
Implementation of health education interventions at Dutch music schools

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Summary

A randomized controlled trial was conducted comparing the effects of a biopsychosocial course (PRESTO-Play) vs. physical activity promotion (PRESTO-Fit) to reduce disability related to musculoskeletal disorders in music students. The current study provides an external validation and a formative and process evaluation, allowing for a better interpretation of results. First, a group of experts was asked to complete a structured evaluation of design and content of the trial. Second, quantitative and qualitative data were analysed from different stakeholders (students, therapists and conservatory staff) using questionnaires, logs, field notes and emails to evaluate fidelity, dose delivered, dose received, reach and context. Results are presented descriptively. Two authors independently identified key responses that were merged into themes. Although no difference in disability was found between interventions, closer evaluation revealed that participants in PRESTO-Play reported that they learned about prevention of physical complaints and were more satisfied with course contents compared with PRESTO-Fit. Study design and contents of the interventions were found to be valid, with an appropriate dose delivered. Feedback from students and logs suggested that behavioural change and psychosocial principles in PRESTO-Play might have not been implemented optimally. Only moderate fidelity in both groups and too little contrast between interventions could have influenced results. Low attendance rates and a presumed lack of generalization further decreased possible effectiveness. Context greatly influenced implementation. Implementing a future health course with closer collaboration with the institution could optimize accessibility and communication, encourage attendance and enhance motivation for behavioural change.

Key words: health promotion, process evaluation, musculoskeletal disorders, feasibility, education

INTRODUCTION

Music students are at increased risk, compared to non-music students, of developing musculoskeletal complaints (Kok *et al.*, 2013; Ballenberger *et al.*, 2018). Music education in conservatories is dedicated to learning to play the musical instrument in the most virtuosic way, with little consideration of individual physical or psychological characteristics. Musicians' health is of significant importance to performance quality due to the very high physical and mental skills required to excel; however, musicians typically receive limited health education regarding the most effective ways to prepare body and minds for performance (Clark and Lisboa, 2013). Current health responsibility and health-promoting behaviour in conservatory students have been reported to be low (Kreutz *et al.*, 2009). Therefore, it seems logical to address health and injury prevention during conservatory studies.

Universities are complex organizations with a great potential to influence student behaviours through factors such as collective values, beliefs and actions (Chesky *et al.*, 2006; Newton *et al.*, 2016). In the typical master-apprentice teaching model in music tertiary training institutions, teachers have an authoritative status, even in regard to physical and psychological aspects of performance, despite the fact that they do not have an educational background in health themselves (Perkins *et al.*, 2017). Next to individual lifestyle behaviours, the demands arising from practice and performance have a high impact on music student's health (Perkins *et al.*, 2017). The culture within music training and music professions usually involves a taboo on reporting or discussing pain. Despite this, pain can have devastating effects on careers, and with high competition and demands to always play at the best, music students may not feel safe to discuss or seek appropriate help for their health-related problems or pain. Therefore, it is an imperative to modify cultures at conservatoires to enable health and well-being to be embedded as integral component of conservatoire education (Perkins *et al.*, 2017) and thereby support students to optimize healthy practice and performance strategies (Araújo *et al.*, 2017).

Existing examples of health promotion projects in music schools include the Health Promotion in Schools of Music Project in the USA (Chesky *et al.*, 2006), and the Healthy Conservatories Network in the UK (Musical Impact). However, only limited studies have been performed evaluating health interventions in music education settings. Varying study designs with limited theoretic foundation, varying assessment tools and outcomes hamper interpretability of results. Interestingly, musicians' health

courses are described as likely to increase perceived knowledge and awareness to performance-related health risks, however, are only associated with a limited actual decline in physical or psychological symptoms (Matei *et al.*, 2018).

Recently, a multi-centre randomized controlled trial (RCT) was conducted at five Dutch conservatories to study the effectiveness of a biopsychosocial prevention course, compared to physical activity promotion, to prevent or reduce disability due to musculoskeletal disorders in music students: the 'PREvention STudy On preventing or reducing disability from musculoskeletal complaints in music students' or PRESTO trial. No difference in primary outcome, playing-related disability, could be found between intervention and control groups. It seemed that disability decreased over the course of 2 years in both groups. When conducting a multi-centre, multi-faceted trial in daily practice, a wide variety of factors is encountered during execution and follow-up that may influence study findings and outcomes. In accordance to the new Medical Research Council guidelines for developing and evaluating complex interventions (Craig *et al.*, 2008), this current report provides a critical examination of the PRESTO trial, in conjunction with multiple stakeholders including an external evaluation of the study protocol, and a formative and process evaluation. Although the trial methodology and interventions were based on theoretical models, existing evidence and elaborate discussions between authors, an independent external review *a posteriori* was aimed at answering the research question: 'are the study design and contents of the interventions in the PRESTO trial valid?' Second, a formative and process evaluation provides valuable information regarding implementation, treatment fidelity and the influence of contextual factors. Second and third research questions were: 'are the interventions implemented as intended?' and 'What are barriers and facilitators of implementing a multi-centre research trial aimed at improving health in music schools?' In conclusion, information gathered in this evaluation could provide great additional value to interpret results of the original trial and unravels barriers and facilitators that could inform future research (Oakley *et al.*, 2006).

MATERIALS

Background information to the original trial (PRESTO)

The study protocol and results of the trial have been published elsewhere (Baadjou *et al.*, 2014, 2018). Included were 170 first- and second-year students who were randomly allocated and stratified by conservatory, to either experimental (PRESTO-Play) or control

condition (PRESTO-Fit). The aim of PRESTO-Play was to educate students about body posture while playing the instrument, and to discuss psychosocial aspects related to the musician's health, while incorporating health behaviour change principles. PRESTO-Fit was designed to control for attention and aimed at stimulating physical activity levels using a 10 000 step per day approach according Dutch guidelines for activity promotion for the general population.

Course contents are presented in [Table 1](#). The courses were implemented as voluntary extracurricular classes for music students during the first or second academic year in either 2012–2013 or 2013–2014. Time spent on both interventions was aimed to be equal, about 18 hours in total, with PRESTO-Play consisting of 11 classes, and PRESTO-Fit of 5 classes with additional time spent increasing daily activity level in leisure time. For further details, see the study protocol and effect evaluation ([Baadjou et al., 2014, 2018](#)). Rationale for PRESTO-Play and PRESTO-Fit were supported by current literature and clinical experience. PRESTO-Play was provided by experienced postural exercise therapists Mensendieck/Cesar, method Samama, and PRESTO-Fit by therapists with an affinity for physical activity education. All therapists were trained to follow a standardized protocol twice; at start of the first and second inclusion year. Outcomes were measured using questionnaires at baseline, during and at the end of the intervention, and at 16- and 24-month follow-up. By the end of the intervention, 62% and 58% of PRESTO-Play and PRESTO-Fit participants, respectively, were still enrolled in the trial. At 2-year follow-up, participation rate had dropped to 32% and 29% for PRESTO-Play and PRESTO-Fit, respectively. Intention-to-treat analysis revealed that during the intervention and until the end of follow-up, there was no difference in disability between both interventions. Disability declined over 2 years with 33% in PRESTO-Play and 49% in PRESTO-Fit.

Study design

A pre-specified mixed-methods evaluation was conducted as an adjunct to the PRESTO study. Aspects of this evaluation are described in [Table 2](#). Measures are presented at the cluster and individual level, using a mix of quantitative and qualitative approaches. Interpretation occurred with consideration of context and in relation to the main trial's findings.

External validation

An independent external review of the study protocol and contents of interventions was performed to assess external validity of the study.

Setting and sample

Reviewers were defined as researchers (academic level ranging from PhD student to professor) experienced in project design, exercise interventions and/or musician's health and were approached for participation by the second author (B.J.A.). They were not involved in the PRESTO trial. Reviewers had to rate their own competency regarding these three themes on a 0–10 scale from no experience at all to highly specialized. The principal investigator (V.A.E.B.) presented a detailed standardized overview on study design, intervention contents and implementation of the trial. A questionnaire was designed and distributed prior to the presentation, to be completed during and immediately after the presentation ([Supplementary Appendix 1](#)). Answer options were yes or no, and an option was provided to note comments. The percentage of positive responses were reported. The analysis focused on key themes from the interventions: body posture while playing, health behaviour change, psychosocial aspects and physical activity promotion. We expected that 10 reviewers would be needed to provide valuable feedback.

Formative and process evaluation

The process evaluation included both formative and summative purposes and was inspired on work of [Steckler and Linnan \(2002\)](#), [Baranowski and Stables \(2000\)](#) and [Saunders et al. \(2005\)](#). The process evaluation intended to answer six key questions: (i) to what extent was the intervention implemented as planned? (fidelity) (ii) to what extent were classes provided as planned? (dose delivered) (iii) how was the course received by the students? (dose received) (iv) how did health behaviour change during and after the trial? (v) what proportion of students participated in the study? (reach) (vi) which aspects may have influenced the implementation? (context).

Setting and sample

Data were collected at all participating music schools. Participants included music students, therapists and conservatory staff engaged in the trial. Feedback was collected by questionnaire, logs, field notes and email correspondence.

Table 1: Contents and components of PRESTO-Play and PRESTO-Fit

Contents	Action components	Methods
PRESTO-Play		
Health behaviour change principles: incorporated throughout all classes		
Awareness	<ul style="list-style-type: none"> • Increase knowledge about importance of posture while playing • Provide cues to action, increase risk perception • Attitudes to attention to body posture while playing • Social influences (norms, modelling, pressure) • Self-efficacy 	<p>Eleven classes of 1.5-h duration</p> <ul style="list-style-type: none"> • Standardized PowerPoint presentation • Semi-structured class discussions, peer model stories • Video of role model with physical complaints • Semi-structured class discussions • Exploring assumptions • Individualized feedback from therapist on body posture • Analysing own body posture with mirror • Goal setting • Personal feedback • Semi-structured class discussions • Exploring barriers and facilitators
Motivation		
Ability	<p>Implementation of paying attention to body posture while playing</p>	
Body posture while playing: practice with instrument incorporated from class 2 until 11	<ul style="list-style-type: none"> • Anatomy and physiology of the human body in relation to playing a musical instrument • Basic body posture • Postural regulation • Playing vs. postural muscles • Thoracic and abdominal muscles • Breathing • Dynamic balance • Hypermobility • Warming-up and cooling-down • Stretching • Relaxation • Influence of stress on your body • Instrument-specific biomechanics • Ergonomics 	<ul style="list-style-type: none"> • Workshop • Individual feedback on performance posture from therapist • Visualizing own body posture by use of mirrors • Analysing each other's body postures • Book: 'Making music without pain' • Homework assignments
Psychosocial aspects: from class 7, half of the class was dedicated to playing the instrument, half to psychosocial aspects		

(continued)

Table 1: (Continued)

Contents	Action components	Methods
Psychosocial aspects	<ul style="list-style-type: none"> • Practice behaviour • Physical activity • Coping with stress • Music performance anxiety • Acute vs. chronic pain • Where to get help 	<ul style="list-style-type: none"> • Workshop • Semi-structured class discussions on real-life situations
PRESTO-Fit	<p>Health behaviour change principles to increase physical activity up to 10 000 steps</p> <p>Increase knowledge about importance of physical activity for a musician</p>	<p>Five classes of 1.5-h duration</p> <ul style="list-style-type: none"> • Video on general physical activity • Video on musician-specific benefits of physical activity
Motivation	Peer model stories	<ul style="list-style-type: none"> • Assignment on calories and physical activity • Semi-structured class discussion
Ability	Implementation of physical activity	<ul style="list-style-type: none"> • Visualizing current steps with graphs • Goal setting • Keeping step logbooks • Visualizing step counts with graphs • Semi-structured class discussion • Count steps of frequent routes • Introduction of mobile telephone apps

Table 2: Overview of evaluation methods

Evaluation domain	Research questions	Research methods	Participants	Data collection tools
External validation	Are study design and interventions in PRESTO trial valid?	<ul style="list-style-type: none"> • Quantitative • Descriptive 	Reviewers	Questionnaire with fixed and open answer options
Fidelity	To what extent was the intervention implemented as planned?	<ul style="list-style-type: none"> • Quantitative • Descriptive 	<ul style="list-style-type: none"> • Students • Therapists 	<ul style="list-style-type: none"> • Questionnaire • Logbook, field notes workshop and evaluation meeting, email
Dose delivered	To what extent were classes provided as planned?	Descriptive	<ul style="list-style-type: none"> • Therapists • Conservatory staff 	<ul style="list-style-type: none"> • Logbook, email • Field notes of evaluation meeting, email
Dose received	How was the course received by the students?	<ul style="list-style-type: none"> • Quantitative • Descriptive 	<ul style="list-style-type: none"> • Students • Therapists 	<ul style="list-style-type: none"> • Questionnaire, email, field notes • Logbook, fieldnotes
Health behaviour change Reach	How did health behaviour change? What proportion of students participated in the study?	<ul style="list-style-type: none"> • Quantitative • Descriptive • Qualitative 	<ul style="list-style-type: none"> • Students • Therapist • Conservatory staff 	<ul style="list-style-type: none"> • Questionnaire • Email • Logbook, field note • Field note of evaluation meeting
Context	Which aspects may have influenced the implementation?	Themes-based analysis	<ul style="list-style-type: none"> • Student • Therapist • Conservatory staff 	<ul style="list-style-type: none"> • Questionnaire, email • Logbook, field note • Evaluation meeting, email

- *Music students*: Trial participants completed a process evaluation questionnaire by the end of the intervention, asking a range of questions, i.e. how the course was received, including key messages, grading the overall course (0 very bad–10 very good) and describing reasons for being absent in class. A contamination check was performed by asking: ‘Did you discuss the contents of this course with students who participated in the other course?’ and ‘Did you hear from students who participated in the other course about the contents of that course?’
- *Therapists*: Therapists kept a log of their courses, where components covered in class were ticked off and remarks could be made. At the end of the first and second intervention year, logs were evaluated, and the contents of the classes and experiences of the therapists were discussed in workshops to evaluate their perceptions of course efficacy and relevance. The principal researcher (V.A.E.B.) took field notes of these discussions and other verbal communication throughout the study.
- *Conservatory staff*: At the end of year 1 and 2, evaluation meetings with conservatory staff engaged in the trial were scheduled. This was done to maintain conservatory engagement with the trial as well as being an opportunity to receive feedback on implementation. Field notes of these discussions and other verbal communication throughout the study were collected.

Analyses

Data included a mix of quantitative and qualitative data. Quantitative results were presented descriptively as means \pm SDs when normally distributed and medians (interquartile ranges) when skewed. Differences between groups were investigated using independent samples *t* tests or Mann–Whitney *U* test for normal and non-normal distributed data, respectively. Statistical testing was performed using IBM SPSS Statistics for Windows, version 23 (IBM Corp., Armonk, NY).

Qualitative data were reported descriptively. Following, two authors (V.A.E.B. and B.J.A.) independently evaluated and discussed key responses that progressed into themes. Citations were selected following these key responses.

RESULTS

External validation

Participants

Fourteen researchers participated in the expert review. Their median experience in research design was seven

interquartile range (IQR) 5–8, exercise intervention was seven IQR 4.75–8.25 and musician’s health was five IQR 0.75–8.5.

Descriptive analysis/key responses

An overview of frequencies of responses to the validation questionnaire is presented in Supplementary Appendix 1. In summary, reviewers found the design of the trial appropriate for the research goal. Considering PRESTO-Play, general consensus existed on the appropriateness and relevance of contents covered in the course, which seemed ‘an appropriate comprehensive biopsychosocial approach’. More specifically, 11 reviewers found the approach according to postural exercise therapy Mensendieck/Cesar, method Samama feasible. However, four questioned the rationale of the spinal biomechanical principal as applied by Samama. Ten reviewers found the application of behavioural change principles in the course appropriate. The majority of the experts expected that PRESTO-Play would be likely to change behaviour and diminish playing-related disability. However, six reviewers thought that PRESTO-Fit also would be likely to affect playing-related disability: ‘There is some evidence that cardiovascular fitness has some value in improving endurance & some psychological benefits’; and five reviewers hypothesized that there was potentially too little contrast between PRESTO-Play and PRESTO-Fit. There was lack of consensus amongst experts regarding the psychological aspects of the experimental condition. While 50% thought psychosocial aspects were covered adequately, others felt that the therapists were not adequately skilled to deliver this part of the intervention ‘Physiotherapists are not expertly trained in behaviour change’ and that psychosocial factors should better be evaluated individually ‘group programs do not allow for individual risks and resilience factors to be explored’.

Formative and process evaluation

Participants

In total, 88 students returned their process evaluation questionnaires (42 PRESTO-Play and 46 PRESTO-Fit). Additionally, all the 12 therapists that provided the interventions participated; five were experienced postural exercise therapists Mensendieck/Cesar, method Samama that delivered PRESTO-Play. Seven therapists delivered PRESTO-Fit; they were physiotherapists (3), Alexander technique teachers (2), a postural exercise therapist without experience in treating musicians (1) and a movement scientist (1). All therapists’ logbooks were analysed and all therapists participated in the

Table 3: Student evaluation of contents: PRESTO-Play

Do you think that the following aspects were sufficiently discussed? (0 not sufficient–5 sufficient)		
	Mean	SD
General information about the human body	3.79	1.03
General information about physical complaints related to playing a musical instrument	4.05	0.84
Body posture in general	4.55	0.63
Body posture while playing a musical instrument	4.61	0.63
Warm-up and cool-down	4.48	0.55
Ergonomics	3.93	0.82
Practice behaviour	3.83	0.88
Physical activity	3.79	1.03
Stress	3.57	1.04
Anxiety (Performance)	3.37	1.16
Care (where can I get help when needed)	3.27	0.95

evaluation meetings. Five evaluation meetings were organized with the conservatory staff involved in local implementation of the trial. Staff members included the five department's managers, one of the school's principals, one concierge, one secretary and a health and well-being coordinator.

Analyses

To what extent was the intervention implemented as planned? (Fidelity). Analysis of logbooks showed that key themes, i.e. body posture while playing in PRESTO-Play and physical activity promotion in PRESTO-Fit, were delivered in accordance with the protocol. For PRESTO-Play only minor differences in timing and structure of the information on postural technique occurred. However, analysis of logbooks showed that health behaviour change aspects were insufficiently incorporated in year 1. Therefore, a workshop was organized to improve knowledge and implementation skills which resulted in optimized understanding of teaching health behaviour change in year 2, which was reflected in a higher number of incorporated aspects in class reflected by the therapists' logbooks. For PRESTO-Fit, it was noticed during the evaluation meeting that four therapists had provided some extra-information regarding physical activity promotion that was not incorporated in the course protocol. Therapists in both conditions reported that the group aspect of the course was of additional value, stimulating discussions, creating an open atmosphere to talk about playing-related problems, particularly in PRESTO-Play with more face-to-face classes. Two therapists from PRESTO-Play suggested providing handouts of psychosocial aspects covered in class. It was also suggested that recording body posture at the start and the end could help students visualize any postural

changes. Considering contamination, the majority of the participants, 67% in PRESTO-Play and 63% in PRESTO-Fit, reported not to have heard about the contents of the course they were not allocated to.

To what extent were classes provided as planned? (Dose delivered). In both groups, several classes were rescheduled because they were first planned during project weeks, exams, holidays, etc. Only 3 out of a total of 99 PRESTO-Play classes and 1 out of 45 PRESTO-Fit classes were cancelled. Questionnaires were long and took more time to complete than expected, which then had an impact on the time for delivery of class contents. Therapists reported in the evaluation meetings that they felt that the questionnaires demotivated students.

How was the course received by the students? (Dose received). Participants in PRESTO-Play awarded the course with a mean score of 7.71 ± 1.63 . Students found that key themes of the classes were discussed at least moderately sufficient. The three most sufficiently discussed items were: body posture while playing a musical instrument, body posture in general and warm-up and cool-down. The three items least sufficiently discussed were: care (where can I get help when needed?) (performance), anxiety and stress. Students agreed most with the statements that the course helped to recognize more of the benefits of healthy music making that they learned new things about prevention of physical complaints related to music making, and they found that the course was an addition to education (Table 3).

'I'm focusing more on my attitude than before. And I also started interval training and exercises for my back. So thank you for mentioning these physical aspects of musicianship'

(Student 1)

Table 4: Student evaluation of contents: PRESTO-Fit

Do you think that the following aspects were sufficiently discussed? (0 not sufficient–5 sufficient)		
	Mean	SD
Importance of physical activity	4.00	0.91
What is the Dutch guideline for physical activity?	3.73	1.01
How to increase physical activity?	3.87	0.87
How to stay active in the future	3.69	0.95

Table 5: General evaluation: indicate whether you disagree or agree with the following hypotheses

	PRESTO-Play		PRESTO-Fit	
	Mean	SD	Mean	SD
This course is an addition to my education	4.14	1.00	2.75	0.84*
It was easy to fit this course in my schedule	3.10	1.27	3.33	1.26
I learned from the discussions in class	3.62	0.83	2.49	0.92*
I would recommend this course to my friends	3.86	1.12	2.76	1.07*
This course was fun	3.88	0.89	2.78	1.04*
The therapist was enthusiastic	4.52	0.80	3.98	0.87*
The conservatory contributed to the success of the course	2.93	1.16	2.91	0.94
I put into practice what I learned from this course	3.86	0.95		
The overall reactions of others (e.g. teachers, friends, therapists) on my participation in this class are positive	3.88	1.06		
I learned new things about prevention of physical complaints related to music making	4.17	1.03		
This course helped me to recognize more of the benefits of healthy music making	4.17	0.88		
This course inspired me to take preventive actions	3.90	0.96		
I completed my homework assignments almost every time	3.26	0.99		
I learned from analysing other students body posture while playing	3.86	0.87		
I learned some new things about physical activity			2.93	1.10
This course taught me to see the benefits that are associated with physical activity			3.18	1.11
I wore the step counter every day during the measurement periods			3.33	1.41
This course helped me to become more physical active			3.02	1.25

Scores represent a Likert scale ranged from 0 (totally disagree) to 5 (totally agree).

*Significant difference between groups, $p < 0.01$.

Participants in PRESTO-Fit rated the course with a mean score of 6.02 ± 1.91 , which was significantly lower than PRESTO-Play. However, some benefits of the generic physical activity were still noted by some, with one student reporting:

‘The course made me much more aware of the importance to be physically active; I make regular lunch walks now and started yoga’

(Student 2)

Students in PRESTO-Fit indicated that the importance of physical activity was sufficiently discussed;

however, scores were low when asked whether they had learned new things about physical activity (Table 4). Compared with PRESTO-Play, participants in PRESTO-Fit scored significantly lower on the following aspects: ‘The course is an addition to my education’, ‘I learned from the discussions in class’, ‘I would recommend this course to my friends’, ‘The course was fun’ (Table 5). Verbal comments from students and therapists during the trial revealed that at start of PRESTO-Fit, students found walking daily routes and the movies shown were interesting, however, a common remark was that

Table 6: Health behaviour change

In the past week, how often would you say... Likert scale 0 (never)–7 (always)	Start intervention (<i>n</i> = 128)	End intervention (<i>n</i> = 87)	End follow-up (<i>n</i> = 55)
You paid attention to body posture while playing music	4.83 ± 1.41	4.95 ± 1.29	5.20 ± 1.13
You performed a physical warm-up before playing	3.52 ± 2.01	3.98 ± 1.78	3.65 ± 2.04
You took sufficient breaks while playing	4.63 ± 1.62	5.12 ± 1.41	4.96 ± 1.67
You managed stressful situations successfully	4.32 ± 1.59	4.54 ± 1.49	4.64 ± 1.37
You were sufficiently physically active	4.23 ± 1.49	4.64 ± 1.45	4.67 ± 1.36
You paid attention to general health	4.84 ± 1.52	5.15 ± 1.33	5.11 ± 1.27
Total mean	4.39 ± 0.98	4.69 ± 0.99	4.71 ± 0.99
Total	26.32 ± 5.89	28.11 ± 5.91	28.24 ± 5.98
PRESTO-Play	27.11	28.95	29.33
PRESTO-Fit	25.55	27.37	26.92

Presented are means ± SD.

participants were disappointed that they did not receive specific advice on body posture while playing and started looking for other ways to get such advice.

One PRESTO-Fit therapist, who was an Alexander teacher at that conservatory, reported:

‘A number of students now also follow Alexander lessons. They like the individual attention and the possibility to discuss their problems in more depth’

(Therapist 1)

How did health behaviour change during and after the trial? As described in the original article, but more specifically reported in Table 6, health behaviour change, regarding aspects such as paying attention to body posture while playing, paying attention to general health etc., did not differ between PRESTO-Play and PRESTO-Fit. A trend towards more protective health behaviour was detected for both groups between start and end of intervention and 2 years after the intervention.

What proportion of students participated in the study? (Reach). Inclusion was performed at five conservatories in year 1. In year 2, one conservatory introduced obligatory health classes for first-year students in their curriculum, which could have contaminated study results; therefore, it was decided to exclude that conservatory from further recruitment in the second year. When implementing the classes, conservatories tried to find a free time period in which all students could participate. However, as students of different bachelor programs with different course schemes were included, this was practically impossible. Some 20% of randomized students had already dropped out between randomization

and start of the first class, just because they were not able to attend the class at the time scheduled. The most common reasons for dropout at this stage were related to other activities for school or work, such as principal subject class, orchestra rehearsals or teaching. For example, students reported in the email correspondence:

‘I have cello class then. If it’ll be on a different day in the future I would love to join (it’s something that’s really interesting for me)’.

(Student 3)

‘I work on Friday afternoon, so I won’t be able to come’.

(Student 4)

‘I am sorry but I will not be able to come to the classes! And I think if the classes were later at the day more people would come, this is really early for musicians’

(Student 5)

‘My schedule has been changed, I have theory class now at the same time. Although I would like to participate in class. What shall I do?’

(Student 6)

Class attendance rate was on average 55% in PRESTO-Play and 60% in PRESTO-Fit. Small incentives, such as chocolate, and raffling tickets for a music festival did not seem very effective in stimulating the students to keep participating in the study, whereas providing study credits for participation lead to a higher attendance rate. The two conservatories that provided study credits reported the highest overall attendance rates (i.e. 66% and 63%). Emails from absent students indicated that activities as masterclasses, orchestra

rehearsals, studying for exams or rescheduling of their principal subject class prevented them from being able to attend the PRESTO course. Other students reported organizational reasons that led them to be unable to attend:

‘... I want to sincerely apologize for not responding to your e-mails and forgot to cancel class. It’s just that I can’t see the forest for the trees now with all these reports, appointments, auditions, exams, etc....’

(Student 7)

‘Please forgive my late response, dealing with musicians is horrible I know, I am having my exam tomorrow and I was travelling for concerts - very busy time, could you please send me a copy of the questionnaire in this travelling-hectic time I put it into one of my bags to fill it in and I’m unable to find it. I’m so sorry. But I want to keep doing it. After tomorrow I will keep on track of this and so many other things are hanging in the waiting list’.

(Student 8)

‘Oh, was there a PRESTO class? Didn’t put it in my agenda. Just forgot’

(Student 9)

Which aspects may have influenced the implementation? (Context). Three themes emerged from this question, informed and supported by key responses from previous evaluation themes: *students’ motivation, institutional support and communication with students.*

Students’ motivation. Both questionnaire and email correspondence remarks (with logs) from therapists indicated that participants in PRESTO-Play were more motivated than PRESTO-Fit. However, participants in PRESTO-Play reported a decline in motivation during the third, fourth and fifth class, as they found the generic posture information not specific enough for their instrument playing. Once themes were more related to instrument playing and incorporated psychosocial aspects after Class 5, motivation increased again. PRESTO-Play therapists confirmed this in comments such as these:

‘Giving this class was fun. The students get more enthusiastic whenever they can practice more and apply the principles learned directly while playing their instrument’.

(Therapist 2)

Some therapists felt that students appeared engaged and motivated when they attended despite many missing classes:

‘Hereby I send you the attendance list. The funny thing is that when students are present, they are enthusiastic—generally speaking. And I notice that they really try to improve posture and movements while playing’

(Therapist 3)

In contrast, participants in PRESTO-Fit reported in their evaluation questionnaires that they were somewhat disappointed about the contents of the class. Others reported that they experienced too much trouble to wear step counters and note steps for 7 days a week during 7 weeks in 1 year. Also, as a consequence of the low attendance rate and motivation of the students, the PRESTO-Fit therapists’ motivation was negatively influenced:

‘Only two students were present, came in late, did not have their logbook. I couldn’t do the evaluation. This is hard for my motivation, which is an understatement’

(Therapist 4)

Institutional support. To promote awareness about the trial at the participating conservatories, different social media sources, intranet and email were used to inform all conservatory staff, although they were not directly involved in study processes. Original plans to inform music teachers by a lecture and possibility for personal contact were found impossible at all conservatories due to lack of common availability of music teachers. Instead, all music teachers received written information about the course. Students were asked to discuss class elements with their music teachers. Music teacher’s comments on course contents were then discussed in the next class.

‘I heard from a student that her teacher now, as a consequence of her discussions with him on posture as induced by the PRESTO class, paid more attention to postural-related aspects as breathing’

(Therapist 2)

Students in PRESTO-Play and PRESTO-Fit reported low scores on the question whether they felt that the conservatory contributed to the success of the course. Therapists reported moderate to good cooperation from the conservatories. Feedback from the therapists at the moderately engaged conservatories suggested that more cooperation of conservatory staff (music teachers, supporting staff) probably would have resulted in fewer dropouts.

Communication with students. According to protocol, regular class attendance reminders were sent to students

by the principal investigator (V.A.E.B.) as well as reminders for them to hand in questionnaires. Because of low class attendance and problems with handing in questionnaires, communication strategies with the students adapted throughout the course in response to feedback regarding reasons for decreased class attendance. Conservatory staff suggested that they would be more active in stimulating students to come to class and hand in questionnaires. Every conservatory proposed his own method, which suited them best to help researchers prevent dropout. The conservatories that were the most active reported the lowest dropout rates.

DISCUSSION

This article describes a comprehensive external validation and process evaluation of a multi-centre RCT evaluating efficacy of a biopsychosocial health promotion and injury prevention course aimed to reduce disability due to musculoskeletal complaints in music students. The use of this retrospective analysis allowed a greater depth of understanding of reasons for PRESTO program outcomes than could be observed from analysis of quantitative data alone. In addition, these observations highlight considerations for the design and implementation of future research studies with this population.

The external experts' review supported the design and contents of the trial. Dose delivered was considered good. Participants in PRESTO-Play confirmed that they learned new aspects about prevention of physical complaints related to music making and found that the course was an addition to their education. The course created an open atmosphere to talk about physical and psychological problems. Postural exercise therapy was delivered according to protocol, with feedback indicating that participants appreciated it most when education was focused on playing the instrument. Health behaviour change principles were insufficiently applied in the first intervention year but improved in year 2. Regarding psychosocial aspects covered, students found that anxiety and stress could have been discussed more. Therapists were advised to present handouts of the psychosocial topics discussed. The review by external experts failed to reach consensus on whether psychosocial aspects were covered appropriately or not. In the control group, participants were disappointed when they found out they did not learn about specific aspects of posture while playing. Correspondingly, participant's course ratings were significantly higher in PRESTO-Play compared with PRESTO-Fit.

No difference in disability was found between groups. This evaluation reveals that the contrast between PRESTO-Play and PRESTO-Fit might have been too small to cause differences. Although originally designed as control for attention, it is possible that PRESTO-Fit also provided a positive health effect, as was reported and expected by experts. It is also possible that PRESTO-Play was not as effective as expected, perhaps because health behaviour change principles were not applied according to the protocol in the first year of intervention. In addition, despite the use of standardized training and logbooks, fidelity was only moderate. Individual backgrounds were anecdotally reported to have an impact on the fidelity of course delivery, such as inconsistencies in depth of discussion of psychosocial aspects in the PRESTO-Play and providing extra information on benefits of physical activity other than described in the protocol in PRESTO-Fit. Third, attendance rates in PRESTO-Play and PRESTO-Fit classes were not optimal. Especially, the dose received in the PRESTO-Play course could have been too low for the course to become effective. Another potential limitation is that we did not measure whether the postural exercise principles were able to be translated into daily practice. Practical applicability or transferability of the contents of the PRESTO-Play class is obviously more likely to be able to reduce complaints and disability. Last, students from PRESTO-Fit reported to start looking for other ways to receive information about health, as they were disappointed in the contents of their course. This could have further reduced contrast between groups.

Enablers and barriers

Three themes were identified that greatly influenced implementation of the trial: student's motivation, institutional support and communication. The question arises as to who is responsible for musician's health? Results of the current evaluation show that the culture towards health and well-being provided by the environment influences motivation that leads to behaviour change in students, which is in accordance with behavioural change theories (e.g. *De Vries et al., 2003*). Music students' health should be a shared responsibility of students, teachers, conservatory and health-care professionals. For example, a lack of support from the conservatory led to a decrease in motivation for some therapists and students, thereby potentially influencing the motivation of both the participants and their instructors.

Several different recommendations arise from the current evaluation to optimize environment to stimulate students to a behavioural change towards a healthy performance. First, a cultural shift increasing the focus on healthy performance in music school is necessary (William and Thompson, 2006). Second, the role of the individual music teacher to stimulate behaviour change is vital, challenging the master–apprentice model as the only method in which music students receive their education (Perkins *et al.*, 2017). Currently, while students may expect guidance from their teachers regarding health aspects, teachers do not feel equipped to provide such support (Rickert *et al.*, 2015). Additionally, providing credits for participation in class, or introducing the class as compulsory, are example of ways that may externally motivate students to participate. In accordance with Matei *et al.* (Matei *et al.*, 2018), it can be advocated that the health course be taught by several educators with their own expertise, rather than one therapist providing all classes of the course, as was done in the current trial. Finally, communication between all stakeholders needs to be optimal to create a good atmosphere for health education and research, with contact by email and phone alone appearing insufficient. Conceivably, in the current era, online resources and social media could be used to create a sense of a healthy community and facilitate communication (Kapp *et al.*, 2009) An example of an intervention that undertakes many of these enablers/barriers is the *Sound Performers* online musicians' health program (Ingle, 2013), as it can be adapted to tailor different audiences and educational contexts, including virtual classrooms, music students, professional musicians and teachers.

Strengths and limitations

Strength of this study is that we examined the experience of participation in a health promotion and injury prevention course for music students from different perspectives using a predefined structure. A limitation is that we did not incorporate structured interviews or focus groups, which could have provided additional themes of interest. Furthermore, reliability testing of therapists' compliance with the protocol by audio/video-taping and evaluation of the classes would have augmented information on fidelity (Steckler and Linnan, 2002). A pilot study or a priori broader stakeholder consultation a priori could have increased institutional support in this trial (McSweeney *et al.*, 2017).

Although planned as a health promotion intervention, one can question whether the actions to change

cultures, i.e. by involving teachers and conservatory management where sufficient for health promotion. In retrospect, on the basis of the knowledge gained from this process evaluation, obtained from a wide range of stakeholders and experts, it is assumed that much more action is likely to be needed to change cultures in the music professional community. For example, taking into account social determinants, infrastructures and environmental perspectives, it must therefore be acknowledged that the current study reflects much more a health education approach rather than a health promotion approach.

In conclusion, although no differences in primary outcome were found, this process evaluation revealed that participants in PRESTO-Play reported to have learned about prevention of physical complaints related to music making and were more satisfied with the course compared with PRESTO-Fit. The study design and contents of the interventions were valid. Dose delivered was good. Behavioural change and psychosocial principles in PRESTO-Play may have been able to be implemented in a more optimal manner. Moderate fidelity in both groups and too little contrast between interventions could have further influenced results. Attendance rate and a presumed lack of generalizability further decreased possible effect of the interventions. Reach and context were found to be the largest influencing factors on study participation and study outcome.

Recommendations for practice: music students do feel the need for specific music-related health education. It is assumed that implementing a health course from the inside of the institution will optimize accessibility and communication, encourage attendance and enhance motivation for behavioural change. A cultural change is needed for health promotion. Educational approaches that include flexible delivery methods, tailored for different populations and cultural contexts, need to be designed and tested (Baadjou *et al.*, 2019).

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Health Promotion International* online.

AUTHORS' CONTRIBUTIONS

Conception and design: V.A.E.B., B.J.A., J.A.M.C.F.V., M.D.F.V., R.A.D., R.J.E.M.S. Analysis of data: V.A.E.B., B.J.A., R.J.E.M.S. Interpretation of data: V.A.E.B., B.J.A., J.A.M.C.F.V., M.D.F.V., R.A.D., R.J.E.M.S. Drafting of the article, critical revision and

final approval: V.A.E.B., B.J.A., J.A.M.C.F.V., M.D.F.V., R.A.D., R.J.E.M.S.

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ETHICAL APPROVAL

The medical ethics committee of Maasstad Ziekenhuis Rotterdam approved the study (NL39564.101.12). The trial is registered in the Netherlands Trial Register NTR3561.

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