how to use the training manual and taught the students how to perform the relaxation techniques. The daily sessions over the following four weeks were led by the respective classroom teachers. The goal for the first week was to increase the students' knowledge and understanding of stress by asking them to brainstorm what they knew about the concept of stress and how they coped with stressful experiences, and to write down situations in which they were proud of themselves for handling a stressful episode. During the next three weeks, the students performed daily exercises designed to a) improve their understanding of the relations between their thoughts and stress, b) develop a more positive self-evaluation and c) improve their coping skills.

On the final day of the programme, the students were asked to report how they rated the programme and whether they had the impression that their stress-related experiences had decreased over the four-week period. Finally, the students were thanked, debriefed and received a small gift.

Results

Preliminary analyses

Descriptive statistics resulting from the preliminary analyses are illustrated in Table 1. The full data set is available at https://figshare.com/articles/Untitled_Item/6264767. An analysis of variance (ANOVA) revealed that the prevention and the control groups did not differ significantly in any of the nine SVF-KJ scales (Hampel & Petermann, 2016), indicating that there were no differences concerning the habitual use of certain coping strategies ($ps > .14$).

Furthermore, between-subjects ANOVAs demonstrated that the two conditions did not differ significantly in their self-control resources, $F(1,151) = 0.73, p = .40, \eta^2_p = .01$; however, participants from the prevention group displayed significantly higher self-efficacy scores than participants from the control group, $F(1,151) = 5.93, p = .02, \eta^2_p = .04$. Therefore, self-efficacy was added as a covariate to the main analyses.

[Table 1 near here]

Main analyses

A mixed 2x4 between-/within-subjects analysis of covariance (ANCOVA) was conducted to test the effect of the stress prevention programme on physical stress-related symptoms (for descriptive statistics, see Table 2). The baseline scores for physical stress-related symptoms were added as a covariate (for details on this procedure, see Lohaus, Fridrici, & Maass, 2009). We also added self-efficacy as a second covariate, as the preliminary analysis revealed significant differences in self-efficacy between the two conditions. The experimental condition (i.e., prevention vs. control group) was the between-subjects factor, time of measurement (T2–5) was the within-subjects factor, and the physical stress-related symptoms were the dependent variables. There was neither a significant main effect of time of measurement, $F(3,146) = 0.38, p = .77, \eta^2_p = .01$, nor of experimental condition on physical stress-related symptoms, $F(1,148) = 0.10, p = .75, \eta^2_p = .00$. The interaction between the two also did not reach statistical significance, $F(3,146) = 0.26, p = .85, \eta^2_p = .00$, indicating that the prevention programme did not have a significant effect on relieving physical stress-related symptoms.

To test whether the stress prevention programme influenced psychological stress-related symptoms, we conducted a mixed 2x4 between (i.e., prevention group vs. control group) - within-subjects (i.e., time of measurement [T2–5]) ANCOVA,

including the covariates of psychological stress-related symptoms and self-efficacy. Contrary to our predictions, we found no effect of time measurement, $F(3,142) = 1.17$, $p = .32$, $\eta^2_p = .02$, no effect of experimental condition, $F(1,144) = 2.32$, $p = .13$, $\eta^2_p = .02$, and no effect of their interactions on psychological stress-related symptoms, $F(3,142) = 1.00$, $p = .39$, $\eta^2_p = .02$.

[Table 2 near here]

Discussion

Chronic stress is related to a wide variety of psychological and physical problems (Cohen et al., 2007), which often translates from adolescence into adulthood (Dube et al., 2009; Matthews, 2005). Several researchers have pointed out the necessity of developing stress prevention programmes for children and implementing these programmes into their daily lives at school (e.g., Lohaus, 2010). The present study investigated the effectiveness of a four-week universal stress prevention programme, which included exercises from two well-validated anti-stress training programmes (i.e., Hampel & Petermann, 2003; Klein-Heßling & Lohaus, 2000). The daily exercises were performed during regular classroom sessions, lasting approximately 10–15 minutes on average. We chose exercises that were relatively short and easy to integrate into regular lessons. We chose this approach because we did not want to interfere with the teacher's tuition and also wanted to minimise programme dropout rates (cf. Lohaus, 2010).

Limitations

While the students expressed satisfaction with the prevention programme and participated in most of the exercises, the results were contrary to our expectations. During the four-week period, psychological and physical stress-related symptoms decreased in both groups; however, we did neither find a statistically significant effect of time of measurement nor of our prevention programme overall. One reason may be

1 that the exercises were simply too short to change the students' pre-existing coping
2 habits. Even though the primary goal of the present study was to develop a short-term
3 stress prevention programme that could be easily integrated into regular classroom
4 sessions, it seems it is more beneficial to implement prevention programmes including
5 exercises of longer durations (see de Anda, 1998).

6 Another limitation lies in the fact that we did not include any follow-up
7 assessments after the programme ended. It is possible that the programme has an effect
8 only after a certain period. Future research should include additional times of
9 measurement following the programme to determine its potential long-term effects.

10 Furthermore, we exclusively focused on children, even though previous research
11 has outlined that parents play a vital role in their children's stress experiences (e.g.,
12 Hampel et al., 2008). For example, the Anti-Stress Training includes information
13 sessions in which parents receive information on the concept of stress, coping strategies
14 and the key components of the stress prevention programme (see Hampel & Petermann,
15 2003). The idea behind this holistic approach is that parents can help their children
16 implement novel coping strategies, also serving as role models for coping with stress
17 (e.g., Power, 2004).

18 ***Recommendations for future research***

19 Lohaus (2010) also stresses that students' motivation toward participating in
20 stress prevention programmes seems rather weak, and dropouts are a serious problem.
21 He recommended including internet-based e-learning tools in stress prevention
22 programmes, because children and adolescents are often interested in innovative
23 multimedia tools (see also Vandewater et al., 2007). The advantage of using online tools
24 is that they can be easily accessed and learners can decide for themselves how and when
25 they want to access them (Barak, Klein, & Proudfoot, 2009; Taylor, Jobson,

Winzelberg, & Abascal, 2002). Internet-based programmes have been developed and validated for treating several physical and psychological problems (e.g., depression; Richards & Richardson, 2012). In the same vein, a recent study by Lohaus (2010) suggests that e-learning tools may help maximise the effects of traditional stress prevention programmes (see also Lohaus et al., 2009).

Given that children and adolescents are often less motivated toward participating in long-term stress prevention programmes, future research should focus on developing more effective short-term stress prevention programmes, potentially including e-learning elements (Lohaus, 2010).

Ethics

This study has been approved by the local ethics committee of the faculty of Human Sciences at the University of Bern, Switzerland see *Ethical Approval* in the Supplemental Material available online). All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments. We obtained written, informed consent from the parents and the students prior to their inclusion in the study.

Data Availability Statement

Full data set available at https://figshare.com/articles/Untitled_Item/6264767

References

- Barak, A., Klein, B., & Proudfoot, J. G. (2009). Defining internet-supported therapeutic interventions. *Annals of Behavioral Medicine*, 38, 4–17. doi:10.1007/s12160-009-9130-7
- Blaser, M., & Amstad, F. (2016). *Psychische Gesundheit über die Lebensspanne* [Psychological Health Across the Lifespan]. Bern: Gesundheitsförderung Schweiz.
- Cohen, S., Janicki-Deverts, D., & Miller, G. E. (2007). Psychological stress and disease. *Jama*, 298, 1685–1687. doi:10.1001/jama.298.14.1685
- Currie, C., Hurrelmann, K., Settertobulte, W., Smith R., & Todd J. (2000). *Health and health behaviour among young people. Issue 1 of the WHO Policy Series: Health policy for children and adolescents*. Copenhagen: World Health Organization.
- de Anda, D. (1998). The evaluation of a stress management program for middle school adolescents. *Child and Adolescent Social Work Journal*, 15, 73–85. doi:10.1023/A:1022297521709
- de Anda, D., Baroni, S., Boskin, L., Buchwald, L., Morgan, J., Ow, J., . . . Weiss, R. (2000). Stress, stressors and coping strategies among high school students. *Children and Youth Services Review*, 22, 441–463. doi:10.1016/S0190-7409(00)00096-7
- Donaldson, D., Prinstein, M., Danovsky, M. & Spirito, A. (2000). Patterns of children's coping with life stress: Implications for clinicians. *American Journal of Orthopsychiatry*, 70, 351–359. doi:10.1037/h0087689

- 1 Dube, S. R., Fairweather, D., Pearson, W. S., Felitti, V. J., Anda, R. F., & Croft, J. B.
2 (2009). Cumulative childhood stress and autoimmune diseases in adults.
3 *Psychosomatic Medicine*, 71, 243–250. doi:10.1097/PSY.0b013e318190788
- 4 Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: a flexible
5 statistical power analysis program for the social, behavioural, and biomedical
6 sciences. *Behavior Research Methods*, 39, 175–191. doi:10.3758/BF03193146
- 7 Grant, K. E., Compas, B. E., Stuhlmacher, A. F., Thurm, A. E., McMahon, S. D., &
8 Halpert, J. A. (2003). Stressors and child and adolescent psychopathology:
9 Moving from markers to mechanisms of risk. *Psychological Bulletin*, 129, 447–
10 466. doi:10.1037/0033-2909.129.3.447
- 11 Hampel, P., Meier, M., & Kümmel, U. (2008). School-based stress management
12 training for adolescents: Longitudinal results from an experimental study.
13 *Journal of Youth and Adolescence*, 37, 1009–1024. doi:10.1007/s10964-007-
14 9204-4
- 15 Hampel, P., & Petermann, F. (2003). *Anti-Stress-Training für Kinder* [Anti-Stress
16 Training for Children]. Weinheim, Germany: Beltz.
- 17 Hampel, P., & Petermann, F. (2016). *Stressverarbeitungsfragebogen von Janke und*
18 *Erdmann angepasst für Kinder und Jugendliche (SVF-KJ)* [The German Coping
19 Questionnaire by Janke and Erdmann Adapted for Children and Adolescents].
20 Göttingen, Germany: Hogrefe.
- 21 Inchley, J., Currie, C., Young, T., Samdal, O., Torsheim, T., Auguston, L., . . .
22 Barnekow, V. (2016). Growing up unequal: Gender and socioeconomic
23 differences in young people's health and well-being. *Health Behaviour in*
24 *School-aged Children (HBSC) Study: International Report from the 2013/14*
25 *Survey*. Copenhagen: World Health Organization.

- 1
2 Klein-Heßling, J., & Lohaus, A. (2000). *Stresspräventionstraining für Kinder im*
3 *Grundschulalter* [Stress Prevention Training for Primary School Kids].
4 Göttingen, Germany: Hogrefe.
- 5 Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York:
6 Springer-Verlag.
- 7 Lohaus, A. (2010). Stress prevention in adolescence: Evaluation of a multimodal
8 training approach. *Journal of Public Health, 19*, 385–388. doi:10.1007/s10389-
9 010-0391-1
- 10 Lohaus, A., Eschenbeck, H., Kohlmann, C. W., & Klein-Heßling, J. (2006).
11 *Fragebogen zur Erhebung von Stress und Stressbewältigung im Kindes- und*
12 *Jugendalter (SSKJ 3-8)* [The German Stress and Coping Questionnaire for
13 Children and Adolescents]. Göttingen, Germany: Hogrefe.
- 14 Lohaus, A., Fridrici, M., & Maass, A. (2009). Stressprävention im Jugendalter: Effekte
15 eines Trainingsprogramms mit Internetbegleitung [Stress prevention in
16 adolescence: Effects of a training program with an accompanying internet
17 platform]. *Zeitschrift für Gesundheitspsychologie, 17*, 13–21. doi:10.1026/0943-
18 8149.17.1.13
- 19 Lohaus, A. & Nussbeck, F. W. (2016). *Fragebogen zu Ressourcen im Kindes- und*
20 *Jugendalter (FRKJ 8-16)* [Resource Questionnaire for Children and
21 Adolescents]. Göttingen, Germany: Hogrefe.
- 22 Matthews, K. A. (2005). Psychological perspectives on the development of coronary
23 heart disease. *American Psychologist, 60*, 783–796. doi:10.1037/0003-
24 066X.60.8.783.

- 1 McCallie, M. S., Blum, C. M., & Hood, C. J. (2006). Progressive muscle relaxation.
2 *Journal of Human Behavior in the Social Environment, 13*, 51–66.
3 doi:10.1300/J137v13n03_04
- 4 McNamara, S. (2000). *Stress in young people. What's new and what can we do?*
5 London: Continuum.
- 6 Meichenbaum, D. (1985). *Stress inoculation training*. New York: Pergamon Press.
- 7 Misra, R., & McKean, M. (2000). College students' academic stress and its relation to
8 their anxiety, time management, and leisure satisfaction. *American Journal of*
9 *Health Studies, 16*, 41–51.
- 10 Power, T. G. (2004). Stress and coping in childhood: The parents' role. *Parenting:*
11 *Science and Practice, 4*, 271–317. doi:10.1207/s15327922par0404_1
- 12 Richards, D., & Richardson, T. (2012). Computer-based psychological treatments for
13 depression: a systematic review and meta-analysis. *Clinical Psychology Review,*
14 *32*, 329–342. doi:10.1016/j.cpr.2012.02.004
- 15 Seiffge-Krenke, I. (2000). Causal links between stressful events, coping style, and
16 adolescent symptomatology. *Journal of Adolescence, 23*, 675–691.
17 doi:10.1006/jado.2000.0352
- 18 Taylor, C. B., Jobson, K. O., Winzelberg, A., & Abascal, L. (2002). The use of the
19 Internet to provide evidence-based integrated treatment programs for mental
20 health. *Psychiatric Annals, 32*, 671–677. doi:10.3928/0048-5713-20021101-06
- 21 Vandewater, E. A., Rideout, V. J., Wartella, E. A., Huang, X., Lee, J. H., & Shim, M. S.
22 (2007). Digital childhood: electronic media and technology use among infants,
23 toddlers, and preschoolers. *Pediatrics, 119*, 1006–1015. doi:10.1542/peds.2006-
24 1804
- 25

1 Table 1

2 *Descriptive Statistics: Means and Standard Deviations for the Control Measures*

Variables	Experimental Condition				
	α	Prevention		Control	
		M	SD	M	SD
SVK-KJ minimisation	.58	3.09	0.69	3.18	0.81
SVK-KJ distraction/recreation	.67	3.47	0.84	3.48	0.89
SVK-KJ situation control	.71	3.79	0.80	3.60	0.84
SVK-KJ positive self-instructions	.70	3.75	0.71	3.62	0.87
SVK-KJ social support	.70	3.42	0.77	3.41	0.85
SVK-KJ passive avoidance	.53	2.52	0.82	2.71	0.85
SVK-KJ rumination	.73	3.05	0.90	2.96	0.89
SVK-KJ resignation	.57	2.29	0.73	2.31	0.73
SVK-KJ aggression	.60	2.37	0.76	2.49	0.81
FRKJ 8-16 self-efficacy	.83	2.80	0.58	2.59	0.46
FRKJ 8-16 self-control	.66	2.90	0.51	2.82	0.53

3 *Note.* $n = 80$ in the prevention group, $n = 73$ in the control group. Overall scores of a
4 psychometric scale were obtained by averaging the responses to the scale items. SVF-
5 KJ refers to the Stressverarbeitungsfragebogen für Kinder und Jugendliche (German
6 Coping Questionnaire for Children and Adolescents); FRKJ 8–16 refers to the
7 Fragebogen zu Ressourcen im Kindes- und Jugendalter (Resource Questionnaire for
8 Children and Adolescents).

9

Table 2

Descriptive Statistics: Means and Standard Errors for the Main Measures

Variables	Experimental Condition				
	α	Prevention		Control	
		<i>M</i>	<i>SE</i>	<i>M</i>	<i>SE</i>
T2 SSKJ 3-8 psychological ^{a,b}	.84	1.68	0.04	1.72	0.04
T3 SSKJ 3-8 psychological ^{a,b}	.85	1.55	0.04	1.66	0.04
T4 SSKJ 3-8 psychological ^{a,b}	.87	1.56	0.05	1.61	0.05
T5 SSKJ 3-8 psychological ^{a,b}	.85	1.48	0.04	1.56	0.04
T2 SSKJ 3-8 physical ^{a,c}	.71	1.52	0.04	1.53	0.05
T3 SSKJ 3-8 physical ^{a,c}	.68	1.46	0.04	1.46	0.05
T4 SSKJ 3-8 physical ^{a,c}	.78	1.49	0.05	1.53	0.05
T5 SSKJ 3-8 physical ^{a,c}	.74	1.41	0.04	1.41	0.05

Note. $n = 80$ in the prevention group, $n = 73$ in the control group. Overall scores of a psychometric scale were obtained by averaging the responses to the scale items. SSKJ 3–8 refers to the Fragebogen zur Erhebung von Stress und Stressbewältigung im Kindes- und Jugendalter. T2: Friday of the first week; T3: Friday of the second week; T4: Friday of the third week; T5: Friday of the fourth week. ^a self-efficacy added as covariate. ^b baseline stress-related psychological symptoms added as covariate. ^c baseline stress-related physical symptoms added as covariate.

Figure Caption

1
2 *Figure 1.* Logical model of the present study: It is assumed that practicing cognitive-
3 behavioural techniques and relaxation exercises should improve emotion-focused as
4 well as problem-focused coping skills, which in turn should reduce physical as well
5 psychological stress-related symptoms.

**Round 2: revised manuscript
(tier 1, introduction and methods)**

1

2

3 Testing the effectiveness of a short-term stress prevention programme in primary school

4 students

5

Abstract

The present study tested the effectiveness of a four-week, school-based, universal cognitive-behavioural stress prevention programme. The prevention programme included short daily exercises which were adopted from two well-validated anti stress trainings. The daily exercises took approximately 10–15 minutes on average and were performed during regular classroom sessions. Half of the classes were randomly assigned to the prevention group, while the other half were sorted into the non-treatment control group, which did not take part in the stress prevention programme. The students' physical and psychological stress-related symptoms were assessed ~~at five times~~ ~~times of~~ ~~measurement~~ (i.e., prior to the training and after each week of training). Their coping strategies, self-efficacy and self-control were also measured. It was ~~assumed~~ hypothesized that in the prevention group students' physical and psychological stress-related symptoms would significantly decrease over time, compared to the non-treatment control group.

Keywords: prevention, school, self-control, self-efficacy, stress

Introduction

Children are frequently confronted with challenges that can tax or exceed their psychological resources, which often elicits heightened levels of stress (Lazarus & Folkman, 1984; Seiffge-Krenke, 2000). These stressors involve, amongst others, daily hassles, academic performance pressure or developmental tasks (de Anda et al., 2000; Donaldson, Prinstein, Danovsky, & Spirito, 2000). The cross-national survey 'Health Behaviour in School-aged Children' (HSBC), which is regularly conducted by the World Health Organization (WHO), revealed that a high percentage of children aged 11–15 years ~~suffer under~~report elevated stress levels (Inchley et al., 2016). For example, in the 2014 Swiss sample of the HSBC survey, over 22% of the 11-year-old boys and over 17% of the 11-year-old girls reported moderate to high stress levels (Blaser & Amstad, 2016).

Chronic stress exposure has been found to be associated with severe short- and long-term psychological (e.g., depression) and physical (e.g., cancer) problems (Janicki-Deverts & Miller, 2007). Furthermore, there is growing evidence that chronic stress exposure during the early years of life can cause severe consequences for one's health across the lifespan (Dube et al., 2009; Matthews, 2005). Considering the potential negative effects of stress on health and wellbeing, it seems ~~highly~~very important to support children in developing their abilities to efficiently cope with stressful ~~life-~~eventssituations (McNamara, 2000). Given the fact that coping strategies are primarily developed during adolescence, focusing on opportunities to improve coping skills during adolescence ~~childhood~~ is highly important (Currie, Hurrelmann, Settertobulte, Smith, & Todd 2000). Several prevention programmes have been developed and evaluated in previous years, indicating that strategies for improving children's coping capacities are highly important (Grant et al., 2003); however, most of these programmes

are ~~often~~ performed outside the classroom, as the exercises are too long and may interfere with regular classroom sessions (Hampel & Petermann, 2003). This limitation may lead to a high number of dropouts and influence the effectiveness of the respective programme. To ensure that most students take part in a stress prevention programme, it seems beneficial to conduct the respective exercises during regular classroom sessions, which is why shorter exercises should be developed (Lohaus, 2010).

The goal of the present study was to develop and evaluate a four-week stress prevention programme including that includes short daily exercises, which can be easily completed during regular classroom sessions under the supervision of a teacher. The exercises were sourced from two well-validated cognitive-behavioural stress prevention programmes: the Anti-Stress Training for children (AST) (Hampel & Petermann, 2003) and the Stress Prevention Training for primary school ~~kids-children~~ (Klein-Heßling & Lohaus, 2000). Both of these two programmes contain cognitive-behavioural techniques (e.g., cognitive restructuring and problem solving) aimed at helping students to develop emotion-focused coping skills to reduce the actual sensations of psychological stress (e.g., relaxation techniques) and to establish problem-focused coping skills so that they can effectively deal with daily stressors in the future (see Figure 1 for our logical model). The daily exercises we included in the present study took approximately 10–15 minutes on average and were performed during regular classroom sessions led by the respective teachers. This longitudinal study tested the core hypothesis, which was that the students' physical and psychological stress-related symptoms would significantly decrease while participating in the four-week stress prevention programme, compared to a control group which did not take part in the ~~respective~~ stress prevention programme.

- Figure 1 about here -

Methods

1 *Procedure*

2 Half of the classes were randomly assigned to the prevention group, while the
3 other half were sorted into the non-treatment control group, which did not take part in
4 the stress prevention programme. The study lasted four weeks and the students in both
5 groups were tested at five time of measurement: prior to starting the programme (T1)
6 and on the Friday of each week the programme was conducted (T2–5). A follow-up
7 assessment could not be implemented due to organisational difficulties among the
8 respective schools. To match the data with each student, all students generated a unique,
9 anonymous code by writing down the first letter of their father's name, the first letter of
10 their mother's name, and the date of the day they were born. For each questionnaire
11 administered, overall scores were generated by averaging each participant's answers
12 given in the respective questionnaire; higher scores are indicative of a higher value for
13 the corresponding variable.

14 *Operationalisations*

15 **Baseline assessment.** At the first time of measurement, the students generated
16 their anonymous codes and reported their demographic information (i.e., age, gender
17 and native language; see *Questionnaire_Baseline* in the Supplemental Material
18 available online for the full baseline questionnaire). To assess habitual coping
19 tendencies, the students then worked on the 'German Coping Questionnaire for Children
20 and Adolescents' (Stressverarbeitungsfragebogen für Kinder und Jugendliche; SVF-KJ;
21 Hampel & Petermann, 2016). The SVF-KJ requests students to rate a series of 36
22 possible coping responses to interpersonal stressors and 36 possible coping responses to
23 academic stressors. Each response has to be rated on a scale of 1 ('not at all') to 5 ('all
24 the time'), indicating how likely they would apply the coping response in the respective

situation. Considering that the present study examined academic stress, the subscale for interpersonal stress was omitted, a decision that has been made in previous research as well (e.g., Hampel, Meier, & Kümmel, 2008). The scale for academic stress assessed nine coping strategies, each represented by four items, including: minimisation (e.g., 'I say to myself: "It is not that important".'), distraction/recreation (e.g., 'I just do something that I enjoy.'), situation control (e.g., 'I do something about it.'), positive self-instruction (e.g., 'I say to myself: "I can solve this problem".'), social support (e.g., 'I talk to someone about the problem.'), passive avoidance (e.g., 'I like to pretend I am sick.'), rumination (e.g., 'I worry about the situation the whole time.'), resignation (e.g., 'I say to myself: "I cannot do anything about it".') and aggression (e.g., 'I get a bad temper.').

Previous research has ~~outlined~~ shown that self-efficacy and self-control are important internal resources that can act as preventative measures against stress (e.g., Hampel et al., 2008); as such, the participants of the present study completed the 'Resource Questionnaire for Children and Adolescents' (Fragebogen zu Ressourcen im Kindes- und Jugendalter; FRKJ 8–16; Lohaus & Nussbeck, 2016). Self-efficacy (e.g., 'If I set a goal for myself, I will reach it.') and self-control (e.g., 'I am good at focusing on a given task.') were measured with six items each, which were rated on six-point Likert scales (i.e., 1 'never' to 6 'always').

Weekly assessments. To measure stress-related symptoms at each time point (T1–5), we administered the symptom checklist of the revised 'German Stress and Coping Questionnaire for Children and Adolescents' (Fragebogen zur Erhebung von Stress und Stressbewältigung im Kindes- und Jugendalter; SSKJ 3–8; Lohaus, Eschenbeck, Kohlmann, & Klein-Heßling, 2006). The students were asked to report how often they experienced the six physical stress-related symptoms (e.g., 'How often

1 have you experienced dizziness?') and the twelve psychological stress-related
2 symptoms (e.g., 'How often have you been sad?') during the week (i.e., 1 'never', 2
3 'once', 3 'more than once'). The SSKJ 3–8 was first filled out at T1. The SSKJ 3–8 was
4 also administered to both groups on every Friday during the four weeks of the
5 programme. The students' stress-related symptoms were assessed five times in total for
6 both groups (see *Questionnaire_Weekly* in the Supplemental Material available online
7 for the full weekly questionnaire).

8 ***Stress prevention programme.*** The stress prevention programme lasted four
9 weeks and included exercises adapted from two well-validated cognitive-behavioural
10 stress prevention programmes: AST (Hampel & Petermann, 2003) and Stress
11 Prevention Training (Klein-Heßling & Lohaus, 2000). Both source programmes are
12 based on the concept of stress proposed by Lazarus and Folkman (1984), as well as
13 Meichenbaum's (1985) 'Stress Inoculation Training'. We chose exercises that took, on
14 average, less than 15 minutes to complete, as the goal of the present study was to
15 develop a short stress prevention programme that could be easily integrated into regular
16 classroom sessions. The programme of the present study was highly structured; students
17 in the prevention group received a manual that included all exercises and instructions
18 for every school day during the four weeks, which were conducted during regular
19 classroom lessons (see *Manual_Children* in the Supplemental Material available online
20 for the manual).

21 The first session of the programme was led by one of the researchers of the
22 present study, while the remaining sessions were led by the respective classroom
23 teachers, who received a thorough introduction to the concept of stress and all exercises
24 depicted in the manual by the researcher before the programme started. The researcher
25 also handed out a four-week schedule to the teachers, showing which exercises to

perform on which day (see *Timetable* in the Supplemental Material available online for the four-week schedule). Each session started with a short audio-relaxation technique (cf. McCallie, Blum, & Hood, 2006), followed by the actual exercise for the given day. At the end of each week, the students reported their stress-related symptoms on the SSKJ 3–8 checklist (Lohaus et al., 2006). Each Monday, the students wrote down their tasks and responsibilities for each day of the upcoming week; previous research has demonstrated that thorough planning can be a helpful strategy for reducing stress-related symptoms (e.g., Misra & McKean, 2000).

On the first day of the programme, the researcher explained the concept of stress in detail (cf. Lazarus & Folkman, 1984), demonstrated how to use the training manual and taught the students how to perform the relaxation techniques. The daily sessions over the following four weeks were led by the respective classroom teachers. The goal for the first week was to increase the students' knowledge and understanding of stress by asking them to brainstorm what they knew about the concept of stress and how they coped with stressful experiences, and to write down situations in which they were proud of themselves for handling a stressful episode. During the next three weeks, the students performed daily exercises designed to a) improve their understanding of the relations between their thoughts and stress, b) develop a more positive self-evaluation and c) improve their coping skills.

On the final day of the programme, the students were asked to report how they rated the programme and whether they had the impression that their stress-related experiences had decreased over the four-week period. Finally, the students were thanked, debriefed and received a small gift.

Sampling

We chose a representative sample of third- and fourth-grade students from several schools in Switzerland. We randomly contacted several schools and asked them if they were willing to participate in the present study. We obtained written, informed consent from the parents and the students.

Required Sample Size

An a priori power analysis was conducted using G*Power, revealing that we needed a sample of $N = 141$ students to detect at least a medium effect (parameters: $f = .30$, $\alpha = .05$, $1 - \beta = .85$) (Faul, Erdfelder, Lang, & Buchner, 2007). Our final sample size was large enough to find such an effect.

Data collection period

The data collection took place between January and March 2017.

Analysis plan

Preliminary analyses. To analyse whether the prevention and the control condition differed in their habitual use of certain coping strategies (as measured by the SVF-KJ; Hampel & Petermann, 2016), in their self-control resources, or in their self-efficacy (as measured by the FRKJ 8–16; Lohaus & Nussbeck, 2016), between-subjects analyses of variance (ANOVA) were conducted.

Main analyses. A mixed 2x4 between-/within-subjects analysis of covariance (ANCOVA) was conducted to test the effect of the stress prevention programme on physical stress-related symptoms. The baseline scores for physical stress-related symptoms were added as a covariate (for details on this procedure, see Lohaus, Fridrici, & Maass, 2009). The experimental condition (i.e., prevention vs. control group) was added as the between-subjects factor, time of measurement (T2–5) as the within-subjects factor, and the physical stress-related symptoms were added as the dependent variables. In the same vein, to test whether the stress prevention programme influenced

psychological stress-related symptoms, we conducted a mixed 2x4 between (i.e., prevention group vs. control group) - within-subjects (i.e., time of measurement [T2–5]) ANCOVA. The baseline scores for psychological stress-related symptoms were added as a covariate.

Software and materials

All data was collected via paper-pencil questionnaires. We used SPSS to analyze the data.

Ethics

This study has been approved by the local ethics committee of the faculty of Human Sciences at the University of Bern, Switzerland see *Ethical Approval in the Supplemental Material available online*). All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments. We obtained written, informed consent from the parents and the students prior to their inclusion in the study.

References

- Blaser, M., & Amstad, F. (2016). *Psychische Gesundheit über die Lebensspanne* [Psychological Health Across the Lifespan]. Bern: Gesundheitsförderung Schweiz.
- Currie, C., Hurrelmann, K., Settertobulte, W., Smith R., & Todd J. (2000). *Health and health behaviour among young people. Issue 1 of the WHO Policy Series: Health policy for children and adolescents*. Copenhagen: World Health Organization.
- de Anda, D., Baroni, S., Boskin, L., Buchwald, L., Morgan, J., Ow, J., . . . Weiss, R. (2000). Stress, stressors and coping strategies among high school students. *Children and Youth Services Review*, 22, 441–463. doi:10.1016/S0190-7409(00)00096-7
- Donaldson, D., Prinstein, M., Danovsky, M. & Spirito, A. (2000). Patterns of children's coping with life stress: Implications for clinicians. *American Journal of Orthopsychiatry*, 70, 351–359. doi:10.1037/h0087689
- Dube, S. R., Fairweather, D., Pearson, W. S., Felitti, V. J., Anda, R. F., & Croft, J. B. (2009). Cumulative childhood stress and autoimmune diseases in adults. *Psychosomatic Medicine*, 71, 243–250. doi:10.1097/PSY.0b013e318190788
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: a flexible statistical power analysis program for the social, behavioural, and biomedical sciences. *Behavior Research Methods*, 39, 175–191. doi:10.3758/BF03193146
- Grant, K. E., Compas, B. E., Stuhlmacher, A. F., Thurm, A. E., McMahon, S. D., & Halpert, J. A. (2003). Stressors and child and adolescent psychopathology:

- 1 Moving from markers to mechanisms of risk. *Psychological Bulletin*, 129, 447–
2 466. doi:10.1037/0033-2909.129.3.447
- 3 Hampel, P., Meier, M., & Kümmel, U. (2008). School-based stress management
4 training for adolescents: Longitudinal results from an experimental study.
5 *Journal of Youth and Adolescence*, 37, 1009–1024. doi:10.1007/s10964-007-
6 9204-4
- 7 Hampel, P., & Petermann, F. (2003). *Anti-Stress-Training für Kinder* [Anti-Stress
8 Training for Children]. Weinheim, Germany: Beltz.
- 9 Hampel, P., & Petermann, F. (2016). *Stressverarbeitungsfragebogen von Janke und*
10 *Erdmann angepasst für Kinder und Jugendliche (SVF-KJ)* [The German Coping
11 Questionnaire by Janke and Erdmann Adapted for Children and Adolescents].
12 Göttingen, Germany: Hogrefe.
- 13 Inchley, J., Currie, C., Young, T., Samdal, O., Torsheim, T., Auguston, L., . . .
14 Barnekow, V. (2016). Growing up unequal: Gender and socioeconomic
15 differences in young people's health and well-being. *Health Behaviour in*
16 *School-aged Children (HBSC) Study: International Report from the 2013/14*
17 *Survey*. Copenhagen: World Health Organization.
- 18 Klein-Heßling, J., & Lohaus, A. (2000). *Streßpräventionstraining für Kinder im*
19 *Grundschulalter* [Stress Prevention Training for Primary School Kids].
20 Göttingen, Germany: Hogrefe.
- 21 Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York:
22 Springer-Verlag.
- 23 Lohaus, A. (2010). Stress prevention in adolescence: Evaluation of a multimodal
24 training approach. *Journal of Public Health*, 19, 385–388. doi:10.1007/s10389-
25 010-0391-1

Formatted: English (United Kingdom)

- 1 Lohaus, A., Eschenbeck, H., Kohlmann, C. W., & Klein-Heßling, J. (2006).
2 *Fragebogen zur Erhebung von Stress und Stressbewältigung im Kindes- und*
3 *Jugendalter (SSKJ 3-8)* [The German Stress and Coping Questionnaire for
4 Children and Adolescents]. Göttingen, Germany: Hogrefe.
- 5 Lohaus, A., Fridrici, M., & Maass, A. (2009). Stressprävention im Jugendalter: Effekte
6 eines Trainingsprogramms mit Internetbegleitung [Stress prevention in
7 adolescence: Effects of a training program with an accompanying internet
8 platform]. *Zeitschrift für Gesundheitspsychologie*, 17, 13–21. doi:10.1026/0943-
9 8149.17.1.13
- 10 Lohaus, A. & Nussbeck, F. W. (2016). *Fragebogen zu Ressourcen im Kindes- und*
11 *Jugendalter (FRKJ 8-16)* [Resource Questionnaire for Children and
12 Adolescents]. Göttingen, Germany: Hogrefe.
- 13 Matthews, K. A. (2005). Psychological perspectives on the development of coronary
14 heart disease. *American Psychologist*, 60, 783–796. doi:10.1037/0003-
15 066X.60.8.783.
- 16 McCallie, M. S., Blum, C. M., & Hood, C. J. (2006). Progressive muscle relaxation.
17 *Journal of Human Behavior in the Social Environment*, 13, 51–66.
18 doi:10.1300/J137v13n03_04
- 19 McNamara, S. (2000). *Stress in young people. What's new and what can we do?*
20 London: Continuum.
- 21 Meichenbaum, D. (1985). *Stress inoculation training*. New York: Pergamon Press.
- 22 Misra, R., & McKean, M. (2000). College students' academic stress and its relation to
23 their anxiety, time management, and leisure satisfaction. *American Journal of*
24 *Health Studies*, 16, 41–51.

Seiffge-Krenke, I. (2000). Causal links between stressful events, coping style, and adolescent symptomatology. *Journal of Adolescence*, 23, 675–691.
doi:10.1006/jado.2000.0352

Figure Caption

Figure 1. Logical model of the present study: It is assumed that practicing cognitive-behavioural techniques and relaxation exercises should improve emotion-focused as well as problem-focused coping skills, which in turn should reduce physical as well psychological stress-related symptoms.

**Round 1: submitted manuscript
(tier 1, introduction and methods)**

1

2

3 Testing the effectiveness of a short-term stress prevention programme in primary school

4 students

5

Abstract

The present study tested the effectiveness of a four-week, school-based, universal cognitive-behavioural stress prevention programme. The prevention programme included short daily exercises which were adopted from two well-validated anti stress trainings. The daily exercises took approximately 10–15 minutes on average and were performed during regular classroom sessions. Half of the classes were randomly assigned to the prevention group, while the other half were sorted into the non-treatment control group, which did not take part in the stress prevention programme. The students' physical and psychological stress-related symptoms were assessed at five time times of measurement (i.e., prior to the training and after each week of training). Their coping strategies, self-efficacy and self-control were also measured. It was assumed that in the prevention group students' physical and psychological stress-related symptoms would significantly decrease over time, compared to the non-treatment control group.

Keywords: prevention, school, self-control, self-efficacy, stress

Introduction

Children are frequently confronted with challenges that can tax or exceed their psychological resources, which often elicits heightened levels of stress (Lazarus & Folkman, 1984; Seiffge-Krenke, 2000). These stressors involve, amongst others, daily hassles, academic performance pressure or developmental tasks (de Anda et al., 2000; Donaldson, Prinstein, Danovsky, & Spirito, 2000). The cross-national survey ‘Health Behaviour in School-aged Children’ (HSBC), which is regularly conducted by the World Health Organization (WHO), revealed that a high percentage of children aged 11–15 years suffer under elevated stress levels (Inchley et al., 2016). For example, in the 2014 Swiss sample of the HSBC survey, over 22% of the 11-year-old boys and over 17% of the 11-year-old girls reported moderate to high stress levels (Blaser & Amstad, 2016).

Chronic stress exposure has been found to be associated with severe short- and long-term psychological (e.g., depression) and physical (e.g., cancer) problems (Janicki-Deverts & Miller, 2007). Furthermore, there is growing evidence that chronic stress exposure during the early years of life can cause severe consequences for one’s health across the lifespan (Dube et al., 2009; Matthews, 2005). Considering the potential negative effects of stress on health and wellbeing, it seems highly important to support children in developing their abilities to efficiently cope with stressful life events (McNamara, 2000). Given the fact that coping strategies are primarily developed during adolescence, focusing on opportunities to improve coping skills during childhood is highly important (Currie, Hurrelmann, Settertobulte, Smith, & Todd 2000). Several prevention programmes have been developed and evaluated in previous years, indicating that strategies for improving children’s coping capacities are highly important (Grant et al., 2003); however, most of these programmes are often performed outside

the classroom, as the exercises are too long and may interfere with regular classroom sessions (Hampel & Petermann, 2003). This may lead to a high number of dropouts and influence the effectiveness of the respective programme. To ensure that most students take part in a stress prevention programme, it seems beneficial to conduct the respective exercises during regular classroom sessions, which is why shorter exercises should be developed (Lohaus, 2010).

The goal of the present study was to develop a four-week stress prevention programme including short daily exercises, which can be easily completed during regular classroom sessions under the supervision of a teacher. The exercises were sourced from two well-validated cognitive-behavioural stress prevention programmes: the Anti-Stress Training for children (AST) (Hampel & Petermann, 2003) and the Stress Prevention Training for primary school kids (Klein-Heßling & Lohaus, 2000). The daily exercises took approximately 10–15 minutes on average and were performed during regular classroom sessions led by the respective teachers. This longitudinal study tested the core hypothesis, which was that the students' physical and psychological stress-related symptoms would significantly decrease while participating in the four-week stress prevention programme, compared to a control group which did not take part in the respective stress prevention programme.

Methods

Procedure

Half of the classes were randomly assigned to the prevention group, while the other half were sorted into the non-treatment control group, which did not take part in the stress prevention programme. The study lasted four weeks and the students in both groups were tested at five time of measurement: prior to starting the programme (T1)

and on the Friday of each week the programme was conducted (T2–5). A follow-up assessment could not be implemented due to organisational difficulties among the respective schools. To match the data with each student, all students generated a unique, anonymous code. For each questionnaire administered, overall scores were generated by averaging each participant's answers given in the respective questionnaire; higher scores are indicative of a higher value for the corresponding variable.

Operationalisations

Baseline assessment. At the first time of measurement, the students generated their anonymous codes and reported their demographic information (i.e., age, gender and native language; see *Questionnaire_Baseline* in the Supplemental Material available online for the full baseline questionnaire). To assess habitual coping tendencies, the students then worked on the 'German Coping Questionnaire for Children and Adolescents' (Stressverarbeitungsfragebogen für Kinder und Jugendliche; SVF-KJ; Hampel & Petermann, 2016). The SVF-KJ requests students to rate a series of 36 possible coping responses to interpersonal stressors and 36 possible coping responses to academic stressors. Each response has to be rated on a scale of 1 ('not at all') to 5 ('all the time'), indicating how likely they would apply the coping response in the respective situation. Considering that the present study examined academic stress, the subscale for interpersonal stress was omitted, a decision that has been made in previous research as well (e.g., Hampel, Meier, & Kümmel, 2008). The scale for academic stress assessed nine coping strategies, each represented by four items, including: minimisation (e.g., 'I say to myself: "It is not that important".'), distraction/recreation (e.g., 'I just do something that I enjoy.'), situation control (e.g., 'I do something about it.'), positive self-instruction (e.g., 'I say to myself: "I can solve this problem".'), social support (e.g., 'I talk to someone about the problem.'), passive avoidance (e.g., 'I like to pretend I am

sick.’), rumination (e.g., ‘I worry about the situation the whole time.’), resignation (e.g., ‘I say to myself: “I cannot do anything about it”.’) and aggression (e.g., ‘I get a bad temper.’).

Previous research has outlined that self-efficacy and self-control are important internal resources that can act as preventative measures against stress (e.g., Hampel et al., 2008); as such, the participants of the present study completed the ‘Resource Questionnaire for Children and Adolescents’ (Fragebogen zu Ressourcen im Kindes- und Jugendalter; FRKJ 8–16; Lohaus & Nussbeck, 2016). Self-efficacy (e.g., ‘If I set a goal for myself, I will reach it.’) and self-control (e.g., ‘I am good at focusing on a given task.’) were measured with six items each, which were rated on six-point Likert scales (i.e., 1 ‘never’ to 6 ‘always’).

Weekly assessments. To measure stress-related symptoms at each time point (T1–5), we administered the symptom checklist of the revised ‘German Stress and Coping Questionnaire for Children and Adolescents’ (Fragebogen zur Erhebung von Stress und Stressbewältigung im Kindes- und Jugendalter; SSKJ 3–8; Lohaus, Eschenbeck, Kohlmann, & Klein-Heßling, 2006). The students were asked to report how often they experienced the six physical stress-related symptoms (e.g., ‘How often have you experienced dizziness?’) and the twelve psychological stress-related symptoms (e.g., ‘How often have you been sad?’) during the week (i.e., 1 ‘never’, 2 ‘once’, 3 ‘more than once’). The SSKJ 3–8 was first filled out at T1. The SSKJ 3–8 was also administered to both groups on every Friday during the four weeks of the programme. The students’ stress-related symptoms were assessed five times in total for both groups (see *Questionnaire_Weekly* in the Supplemental Material available online for the full weekly questionnaire).

Stress prevention programme. The stress prevention programme lasted four weeks and included exercises adapted from two well-validated cognitive-behavioural stress prevention programmes: AST (Hampel & Petermann, 2003) and Stress Prevention Training (Klein-Heßling & Lohaus, 2000). Both source programmes are based on the concept of stress proposed by Lazarus and Folkman (1984), as well as Meichenbaum's (1985) 'Stress Inoculation Training'. We chose exercises that took, on average, less than 15 minutes to complete, as the goal of the present study was to develop a short stress prevention programme that could be easily integrated into regular classroom sessions. Both source programmes contain cognitive-behavioural techniques (e.g., cognitive restructuring and problem solving) aimed at helping students to develop emotion-focused coping skills to reduce the actual sensations of psychological stress (e.g., relaxation techniques) and to establish problem-focused coping skills so that they can effectively deal with daily stressors in the future. The programme of the present study was highly structured; students in the prevention group received a manual that included all exercises and instructions for every school day during the four weeks, which were conducted during regular classroom lessons (see *Manual_Children* in the Supplemental Material available online for the manual).

The first session of the programme was led by one of the researchers of the present study, while the remaining sessions were led by the respective classroom teachers, who received a thorough introduction to the concept of stress and all exercises depicted in the manual by the researcher before the programme started. The researcher also handed out a four-week schedule to the teachers, showing which exercises to perform on which day (see *Timetable* in the Supplemental Material available online for the four-week schedule). Each session started with a short audio-relaxation technique (cf. McCallie, Blum, & Hood, 2006), followed by the actual exercise for the given day.

At the end of each week, the students reported their stress-related symptoms on the SSKJ 3–8 checklist (Lohaus et al., 2006). Each Monday, the students wrote down their tasks and responsibilities for each day of the upcoming week; previous research has demonstrated that thorough planning can be a helpful strategy for reducing stress-related symptoms (e.g., Misra & McKean, 2000).

On the first day of the programme, the researcher explained the concept of stress in detail (cf. Lazarus & Folkman, 1984), demonstrated how to use the training manual and taught the students how to perform the relaxation techniques. The daily sessions over the following four weeks were led by the respective classroom teachers. The goal for the first week was to increase the students' knowledge and understanding of stress by asking them to brainstorm what they knew about the concept of stress and how they coped with stressful experiences, and to write down situations in which they were proud of themselves for handling a stressful episode. During the next three weeks, the students performed daily exercises designed to a) improve their understanding of the relations between their thoughts and stress, b) develop a more positive self-evaluation and c) improve their coping skills.

On the final day of the programme, the students were asked to report how they rated the programme and whether they had the impression that their stress-related experiences had decreased over the four-week period. Finally, the students were thanked, debriefed and received a small gift.

Sampling

We chose a representative sample of third- and fourth-grade students from several schools in Switzerland. We randomly contacted several schools and asked them if they were willing to participate in the present study. We obtained written, informed consent from the parents and the students.

Required Sample Size

An a priori power analysis was conducted using G*Power, revealing that we needed a sample of $N = 141$ students to detect at least a medium effect (parameters: $f = .30$, $\alpha = .05$, $1 - \beta = .85$) (Faul, Erdfelder, Lang, & Buchner, 2007). Our final sample size was large enough to find such an effect.

Data collection period

The data collection took place between January and March 2017.

Analysis plan

Preliminary analyses. To analyse whether the prevention and the control condition differed in their habitual use of certain coping strategies (as measured by the SVF-KJ; Hampel & Petermann, 2016), in their self-control resources, or in their self-efficacy (as measured by the FRKJ 8–16; Lohaus & Nussbeck, 2016), between-subjects analyses of variance (ANOVA) were conducted.

Main analyses. A mixed 2x4 between-/within-subjects analysis of covariance (ANCOVA) was conducted to test the effect of the stress prevention programme on physical stress-related symptoms. The baseline scores for physical stress-related symptoms were added as a covariate (for details on this procedure, see Lohaus, Fridrici, & Maass, 2009). The experimental condition (i.e., prevention vs. control group) was added as the between-subjects factor, time of measurement (T2–5) as the within-subjects factor, and the physical stress-related symptoms were added as the dependent variables. In the same vein, to test whether the stress prevention programme influenced psychological stress-related symptoms, we conducted a mixed 2x4 between (i.e., prevention group vs. control group) - within-subjects (i.e., time of measurement [T2–5]) ANCOVA, including the covariate psychological stress-related symptoms.

201 *Software and materials*

202 All data was collected via paper-pencil questionnaires. We used SPSS to analyze
203 the data.

204 *Ethics*

205 All procedures performed in this study were in accordance with the ethical
206 standards of the institutional and/or national research committee and with the 1964
207 Helsinki declaration and its later amendments. We obtained written, informed consent
208 from the parents and the students prior to their inclusion in the study.

209

210

211

212

213

214

215

216

217

218

219

220

221

222

223

224

225

References

- Blaser, M., & Amstad, F. (2016). *Psychische Gesundheit über die Lebensspanne* [Psychological Health Across the Lifespan]. Bern: Gesundheitsförderung Schweiz.
- Currie, C., Hurrelmann, K., Settertobulte, W., Smith R., & Todd J. (2000). *Health and health behaviour among young people. Issue 1 of the WHO Policy Series: Health policy for children and adolescents*. Copenhagen: World Health Organization.
- de Anda, D., Baroni, S., Boskin, L., Buchwald, L., Morgan, J., Ow, J., . . . Weiss, R. (2000). Stress, stressors and coping strategies among high school students. *Children and Youth Services Review*, 22, 441–463. doi:10.1016/S0190-7409(00)00096-7
- Donaldson, D., Prinstein, M., Danovsky, M. & Spirito, A. (2000). Patterns of children's coping with life stress: Implications for clinicians. *American Journal of Orthopsychiatry*, 70, 351–359. doi:10.1037/h0087689
- Dube, S. R., Fairweather, D., Pearson, W. S., Felitti, V. J., Anda, R. F., & Croft, J. B. (2009). Cumulative childhood stress and autoimmune diseases in adults. *Psychosomatic Medicine*, 71, 243–250. doi:10.1097/PSY.0b013e318190788
- Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G* Power 3: a flexible statistical power analysis program for the social, behavioural, and biomedical sciences. *Behavior Research Methods*, 39, 175–191. doi:10.3758/BF03193146
- Grant, K. E., Compas, B. E., Stuhlmacher, A. F., Thurm, A. E., McMahon, S. D., & Halpert, J. A. (2003). Stressors and child and adolescent psychopathology: Moving from markers to mechanisms of risk. *Psychological Bulletin*, 129, 447–466. doi:10.1037/0033-2909.129.3.447

- 251 Hampel, P., Meier, M., & Kümmel, U. (2008). School-based stress management
252 training for adolescents: Longitudinal results from an experimental study.
253 *Journal of Youth and Adolescence*, 37, 1009–1024. doi:10.1007/s10964-007-
254 9204-4
- 255 Hampel, P., & Petermann, F. (2003). *Anti-Stress-Training für Kinder* [Anti-Stress
256 Training for Children]. Weinheim, Germany: Beltz.
- 257 Hampel, P., & Petermann, F. (2016). *Stressverarbeitungsfragebogen von Janke und*
258 *Erdmann angepasst für Kinder und Jugendliche (SVF-KJ)* [The German Coping
259 Questionnaire by Janke and Erdmann Adapted for Children and Adolescents].
260 Göttingen, Germany: Hogrefe.
- 261 Inchley, J., Currie, C., Young, T., Samdal, O., Torsheim, T., Auguston, L., . . .
262 Barnekow, V. (2016). Growing up unequal: Gender and socioeconomic
263 differences in young people's health and well-being. *Health Behaviour in*
264 *School-aged Children (HBSC) Study: International Report from the 2013/14*
265 *Survey*. Copenhagen: World Health Organization.
- 266 Klein-Heßling, J., & Lohaus, A. (2000). *Streßpräventionstraining für Kinder im*
267 *Grundschulalter* [Stress Prevention Training for Primary School Kids].
268 Göttingen, Germany: Hogrefe.
- 269 Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. New York:
270 Springer-Verlag.
- 271 Lohaus, A. (2010). Stress prevention in adolescence: Evaluation of a multimodal
272 training approach. *Journal of Public Health*, 19, 385–388. doi:10.1007/s10389-
273 010-0391-1
- 274 Lohaus, A., Eschenbeck, H., Kohlmann, C. W., & Klein-Heßling, J. (2006).
275 *Fragebogen zur Erhebung von Stress und Stressbewältigung im Kindes- und*

- 276 *Jugendalter (SSKJ 3-8)* [The German Stress and Coping Questionnaire for
277 Children and Adolescents]. Göttingen, Germany: Hogrefe.
- 278 Lohaus, A., Fridrici, M., & Maass, A. (2009). Stressprävention im Jugendalter: Effekte
279 eines Trainingsprogramms mit Internetbegleitung [Stress prevention in
280 adolescence: Effects of a training program with an accompanying internet
281 platform]. *Zeitschrift für Gesundheitspsychologie*, 17, 13–21. doi:10.1026/0943-
282 8149.17.1.13
- 283 Lohaus, A. & Nussbeck, F. W. (2016). *Fragebogen zu Ressourcen im Kindes- und*
284 *Jugendalter (FRKJ 8-16)* [Resource Questionnaire for Children and
285 Adolescents]. Göttingen, Germany: Hogrefe.
- 286 Matthews, K. A. (2005). Psychological perspectives on the development of coronary
287 heart disease. *American Psychologist*, 60, 783–796. doi:10.1037/0003-
288 066X.60.8.783.
- 289 McCallie, M. S., Blum, C. M., & Hood, C. J. (2006). Progressive muscle relaxation.
290 *Journal of Human Behavior in the Social Environment*, 13, 51–66.
291 doi:10.1300/J137v13n03_04
- 292 McNamara, S. (2000). *Stress in young people. What's new and what can we do?*
293 London: Continuum.
- 294 Meichenbaum, D. (1985). *Stress inoculation training*. New York: Pergamon Press.
- 295 Misra, R., & McKean, M. (2000). College students' academic stress and its relation to
296 their anxiety, time management, and leisure satisfaction. *American Journal of*
297 *Health Studies*, 16, 41–51.
- 298 Seiffge-Krenke, I. (2000). Causal links between stressful events, coping style, and
299 adolescent symptomatology. *Journal of Adolescence*, 23, 675–691.
300 doi:10.1006/jado.2000.0352

301

302