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Teachers' motivation for using physical activity as part of teaching: A study protocol.

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4 1 **TITLE PAGE**

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8 3 **Title**

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10 4 Teachers' motivation for using physical activity as part of teaching: A study protocol.
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8 27 **ABSTRACT**
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10 28 **Introduction:** The benefits of physical activity for children's health, both mental and physical,
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12 and its positive effects on academic achievement are well-established. Research also
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14 emphasizes that schools could provide a natural setting for regular physical activity. There is,
15 30
16 however, a limited amount of knowledge about teachers' views when it comes to integrating
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18 physical activity. The aim of this study is to understand teachers' motivation for integrating
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20 physical activity as part of teaching, and to assess their need for guidance and support.
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23 34 **Methods and Analysis:** The study uses an Explanatory Sequential Mixed Methods Design.
24
25 Schools from across Denmark are included in the sample. The design comprises two
26 35
27 separated phases – a quantitative and qualitative phase. The quantitative phase is guided by
28 36
29 the Self-Determination Theory where teachers' motivation will be measured using the Work
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31 Task Motivation Scale for Teachers. The theory of scaffolding guides the qualitative phase,
32 38
33 which consists of ten in-depth interviews with participants selected from the quantitative
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35 phase based on levels of motivation and on demographic information. In accordance with the
36 40
37 study aims the analysis of data will identify teachers internal and external levels of
38 41
39 motivation. The purpose of the qualitative phase is to enhance understanding of teachers'
40 42
41 motivation and of their need for support in the use of physical activity in teaching.
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43

44 44 **Ethics and Dissemination:** All relevant ethics approval for the study has been acquired. All
45 45
46 participants in this study will provide written informed consent prior to data collection. All
47 46
48 data emerging from the quantitative and qualitative phase is anonymised for analysis. Results
49 47
50 from the study will be disseminated by conference presentations and scientific articles.
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49 **Keywords**

50 Physical activity, motivation, scaffolding, teachers, school, school reform, , Denmark,

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52 **Strengths and Limitations of this study**

- 53 • Only a limited research on teachers' motivation for using physical activity as part of
- 54 teaching exists. This study will provide new important perspectives on this issue.
- 55 • A mixed methods approach will provide a nuanced and detailed understanding of
- 56 teachers' motivation and need of scaffolding.
- 57 • This study has the potential to address key factors of future school based interventions
- 58 that seek to increase student's levels of PA during the school day.
- 59 • The study covers a wide range of areas of Denmark, but will not be representative for
- 60 all teachers in Denmark.

61

62 **BACKGROUND AND INTRODUCTION**

63 The benefits of physical activity (PA) for mental and physical health, cognitive function and
64 academic achievement are well-established, not least for children and young people¹⁻⁶.
65 Children and adolescents spend a large part of the day at school, and even though they are
66 required to sit still for the majority of the day, research emphasizes that school is an ideal
67 setting for promoting physical activity^{7 8}. In Denmark, daily PA has been mandatory in all
68 Danish state schools (primary and lower secondary education) since 2014. Physical Education
69 has been an integrated part of the curriculum in Danish state schools for many years, however
70 daily PA is part of a comprehensive public school state reform launched in august 2014. The
71 purpose is to ensure that all students engage in sport, exercise and PA every day with the
72 purpose of securing their health and well-being and at the same time supporting motivation

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4 73 and learning in all subjects. In this study, PA is used synonymously with exercise, sport, and
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6 74 movement. All students must engage in, on average, 45 minutes of PA during the school day.
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8 75 PA has to be part of subject-divided teaching, including Physical Education, and of assisted
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10 76 learning. Assisted learning supplements and supports subject-divided teaching and is
11
12 77 typically placed at the end of the school day⁹. School management has to ensure that the
13
14 78 physically active school day is, in fact, implemented. However, there are no systematic
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16 79 guidelines from the Danish Ministry of Education in this area.
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22 81 A few preliminary Danish reports on the implementation of the state school reform have been
23
24 82 conducted^{10 11}. These state that a considerable number of schools and teachers find it difficult
25
26 83 to integrate PA into the school day. In this study 'teacher' is an overall label for both teachers
27
28 84 and assistant teachers. Assistant teachers are often part of both subject-divided teaching and
29
30 85 assisted learning with the purpose of supporting the teacher in the subject-divided teaching
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32 86 and also carry out assisted learning alone. The reports note that PA has a positive effect on
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34 87 students' well-being and academic performance, but that barriers to integrating PA during the
35
36 88 school day remain, and that only a limited number of schools have successfully implemented
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38 89 PA. There is an implication that teachers need more guidance and support in integrating PA in
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40 90 a meaningful manner, especially as part of their teaching practice^{10 11}. However, there are no
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42 91 suggestions as to what kind of support or who should provide it. As a result, we know very
43
44 92 little of the effect of the reform, and teachers' qualifications and motivation for integrating PA.
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50 94 As far as we can see, there is a shortage of knowledge about teachers' perception of PA and
51
52 95 more specifically about their motivation for integrating PA into the classroom. In this sense
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54 96 'integration' means incorporating PA into the academic material of any given subject. Looking
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4 97 at the literature, we find suggestions of the perceived barriers to integrating PA into the
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6 98 classroom^{1 12-14}, and these are typically: time consumption, other curriculum pressures, lack
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8 99 of resources, lack of space, and lack of competence. Additionally, a number of studies address
9
10 100 the issue of teachers' perspectives on PA^{13 15 16}, and willingness to integrate PA into the
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12 101 classroom^{17 18}. However, knowledge about the factors that may influence teachers' motivation
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14
15 102 or view on PA is limited. A study by Parks, Solmon & Lee¹⁷ finds that teachers generally
16
17 103 recognize the importance of PA for children's physical and mental health, and possibly for
18
19 104 their academic progress. It also indicates that teachers would be willing to integrate PA into
20
21 105 the classroom, but that their preparedness for designing and implementing PA is limited. It
22
23 106 finds that they would need support in order to do so successfully. The Parks, Solmon & Lee
24
25 107 study raises important concerns about teachers' motivation for integrating PA during the
26
27 108 school day and about the factors that may hinder or facilitate that integration. The study also
28
29 109 supports the notion that integrating something 'new', such as school-based PA interventions
30
31 110 or a state school reform such as the one seen in Denmark, puts extra pressure on teachers that
32
33 111 affects not only their involvement in the particular new task but also their overall job-
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35 112 satisfaction^{19 20}. Furthermore, since teachers' motivation has received little attention
36
37 113 compared to students' motivation²¹⁻²⁵, it is very relevant to understand their motivation in an
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39 114 educational setting. Teachers play an important role in integrating PA into the classroom and
40
41 115 in increasing levels of PA among students²⁶. The focus of this study is on understanding
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43 116 teachers' motivation for integrating PA in their teaching practice and their need for support
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45 117 using two underpinning theories as a guide.
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52 119 **Self-Determination Theory**

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4 120 In this project, the Self-Determination Theory (SDT)^{27 28} is applied and motivation assessed
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6 121 using the Work Task Motivation Scale for Teachers (WTMST)²⁹. SDT is a useful theoretical
7
8 122 framework for understanding the nature of teachers' motivation. SDT makes important
9
10 123 distinctions between different types of motivation that make human beings act in different
11
12 124 domains. Using SDT will make it possible to establish whether teachers have the motivation to
13
14 125 use PA as part of their teaching on a daily basis. Furthermore, by applying the SDT perspective
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16 126 this study will look further into possibilities of maintaining PA in both subject-divided
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18 127 teaching and assisted learning.
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24 129 At the core of SDT are three basic psychological needs that, according to Edward L. Deci and
25
26 130 Richard M. Ryan, are inherent in all human life and essential for optimal human functioning
27
28 131 and development. The three innate needs are: competence, relatedness and autonomy^{27 28 30}
29
30 132 ³¹. Deci & Ryan distinguishes between intrinsic motivation, external regulation (external,
31
32 133 introjected, identified, and integrated), and amotivation. For example, intrinsic motivation
33
34 134 occurs when people engage in their job for the pleasure and satisfaction they gain from it.
35
36 135 External regulation occurs when the underlying motives are more instrumental and when
37
38 136 reward is seen as originating in a benefit or pressure from without^{28 32}. There are four kinds
39
40 137 of external regulation according to Deci & Ryan. External regulation is a classical type of
41
42 138 extrinsic motivation. It occurs when a task is performed on the basis of rewards or to avoid
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44 139 punishment. Introjected regulation occurs when the work tasks are performed to avoid
45
46 140 feelings of guilt, or to increase self-worth. Identified regulation occurs when work tasks are
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48 141 performed based on personal beliefs, importance or personal values. According to Deci &
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50 142 Ryan this is the process where people recognize and accept the underlying value of a
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52 143 behaviour or task^{27 32}. Integration occurs when people identify with the importance of the
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4 144 task and integrates the identification with other aspects of the self²⁷. In this study these
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6 145 different types of motivation and regulations will be assessed at a task level by applying the
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8 146 WTMST²⁹. For example, to what extent do teachers feel regulated by external pressure, or to
9
10 147 what extent are they intrinsically motivated when it comes to integrating PA.
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149 **Scaffolding**

150 According to Deci & Ryan all motivation needs the right support and conditions in order to
151 thrive, and negative conditions can have a negative impact on motivation as well as well-
152 being. They see the environment as a key predictor in the maintenance and support of
153 motivation^{27 28}. In order to understand how teachers and their motivation can be supported in
154 the process of integrating PA in teaching, scaffolding will be used as a theoretical framework.
155 In this study the environment will be understood as the school context, consisting of both
156 social, cultural and physical elements^{33 34}.

157

158 Scaffolding is originally a teaching strategy, and originated as the principle of an expert (e.g.
159 teacher) that guides a learner (e.g. student) in a one-to-one interaction. The basic feature of
160 scaffolding is to guide and support children or students to solve problems not by telling them
161 what to do but by using six types of scaffolding, which, applied appropriately, may help the
162 learner in the learning process until they are able to do it themselves³⁵. In this study,
163 scaffolding will not be used as a teaching strategy in its original form. Instead it will be used as
164 a way of describing and identifying what kind of supportive conditions that exists in a school
165 environment. Scaffolding is therefore used synonymously with support³⁴, and will be used to
166 understand what kind of support and scaffolding 'tools' teachers need in order to carry out
167 PA. It will for example be possible to identify, through the six levels of scaffolding

168 (recruitment, reduction of degrees of freedom, direction maintenance, marking critical
169 features, frustration control, and demonstration) what kind of scaffolding strategy is
170 needed³⁵. Additionally, through the six levels of scaffolding means (feeding back, hints,
171 instructing, explaining, modelling and questioning) it will be possible to further elaborate this
172 strategy and understand what kind of assistance and support teachers specifically need³⁶.

173

174 **Study aims**

175 With a focus on understanding teachers' motivation for integrating PA as part of their
176 teaching, this study aims to:

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- 178 1) Understand teachers' motivation for using PA in teaching using Self-Determination
179 Theory as a theoretical framework
- 180 2) Understand how teachers' and their motivation can be maintained and supported by
181 using the theory of scaffolding.

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183 **METHODS AND ANALYSIS**

184 In order to understand teachers' motivation, this study uses an Explanatory Sequential Mixed
185 Methods Design³⁷⁻³⁹. The purpose is to explore preliminary quantitative data in a subsequent
186 supplementary qualitative phase⁴⁰. The combination of quantitative and qualitative methods
187 will provide a rich and detailed understanding of the study aims. The study started January
188 2016 and will end December 2018.

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190 **The quantitative phase**

191 ***Selection of sample***

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4 192 The target population in this study are teachers employed at Danish state schools. Inclusion
5
6 193 criteria are: a) employment at a Danish state school, and b) teaching responsibilities (both
7
8 194 subject-divided teaching and assisted learning). A pilot study was conducted as part of the
9
10 195 quantitative data collection phase. During the pilot study, it became clear that teaching
11
12 196 assistants with special teaching tasks also carry out PA activities in assisted learning. As a
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14 197 result, teaching assistants were included in the sample. For the quantitative phase a basic
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16 198 probability sampling technique were used⁴¹. In the first stage of sampling, a cluster of schools
17
18 199 was randomly selected. To secure maximum variation and diversity in the sample, schools
19
20 200 were chosen on the basis of their regional and municipal location to reach a variety of schools
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22 201 and making sure that both countryside, suburban and city schools were included. By using
23
24 202 this type of sampling technique, it was also possible to include schools that show different
25
26 203 usage levels of PA. The final step of the sampling process was identifying the teachers at the
27
28 204 sampled schools.
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34 206 ***Recruitment***

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37 207 Participants were recruited through school management. Each school manager received a
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39 208 recruitment email consisting of a detailed description of the study, its purpose, time
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41 209 consumption, and possible workload. After acceptance of the study at management level,
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43 210 teachers at each sampled school received a message through the internal school message
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45 211 system. The message entailed a link to the questionnaire, and provided schools and
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47 212 participants with knowledge of: handling of data, data security, participation rights and
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49 213 anonymity.
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54 215 ***Questionnaire translation and pilot study***

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4 216 A systematic adaptation, pilot-testing and back-translation process of the WTMST were
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6 217 conducted⁴²⁻⁴⁴. The scale was translated from English to Danish using a bilingual translator.
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8 218 Next, it was culturally adapted, making sure the questionnaire was understandable and
9
10 219 meaningful to the sample. The scale was pilot-tested on teachers employed at a state school
11
12 220 representative of the sample. After the pilot test, the scale was analysed and evaluated by a
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14 221 qualified and appropriate reference group. The reference group consisted of researchers in
15
16 222 the field of physical activity, well-being and learning within school contexts. On the basis of
17
18 223 the feedback from the reference group, further adaptations were made. The questionnaire was
19
20 224 then back-translated into English. An expert committee consisting of one native English
21
22 225 speaker as well as researchers with specific knowledge of teaching and the Danish school
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24 226 system evaluated the back-translated questionnaire. Meaning variations were discussed. No
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26 227 significant differences in meaning between the two English versions were identified.
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32 229 ***Quantitative data collection***

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34 230 The target group answered a questionnaire based on the WTMST. The scale is designed to
35
36 231 measure motivation towards six tasks: class preparation, teaching, evaluation of studies,
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38 232 classroom management, administrative tasks, and complementary tasks^{29 32}. At the core of the
39
40 233 questionnaire are 15 items specifically designed to measure both internal and external types
41
42 234 of motivation such as: intrinsic, identified, introjected, and external regulations and
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44 235 amotivation. Each motivational type contains three items addressing possible reasons for
45
46 236 engaging in a particular task. In this study, questions fall into various types, such as: "Because
47
48 237 I find movement activities interesting to use" (*intrinsic*); "Because I feel guilty if I don't use
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50 238 movement activities" (*introjected*); "Because I'm paid to use movement activities" (external);
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52 239 "Because it is important for me to use movement activities" (*identified*). The 15 items are
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4 240 scored on a seven point Likert scale. The WTMST will be used to measure teachers'
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6 241 motivation for using PA as part of their teaching task (both subject-divided and assisted
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8 242 learning) on a task level. In addition, the questionnaire consists of questions that measure
9
10 243 factors that either hinder or facilitate the integration of PA in a school setting. These factors
11
12 244 are based on findings from a review in which Naylor and colleagues¹ identified several
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14 245 perceived barriers that may influence the implementation of school-based physical activity
15
16 246 interventions. Five factors are chosen for this questionnaire: time, support, resources, own
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18 247 competence and relevance. Participants are asked to prioritize the five factors from 1-5 five in
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20 248 two categories; 1) seen as important for carrying out PA; and 2) acting as a barrier for
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22 249 carrying out PA. In addition, the participants answered socio-demographic questions
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24 250 concerning gender, age, employment status, subject(s), year(s), school, and experience.
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252 ***Data analysis***

253 All data from the questionnaire will be analysed using SPSS statistical software (version 24).
254 Data from the questionnaire will be organised and summarised in a descriptive analysis for
255 the purpose of enhancing understanding of teachers' level of motivation⁴⁵. In the descriptive
256 analysis questionnaire, information on levels of motivation will be analysed alongside
257 demographic information using frequency counts and cross tabulations. This type of analysis
258 will provide the information needed for the qualitative phase of the study.
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260 **The qualitative phase**

261 ***Sampling and case selection***

262 Participants for the qualitative phase will be selected based upon the following variables: 1)
263 their level of motivation measured by WTMST – ensuring that both intrinsic and extrinsic

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4 264 levels are represented, and 2) socio-demographic factors such as age, gender, subject, and
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6 265 length of employment. Sample size is based on data saturation, thus reaching the point where
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8 266 the data is rich and detailed and no new information arises. It is expected that ten participants
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10 267 will be required for the qualitative phase. Recruitment of participants is an integrated part of
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12 268 the survey process, where respondents are asked to write their email address if they are
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14 269 interested in participating in a subsequent in-depth interview.
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19 271 **Data collection**

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21 272 Against the background of the preliminary quantitative findings, the aim of the qualitative
22
23 273 phase is to elaborate on and enhance the understanding of teachers' motivation and of their
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25 274 need for support⁴⁰. Where the quantitative data will provide a general picture of trends based
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27 275 on the sample of teachers, the qualitative phase will deepen the understanding of their
28
29 276 motivational levels and explore their need for support^{37 46}. Data is collected through
30
31 277 individual in-depth interviews⁴⁷, and interviews will be carried out in the participants natural
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33 278 setting (schools)⁴⁶. A semi-structured interview guide will form the basis for the interviews,
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35 279 which will be conducted face-to-face⁴⁷. The duration of the interviews is expected to last
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37 280 approximately one hour.
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43 282 The semi-structured interview guide is primarily informed by the theory of scaffolding.
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45 283 Participants will firstly be asked to identify the types of scaffolding levels they currently meet
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47 284 at a school level. Secondly, participants will be asked to identify what kind of environment
48
49 285 and support they need in order to carry out PA in teaching – particularly subject-divided
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51 286 teaching. Thirdly, participants will be asked to identify the factors that may hinder or facilitate
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53 287 their motivation for integrating PA. Before starting data collection, the interview protocol will
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288 be pilot-tested on one or two participants selected from the list of participants, whereupon it
289 will be revised and adjusted as needed.

290

291 ***Data collection and data analysis***

292 The interviews will be transcribed verbatim. Data is afterwards analysed through thematic
293 coding using Nvivo software (v. 11)⁴⁸. First step in the data analysis is to conduct a
294 preliminary exploration of the data by reading through the transcripts and any notes taken
295 during the interview sessions. The second step is to code the data. This will allow for a
296 thematic analysis on the basis of SDT, while the theory of scaffolding that will be used for
297 identifying, analysing and reporting on possible patterns concerning need for support and
298 guidance - both a case level and across cases^{37 49}. As an overall guide the qualitative data
299 analysis follows the six steps of thematic analysis⁴⁸.

300

301 ***Discussion of possible outcomes***

302 This study has the potential to provide a detailed understanding of teachers' motivation for
303 using PA as part of teaching activities. The mixed methods design makes it possible to achieve
304 a multiple perspective on teachers' motivation based on SDT²⁸ measured by the WTMST.
305 Moreover, using the theory of scaffolding³⁵, the study provides information of how teachers
306 can be supported in their work in integrating PA and what factors may affect their willingness
307 to do so. A possible outcome of this is a specification and elaboration on current guidelines for
308 using PA as part of teaching. Finally, it is expected that the study has the potential to address
309 key factors of importance for designs of future school-based interventions that seek to
310 increase student's levels of PA during the school day.

311

312 **ETHICS AND DISSEMINATION**

313 Ethics approval was acquired from The Regional Committee on Health Research Ethics for
314 Southern Denmark approval ID S-20162000-40 and The Danish Data Protection Agency
315 approval ID 16/15491). The study is registered at Clinical Trials with ID NCT02894346. All
316 participants in this study will receive information regarding their participation. This
317 information will outline the study, their voluntary participation and the handling of data.
318 Furthermore, participants have the right to withdraw from the study at any time. Prior to the
319 quantitative phase school management will provide written informed consent. Prior to the
320 qualitative data collection each participant will provide written informed consent.
321 Participants will be anonymous in all publications. All data will be organised and handled
322 with confidence and only the research team will have access to the data. Data will be stored
323 according to the rules of The Danish Protection Agency.

324 Results will be disseminated continuously in the field of public health, e.g. conference
325 presentations, scientific articles, and other platforms deemed relevant for the dissemination
326 of this study.

328 **Abbreviations**

329 PA: Physical Activity; WTMST: the Work Task Motivation Scale for Teachers; SDT: Self-
330 Determination Theory

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6 337 **Contributors**

7
8 338 LSK, TS and TB contributed equally in deciding the overall study design. LSK is principal
9
10 339 investigator and initiated this paper. LSK wrote the first draft. LSK, TS and TB participated
11
12 340 equally in designing, conducting and evaluating the pilot study. All authors contributed in
13
14 341 writing the manuscript and critically reviewing and discussing the content. All authors
15
16 342 approved the final version before submission. All authors are equally responsible for all
17
18 343 aspects of the study.
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22
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26
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28
29 348 and Innovation Centre for Human Movement and Learning at The University of Southern
30
31 349 Denmark and University College Lillebaelt. The funders have no part in conducting the study,
32
33 350 except approval of major adjustments of the research plan.
34

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38 352 **Competing interests**

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40 353 The authors declare that they have no competing interests.
41

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45 355 **Ethics approval**

46
47 356 The study was sent to The Regional Committee on Health Research Ethics for Southern
48
49 357 Denmark (ID S-20162000-40) and The Danish Data Protection Agency (ID 16/15491) for
50
51 358 approval. The study was deemed not notifiable by both authorities. The study is registered at
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53 359 Clinical Trials with ID NCT02894346.
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Teachers' motivation for using physical activity as part of teaching: A study protocol.

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10 4 Teachers' motivation for using physical activity as part of teaching: A study protocol.
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4 25 Word count: 3659
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8 27 **ABSTRACT**
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10 28 **Introduction:** The benefits of physical activity for children's health, both mental and physical,
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12 and its positive effects on academic achievement are well-established. Research also
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14 emphasizes that schools could provide a natural setting for regular physical activity. There is,
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16 however, a limited amount of knowledge about teachers' views when it comes to integrating
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18 physical activity as part of teaching. The aim of this study is to understand teachers'
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20 motivation for integrating physical activity as part of teaching, and to assess their need for
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22 guidance and support.
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24 35 **Methods and Analysis:** The study uses an Explanatory Sequential Mixed Methods Design.
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26 Schools from across Denmark are included in the sample. The design comprises two
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28 separated phases – a quantitative and qualitative phase. The quantitative phase is guided by
29 37
30 the Self-Determination Theory where teachers' motivation will be measured using the Work
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32 Task Motivation Scale for Teachers. The theory of scaffolding guides the qualitative phase,
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34 which consists of ten in-depth interviews with participants selected from the quantitative
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36 phase based on levels of motivation and on demographic information. In accordance with the
37 41
38 study aims the analysis of data will identify teachers' internal and external levels of
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40 motivation. The purpose of the qualitative phase is to enhance understanding of teachers'
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42 motivation and of their need for support in the use of physical activity in teaching.
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45 45 **Ethics and Dissemination:** All relevant ethics approvals have been acquired. All participants
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47 in this study will provide written informed consent prior to data collection. All data emerging
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49 from the quantitative and qualitative phase will be anonymised for analysis.
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49 **Keywords**

50 Physical activity, motivation, scaffolding, teachers, school, school reform,

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52 **Strengths and Limitations of this study**

- 53 • There is limited research on teachers' motivation for using physical activity in the
54 classroom. This study will provide new important perspectives on this issue.
- 55 • Physical activity is a mandatory part of the school day in Denmark. It is therefore
56 necessary to understand Danish school teachers' motivation for this new task, as well
57 as their need for support in integrating physical activity into the classroom
- 58 • A mixed methods approach will provide a nuanced and detailed understanding of
59 teachers' motivation and need of scaffolding.
- 60 • This study has the potential to address key factors of future school based interventions
61 that seek to increase students' levels of PA during the school day.
- 62 • The study covers a wide range of areas of Denmark, but will not be representative for
63 all teachers in Denmark.

65 **BACKGROUND AND INTRODUCTION**

66 The benefits of physical activity (PA) for mental and physical health, cognitive function and
67 academic achievement are well-established, particularly for children and young people¹⁻⁶.

68 Children and adolescents spend a large part of the day at school, and even though they are
69 required to sit still for the majority of the day, research emphasizes that school is an ideal
70 setting for promoting physical activity^{7 8}. In Denmark, daily PA has been mandatory in all
71 Danish state schools (primary and lower secondary education) since 2014, and must be
72 integrated throughout the school day. Physical Education has been an integrated part of the

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4 73 curriculum in Danish state schools for many years, however daily PA is part of a
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6 74 comprehensive public school state reform launched in august 2014. The purpose is to ensure
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8 75 that all students engage in sport, exercise and PA every day with the purpose of securing their
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10 76 health and well-being and at the same time supporting motivation and learning in all subjects.
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12 77 In this study, PA is used in accordance with the terms in the reform text, which is exercise,
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14 78 sport, and movement and offers a broad understanding of movement activities. All students
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16 79 must engage in, on average, 45 minutes of PA during the school day. PA has to be part of
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18 80 subject-divided teaching (e.g. math, science, language subjects, history, geography, physical
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20 81 education etc.), and of assisted learning. This means that all subject teachers across the
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22 82 curriculum are responsible for using PA. Assisted learning supplements and supports subject-
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24 83 divided teaching and is typically placed at the end of the school day⁹. In this study 'teacher' is
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26 84 an overall label for both teachers and assistant teachers. Assistant teachers are often part of
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28 85 both subject-divided teaching and assisted learning with the purpose of supporting the main
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30 86 teacher and also carry out assisted learning alone. School management has to ensure that the
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32 87 physically active school day is, in fact, implemented. However, there are no recognised
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34 88 guidelines from the Danish Ministry of Education in this area. Nor are there any consequences
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36 89 if the school does not adhere to the PA policy. At the moment, selected national school-sport
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38 90 organisations offer professional development for teachers focusing on the PA policy.
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40 91 However, these training courses are not mandatory.
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48 93 A few preliminary Danish reports on the implementation of the state school reform have been
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50 94 conducted^{10 11}. These state that a considerable number of schools and teachers find it difficult
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52 95 to integrate PA into the school day. The reports note that PA has a positive effect on students'
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54 96 well-being and academic performance, but that barriers to integrating PA during the school
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4 97 day remain, and that only a limited number of schools have successfully implemented PA^{10 11}.
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6 98 There is an implication that teachers need more guidance and support in integrating PA in a
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8 99 meaningful manner, especially as part of their teaching practice^{10 11}. However, there are no
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11 100 suggestions as to what kind of support or who should provide it. As a result, we know very
12
13 101 little of the effect of the reform, and teachers' qualifications and motivation for integrating PA.
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17 103 As far as we can see, there is a shortage of knowledge about teachers' motivation for
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19 104 integrating PA into the classroom. In this sense 'integration' means incorporating PA into the
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21 105 academic material of any given subject. Looking at the literature, we find suggestions of the
22
23 106 perceived barriers to integrating PA into the classroom^{1 12-14}, and these are typically: time
24
25 107 consumption, other curriculum pressures, lack of resources, lack of space, and lack of
26
27 108 competence. Additionally, a number of studies address the issue of teachers' perspectives on
28
29 109 PA^{13 15 16 17 18}, and willingness to integrate PA into the classroom^{19 20}. However, knowledge
30
31 110 about the factors that may influence teachers' motivation or view on classroom based PA is
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33 111 limited. A study by Parks, Solmon & Lee¹⁹ finds that teachers generally recognize the
34
35 112 importance of PA for children's physical and mental health, and possibly for their academic
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37 113 progress. The study focus on elementary school teachers and school principals recruited from
38
39 114 both public and private schools in the United States. Elementary school in the United States
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41 115 corresponds to preschool class to fifth grade in Denmark (6-11 years of age). It also indicates
42
43 116 that teachers would be willing to integrate PA into the classroom, but that their preparedness
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45 117 for designing and implementing PA is limited. It finds that they would need support in order
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47 118 to do so successfully. The Parks, Solmon & Lee study raises important concerns about
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49 119 teachers' motivation for integrating PA into the classroom and about the factors that may
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51 120 hinder or facilitate that integration. The study also supports the notion that integrating
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4 121 something 'new', such as school-based PA interventions or a state school reform such as the
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6 122 one seen in Denmark, puts extra pressure on teachers that affects not only their involvement
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8 123 in the particular new task but also their overall job-satisfaction^{21 22}. Furthermore, since
9
10 124 teachers' motivation has received little attention compared to students' motivation²³⁻²⁷, it is
11
12 125 very relevant to understand their motivation in an educational setting. The reform introduced
13
14 126 in Denmark is rather unique, in the way that it is mandatory as opposed to guided by broadly
15
16 127 based recommendations about PA in schools (e.g. the United States: Comprehensive School
17
18 128 Physical Activity Program, CSPAP). All state schools in Denmark are obligated to integrate 45
19
20 129 minutes of PA during the school day across year groups and subjects. Teachers therefore play
21
22 130 an important role in integrating PA into the classroom and in increasing levels of PA among
23
24 131 students^{28 29}. In the light of the reform, it is therefore even more necessary to understand
25
26 132 teachers' motivation for the new PA task, as well as their need for support in integrating PA
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28 133 into the classroom¹⁷. This study investigates teachers' motivation and need for support across
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30 134 subjects and year groups using two underpinning theories as a guide.
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136 **Self-Determination Theory**

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39 137 In this project, the Self-Determination Theory (SDT)^{30 31} is applied and motivation assessed
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41 138 using the Work Task Motivation Scale for Teachers (WTMST)³². SDT is a useful theoretical
42
43 139 framework for understanding the nature of teachers' motivation. SDT makes important
44
45 140 distinctions between different types of motivation that make human beings act in different
46
47 141 domains. Using SDT will make it possible to establish whether teachers have the motivation to
48
49 142 use PA as part of their teaching on a daily basis. Furthermore, by applying the SDT perspective
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51 143 this study will look further into possibilities of maintaining PA in both subject-divided
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53 144 teaching and assisted learning.
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6 146 At the core of SDT are three basic psychological needs that, according to Edward L. Deci and
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8 147 Richard M. Ryan, are inherent in all human life and essential for optimal human functioning
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10 148 and development. The three innate needs are: competence, relatedness and autonomy.
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12 149 Competence can be described as a feeling of being able to achieve a possible and/or desired
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14 150 outcome. Relatedness is the feeling of connectedness with others and having a sense of
15
16 151 belonging. Autonomy refers to the feeling of self-determination^{30 31 33 34}. Deci & Ryan
17
18 152 distinguishes between intrinsic motivation, external regulation (external, introjected,
19
20 153 identified, and integrated), and amotivation. For example, intrinsic motivation occurs when
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22 154 people engage in their job for the pleasure and satisfaction they gain from it. External
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24 155 regulation occurs when the underlying motives are more instrumental and when reward is
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26 156 seen as originating in a benefit or pressure from without^{31 35}. There are four kinds of external
27
28 157 regulation according to Deci & Ryan. External regulation is a classical type of extrinsic
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30 158 motivation. It occurs when a task is performed on the basis of rewards or to avoid
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32 159 punishment. Introjected regulation occurs when the work tasks are performed to avoid
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34 160 feelings of guilt, or to increase self-worth. Identified regulation occurs when work tasks are
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36 161 performed based on personal beliefs, importance or personal values. According to Deci &
37
38 162 Ryan this is the process where people recognize and accept the underlying value of a
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40 163 behaviour or task^{30 35}. Integration occurs when people identify with the importance of the
41
42 164 task and integrate the identification with other aspects of the self³⁰. In this study these
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44 165 different types of motivation and regulations will be assessed at a task level by applying the
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46 166 WTMST³². For example, to what extent do teachers feel regulated by external pressure, or to
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48 167 what extent are they intrinsically motivated when it comes to integrating PA.
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169 **Scaffolding**

170 According to Deci & Ryan all human motivation needs supportive conditions in order to
171 thrive. Negative conditions can, on the contrary, diminish motivation. The mentioned authors
172 see the environment as a key predictor in the maintenance and support of motivation^{30 31}. In
173 order to understand how teachers and their motivation can be supported in the process of
174 integrating PA in teaching, scaffolding will be used as a theoretical framework. In this study
175 the environment will be understood as the school context, consisting of both social, cultural
176 and physical elements^{36 37}.

177

178 Scaffolding is originally a teaching strategy, and originated as the principle of an expert (e.g.
179 teacher) that guides a learner (e.g. student) in a one-to-one interaction. Building on Lev
180 Vygotsky's Zone of Proximal Development, the basic feature of scaffolding is to guide and
181 support children or students to solve problems not by telling them what to do, but by using
182 six types of scaffolding, which, applied appropriately, help the learner in the development
183 process until they are able to solve the task themselves³⁸. The Zone of Proximal Development
184 is characterized as the distance between a child's actual development level and the level of
185 potential development^{36 39}.

186 In this study, scaffolding will not be used as a teaching strategy in its original form. Instead it
187 will be used as a way of describing and identifying what kind of supportive conditions that
188 exist in a school environment. Scaffolding is therefore used synonymously with support³⁷, and
189 will be used to understand what kind of support and scaffolding 'tools' teachers need in order
190 to carry out PA. It will for example be possible to identify, through the six levels of scaffolding
191 (recruitment, reduction of degrees of freedom, direction maintenance, marking critical
192 features, frustration control, and demonstration) what kind of scaffolding strategy is

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4 193 needed³⁸. Additionally, through the six levels of scaffolding means (feeding back, hints,
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6 194 instructing, explaining, modelling and questioning) it will be possible to further elaborate this
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8 195 strategy and understand what kind of assistance and support teachers specifically need⁴⁰.
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12 13 197 **Study aims**

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15 198 This study aims to:

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19 200 1) Understand teachers' motivation for using PA in teaching using Self-Determination
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21 201 Theory as a theoretical framework
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23 202 2) Understand how teachers and their motivation can be maintained and supported by
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25 203 using the theory of scaffolding.
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30 205 **METHODS AND ANALYSIS**

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32 206 In order to understand teachers' motivation, this study uses an Explanatory Sequential Mixed
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34 207 Methods Design⁴¹⁻⁴³. The purpose is to explore preliminary quantitative data in a subsequent
35
36 208 supplementary qualitative phase⁴⁴. The combination of quantitative and qualitative methods
37
38 209 will provide a rich and detailed understanding of the study aims. The study started January
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40 210 2016 and will end December 2018.
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45 212 **The quantitative phase**

46 213 ***Selection of sample***

47
48 214 The target population in this study are teachers employed at Danish state schools. Inclusion
49
50 215 criteria are: a) employment at a Danish state school, and b) teaching responsibilities (both
51
52 216 subject-divided teaching and assisted learning). A pilot study was conducted as part of the
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4 217 quantitative data collection phase. During the pilot study, it became clear that teaching
5
6 218 assistants with special teaching tasks also carry out PA activities in assisted learning. As a
7
8 219 result, teaching assistants were included in the sample. For the quantitative phase a basic
9
10 220 probability sampling technique was used⁴⁵. In the first stage of sampling, a cluster of schools
11
12 221 was randomly selected. To secure maximum variation and diversity in the sample, schools
13
14 222 were chosen on the basis of their regional and municipal location to reach a variety of schools
15
16 223 to make sure that both countryside, suburban and city schools were included. By using this
17
18 224 type of sampling technique, it was also possible to include schools that show different usage
19
20 225 levels of PA. The final step of the sampling process was identifying the teachers at the sampled
21
22 226 schools.
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28 ***Recruitment***

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30 229 Participants were recruited through school management. Each school manager received a
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32 230 recruitment email consisting of a detailed description of the study, its purpose, time
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34 231 consumption, and possible workload. After acceptance of the study at management level,
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36 232 teachers at each sampled school received a message through the internal school message
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38 233 system. The message entailed a link to the questionnaire, and provided schools and
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40 234 participants with knowledge of: handling of data, data security, participation rights and
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42 235 anonymity (figure 1).
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48 ***Questionnaire translation and pilot study***

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50 238 A systematic adaptation, pilot-testing and back-translation process of the WTMST were
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52 239 conducted⁴⁶⁻⁴⁸. The scale was translated from English to Danish using a bilingual translator.
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54 240 Next, it was culturally adapted, making sure the questionnaire was understandable and
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4 241 meaningful to the sample. The scale was pilot-tested on teachers employed at a state school
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6 242 representative of the sample. After the pilot test, the scale was analysed and evaluated by a
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8 243 qualified and appropriate reference group. The reference group consisted of researchers in
9
10 244 the field of physical activity, well-being and learning within school contexts. On the basis of
11
12 245 the feedback from the reference group, further adaptations were made. The questionnaire was
13
14 246 then back-translated into English. An expert committee consisting of one native English
15
16 247 speaker as well as researchers with specific knowledge of teaching and the Danish school
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18 248 system evaluated the back-translated questionnaire. Meaning variations were discussed. No
19
20 249 significant differences in meaning between the two English versions were identified. An
21
22 250 original English version of the WTMST can be found in appendix 1.
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252 ***Quantitative data collection***

253 The target group answered a questionnaire based on the WTMST. The scale is designed to
254 measure motivation towards six tasks: class preparation, teaching, evaluation of studies,
255 classroom management, administrative tasks, and complementary tasks^{32 35}. At the core of the
256 questionnaire are 15 items specifically designed to measure both internal and external types
257 of motivation such as: intrinsic, identified, introjected, and external regulations and
258 amotivation. Each motivational type contains three items addressing possible reasons for
259 engaging in a particular task. In this study, questions fall into various types, such as: "Because
260 I find movement activities interesting to use" (*intrinsic*); "Because I feel guilty if I don't use
261 movement activities" (*introjected*); "Because I'm paid to use movement activities" (external);
262 "Because it is important for me to use movement activities" (*identified*). The 15 items are
263 scored on a seven point Likert scale. The WTMST will be used to measure teachers'
264 motivation for using PA as part of their teaching task (both subject-divided and assisted

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4 265 learning) on a task level. In addition, the questionnaire consists of questions that measure
5
6 266 factors that either hinder or facilitate the integration of PA in a school setting. These factors
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8 267 are based on findings from a review in which Naylor and colleagues¹ identified several
9
10 268 perceived barriers that may influence the implementation of school-based physical activity
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12 269 interventions. Five factors are chosen for this questionnaire: time, support, resources, own
13
14 270 competence and relevance. Participants are asked to prioritize the five factors from 1-5 five in
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16 271 two categories; 1) seen as important for carrying out PA; and 2) acting as a barrier for
17
18 272 carrying out PA. In addition, the participants answered socio-demographic questions
19
20 273 concerning gender, age, employment status, subject(s), year(s), school, and experience.
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25 26 275 ***Data analysis***

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28 276 All data from the questionnaire will be analysed using SPSS statistical software (version 24).
29
30 277 Data from the questionnaire will be organised and summarised in a descriptive analysis for
31
32 278 the purpose of enhancing understanding of teachers' level of motivation⁴⁹. In the descriptive
33
34 279 analysis questionnaire, information on levels of motivation will be analysed alongside
35
36 280 demographic information using frequency counts and cross tabulations. This type of analysis
37
38 281 will provide the information needed for the qualitative phase of the study.
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43 283 **The qualitative phase**

44 45 284 ***Sampling and case selection***

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48 285 Participants for the qualitative phase will be selected based upon the following variables: 1)
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50 286 their level of motivation measured by WTMST – ensuring that both intrinsic and extrinsic
51
52 287 levels are represented, and 2) socio-demographic factors such as age, gender, subject, and
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54 288 length of employment. The number of participants for the interviews is based on data
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4 289 saturation, and will be on-going until reaching the point where the data is rich and detailed
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6 290 and no new information arises. Recruitment of participants is an integrated part of the survey
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8 291 process, where respondents are asked to write their email address if they are interested in
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10 292 participating in a subsequent in-depth interview.
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14 294 ***Data collection***

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17 295 Against the background of the preliminary quantitative findings, the aim of the qualitative
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19 296 phase is to elaborate on and enhance the understanding of teachers' motivation and of their
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21 297 need for support⁴⁴. Where the quantitative data will provide a general picture of trends, based
22
23 298 on the sample of teachers measured by the WTMST, the qualitative phase will deepen the
24
25 299 understanding of their motivational levels, based on the three psychological needs highlighted
26
27 300 in SDT (competence, relatedness and autonomy). The qualitative phase will also explore
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29 301 teachers' need for support^{41 50}. Data is collected through individual in-depth interviews⁵¹, and
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31 302 interviews will be carried out in the participants natural setting (schools)⁵⁰. A semi-structured
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33 303 interview guide will form the basis for the interviews, which will be conducted face-to-face⁵¹.
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35 304 In the qualitative data collection period we will consider teachers' teaching responsibilities
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37 305 and workload, thus staying clear of, for instance, examination periods. The duration of the
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39 306 interviews is expected to last approximately one hour.
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46 308 The semi-structured interview guide is primarily informed by the SDT and the theory of
47
48 309 scaffolding. Participants will firstly be asked to identify motivational levels in accordance to
49
50 310 the three basic needs from SDT (competence, relatedness and autonomy). Secondly,
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52 311 participants will be asked to identify the types of scaffolding levels they currently meet at a
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54 312 school level. Thirdly, participants will be asked to identify what kind of environment and
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4 313 support they need in order to carry out PA in teaching – particularly subject-divided teaching.
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6 314 Lastly, participants will be asked to identify the factors that may hinder or facilitate their
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8 315 motivation for integrating PA. Before starting data collection, the interview protocol will be
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10 316 pilot-tested on one or two participants selected from the list of participants, whereupon it will
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12 317 be revised and adjusted as needed.
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17 319 ***Data analysis***

19 320 The interviews will be transcribed verbatim. Data will then be analysed through thematic
20
21 321 coding using Nvivo software (v. 11)⁵². First step in the data analysis is to conduct a
22
23 322 preliminary exploration of the data by reading through the transcripts and any notes taken
24
25 323 during the interview sessions. The second step is to code the data. This will allow for a
26
27 324 thematic analysis on the basis of SDT, while the theory of scaffolding that will be used for
28
29 325 identifying, analysing and reporting on possible patterns concerning need for support and
30
31 326 guidance - both a case level and across cases^{41 53}. As an overall guide the qualitative data
32
33 327 analysis follows the six steps of thematic analysis⁵². A systematic double coding process with
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35 328 a second analyst will be conducted in Nvivo in order to secure trustworthiness and test for
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37 329 reliability.
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43 331 ***Discussion of possible outcomes***

45 332 This study has the potential to provide a detailed understanding of teachers' motivation for
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47 333 using PA as part of their teaching practice. The mixed methods design makes it possible to
48
49 334 achieve a theory-driven perspective on teachers' motivation based on SDT³¹ measured by the
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51 335 WTMST. Moreover, using the theory of scaffolding³⁸, the study provides information of how
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53 336 teachers can be supported in their work with integrating PA and what factors may affect their
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4 337 willingness to do so. The outcomes of this study may inform training programs improving the
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6 338 skills of current and future teachers as regards implementation of PA into the classroom. The
7
8 339 study also has the potential to address key factors of importance for designing future school-
9
10 340 based interventions aiming to increase students' level of PA by providing knowledge of how
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12 341 to foster teachers' motivation. Finally, this study may be used to inform stakeholders, such as
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14 342 school management, board of governors and subject advisors, on how to foster teachers'
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16 343 motivation for integrating PA into the classroom.
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21 345 **ETHICS AND DISSEMINATION**

22
23 346 Ethics approval was requested from The Regional Committee on Health Research Ethics for
24
25 347 Southern Denmark approval ID S-20162000-40 and The Danish Data Protection Agency
26
27 348 approval ID 16/15491). The study was deemed not notifiable by both authorities. The study is
28
29 349 registered at Clinical Trials with ID NCT02894346. All participants in this study will receive
30
31 350 information regarding their participation. This information will outline the study, their
32
33 351 voluntary participation and the handling of data. Furthermore, participants have the right to
34
35 352 withdraw from the study at any time. Prior to the quantitative phase school management will
36
37 353 provide written informed consent. Prior to the qualitative data collection each participant will
38
39 354 provide written informed consent. Participants will be anonymous in all publications. All data
40
41 355 will be organised and handled with confidence and only the research team will have access to
42
43 356 the data. Data will be stored according to the rules of The Danish Protection Agency.
44
45 357 Results will be disseminated continuously in the field of public health, e.g. conference
46
47 358 presentations, scientific articles, and other platforms deemed relevant for the dissemination
48
49 359 of this study.
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10 502 **Abbreviations**

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12 503 PA: Physical Activity; WTMST: the Work Task Motivation Scale for Teachers; SDT: Self-
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14 504 Determination Theory

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20
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24
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29
30 511 **Contributors**

31
32 512 LSK, TS and TB contributed equally in deciding the overall study design. LSK is principal
33
34 513 investigator and initiated this paper. LSK wrote the first draft. LSK, TS and TB participated
35
36 514 equally in designing, conducting and evaluating the pilot study. All authors contributed in
37
38 515 writing the manuscript and critically reviewing and discussing the content. All authors
39
40 516 approved the final version before submission. All authors are equally responsible for all
41
42 517 aspects of the study.

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46
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50
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52
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4 523 Denmark and University College Lillebaelt. The funders have no part in conducting the study,
5
6 524 except approval of major adjustments of the research plan.
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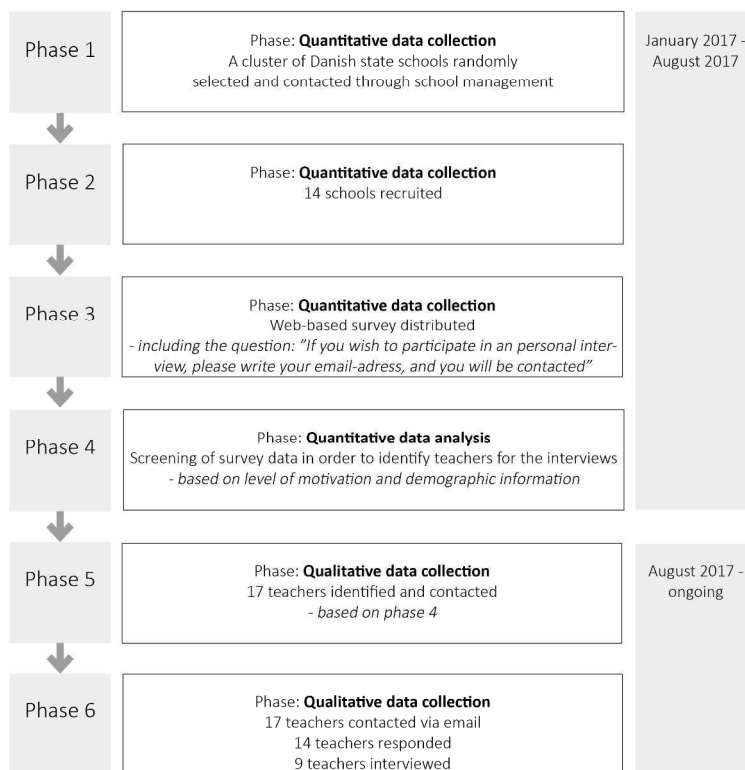
10 526 **Competing interests**

11
12 527 The authors declare that they have no competing interests.
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17 529 **Figure legends**

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19 530 Figure 1 is an overview of recruitment procedures in the quantitative and qualitative data
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21 531 collection phases.
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Appendix 1

The Work Task Motivation Scale for Teachers (WTMST)

The 15 Items Assessing the Motivational Constructs for Each Task.

Intrinsic Motivation

Because it is pleasant to carry out this task.

Because I find this task interesting to do.

Because I like doing this task.

Identified Motivation

Because it is important for me to carry out this task.

Because this task allows me to attain work objectives that I consider important.

Because I find this task important for the academic success of my students.

Introjected Regulation

Because if I don't carry out this task, I will feel bad.

Because I would feel guilty not doing it.

To not feel bad if I don't do it.

External Regulation

Because my work demands it.

Because the school obliges me to do it.

Because I'm paid to do it.

Amotivation

I don't know, I don't always see the relevance of carrying out this task.

I used to know why I was doing this task, but I don't see the reason anymore.

I don't know, sometimes I don't see its purpose.

For peer review only

BMJ Open

Understanding and scaffolding Danish schoolteachers' motivation for using classroom based physical activity: Study protocol for a mixed methods study.

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Manuscripts

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4 1 **TITLE PAGE**

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8 3 **Title**

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10 4 Understanding and scaffolding Danish schoolteachers' motivation for using classroom based
11 physical activity: Study protocol for a mixed methods study.
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4 255
6 26 Word count: 36507
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910 28 **ABSTRACT**

11
12 29 **Introduction:** The benefits of physical activity for children's health, both mental and physical,
13
14 and its positive effects on academic achievement are well-established. Research also
15 30
16 emphasizes that schools could provide a natural setting for regular physical activity. There is,
17 31
18 however, a limited amount of knowledge about teachers' views when it comes to integrating
19 32
20 physical activity as part of teaching. The aim of this study is to understand teachers'
21 33
22 motivation for integrating physical activity as part of teaching, and to assess their need for
23 34
24 guidance and support.
25 35

26 36 **Methods and Analysis:** The study uses an Explanatory Sequential Mixed Methods Design.
27
28 Schools from across Denmark are included in the sample. The design comprises two
29 37
30 separated phases – a quantitative and qualitative phase. The quantitative phase is guided by
31 38
32 the Self-Determination Theory where teachers' motivation will be measured using the Work
33 39
34 Task Motivation Scale for Teachers. The theory of scaffolding guides the qualitative phase,
35 40
36 which consists of ten in-depth interviews with participants selected from the quantitative
37 41
38 phase based on levels of motivation and on demographic information. In accordance with the
39 42
40 study aims the analysis of data will identify teachers' internal and external levels of
41 43
42 motivation. The purpose of the qualitative phase is to enhance understanding of teachers'
43 44
44 motivation and of their need for support in the use of physical activity in teaching.
45 45

46 46 **Ethics and Dissemination:** All relevant ethics approvals have been acquired. All participants
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48 in this study will provide written informed consent prior to data collection. All data emerging
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4 48 from the quantitative and qualitative phase will be anonymised for analysis. Clinical Trial ID:
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6 49 NCT02894346
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8 50

9
10 51 **Keywords**

11
12 52 Physical activity, motivation, scaffolding, teachers, school, school reform,
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16 54 **Strengths and Limitations of this study**

- 17
18
19 55 • The mixed methods approach provides a nuanced and detailed understanding of
20
21 56 teachers' motivation and need of scaffolding.
22
23 57 • The study involves a broad selection of Danish schoolteachers across age, gender,
24
25 58 experience, and school type.
26
27 59 • The study uses a systematic recruiting strategy making sure that different levels of
28
29 60 motivation are represented.
30
31 61 • This study has the potential to address key factors of future school based interventions
32
33 62 that seek to increase students' levels of PA during the school day.
34
35 63 • The study covers a wide range of areas of Denmark, but will not be representative for
36
37 64 all teachers in Denmark.
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41 66 **BACKGROUND AND INTRODUCTION**

42
43 67 The benefits of physical activity (PA) for mental and physical health, cognitive function and
44
45 68 academic achievement are well-established, particularly for children and young people¹⁻⁶.
46
47 69 Children and adolescents spend a large part of the day at school, and even though they are
48
49 70 required to sit still for the majority of the day, research emphasizes that school is an ideal
50
51 71 setting for promoting physical activity^{7 8}. In Denmark, daily PA has been mandatory in all
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4 72 Danish state schools (primary and lower secondary education) since 2014, and must be
5
6 73 integrated throughout the school day. Physical Education has been an integrated part of the
7
8 74 curriculum in Danish state schools for many years, however daily PA is part of a
9
10 75 comprehensive public school state reform launched in August 2014. The purpose is to ensure
11
12 76 that all students engage in sport, exercise and PA every day with the purpose of securing their
13
14 77 health and well-being and at the same time supporting motivation and learning in all subjects.
15
16 78 In this study, PA is used in accordance with the terms in the reform text, which is exercise,
17
18 79 sport, and movement and offers a broad understanding of movement activities. All students
19
20 80 must engage in, on average, 45 minutes of PA during the school day. PA has to be part of
21
22 81 subject-divided teaching (e.g. math, science, language subjects, history, geography, physical
23
24 82 education etc.), and of assisted learning. This means that all subject teachers across the
25
26 83 curriculum are responsible for using PA. Assisted learning supplements and supports subject-
27
28 84 divided teaching and is typically placed at the end of the school day⁹. In this study 'teacher' is
29
30 85 an overall label for both teachers and assistant teachers. Assistant teachers are often part of
31
32 86 both subject-divided teaching and assisted learning with the purpose of supporting the main
33
34 87 teacher and also carry out assisted learning alone. School management has to ensure that the
35
36 88 physically active school day is, in fact, implemented. However, there are no recognised
37
38 89 guidelines from the Danish Ministry of Education in this area. Nor are there any consequences
39
40 90 if the school does not adhere to the PA policy. Danish schoolteachers do not, in general,
41
42 91 receive training in facilitating physical activities in the classroom during their formal teacher
43
44 92 education. However, teachers who choose physical education as main subject during their
45
46 93 education, receive training in developing, for instance, physical activities. At the moment,
47
48 94 selected national school-sport organisations offer professional development for teachers
49
50 95 focusing on the PA policy. However, these training courses are not mandatory.
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97 A few preliminary Danish reports on the implementation of the state school reform have been
98 conducted^{10 11}. These state that a considerable number of schools and teachers find it difficult
99 to integrate PA into the school day. The reports note that PA has a positive effect on students'
100 well-being and academic performance, but that barriers to integrating PA during the school
101 day remain, and that only a limited number of schools have successfully implemented PA^{10 11}.
102 There is an implication that teachers need more guidance and support in integrating PA in a
103 meaningful manner, especially as part of their teaching practice^{10 11}. However, there are no
104 suggestions as to what kind of support or who should provide it. As a result, we know very
105 little of the effect of the reform, and teachers' qualifications and motivation for integrating PA.

106

107 As far as we can see, there is a shortage of knowledge about teachers' motivation for
108 integrating PA into the classroom. In this sense 'integration' means incorporating PA into the
109 academic material of any given subject. Looking at the literature, we find suggestions of the
110 perceived barriers to integrating PA into the classroom^{1 12-14}, and these are typically: time
111 consumption, other curriculum pressures, lack of resources, lack of space, and lack of
112 competence. Additionally, a number of studies address the issue of teachers' perspectives on
113 PA^{13 15 16 17 18}, and willingness to integrate PA into the classroom^{19 20}. However, knowledge
114 about the factors that may influence teachers' motivation or view on classroom based PA is
115 limited. A study by Parks, Solmon & Lee¹⁹ found that teachers generally recognize the
116 importance of PA for children's physical and mental health, and possibly for their academic
117 progress. The study focused on elementary school teachers and school principals recruited
118 from both public and private schools in the United States. Elementary school in the United
119 States corresponds to preschool class to fifth grade in Denmark (6-11 years of age). The

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4 120 findings of the study also indicates that teachers would be willing to integrate PA into the
5
6 121 classroom, but that their preparedness for designing and implementing PA is limited. It finds
7
8 122 that they would need support in order to do so successfully. The Parks, Solmon & Lee study
9
10 123 raises important concerns about teachers' motivation for integrating PA into the classroom
11
12 124 and about the factors that may hinder or facilitate that integration. The study also supports
13
14 125 the notion that integrating something 'new', such as school-based PA interventions or a state
15
16 126 school reform such as the one seen in Denmark, puts extra pressure on teachers that affects
17
18 127 not only their involvement in the particular new task but also their overall job-satisfaction²¹
19
20 128 ²². Furthermore, since teachers' motivation has received little attention compared to students'
21
22 129 motivation²³⁻²⁷, it is very relevant to understand their motivation in an educational setting.
23
24 130 The reform introduced in Denmark is rather unique, in the way that it is mandatory as
25
26 131 opposed to guided by broadly based recommendations about PA in schools (e.g. the United
27
28 132 States: Comprehensive School Physical Activity Program, CSPAP). All state schools in
29
30 133 Denmark are obligated to integrate 45 minutes of PA during the school day across year
31
32 134 groups and subjects. Teachers therefore play an important role in integrating PA into the
33
34 135 classroom and in increasing levels of PA among students^{28 29}. In the light of the reform, it is
35
36 136 therefore even more necessary to understand teachers' motivation for the new PA task, as
37
38 137 well as their need for support in integrating PA into the classroom¹⁷. This study investigates
39
40 138 teachers' motivation and need for support across subjects and year groups using two
41
42 139 underpinning theories as a guide.
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141 **Self-Determination Theory**

142 In this project, the Self-Determination Theory (SDT)^{30 31} is applied and motivation assessed
143 using the Work Task Motivation Scale for Teachers (WTMST)³². SDT is a useful theoretical

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4 144 framework for understanding the nature of teachers' motivation. SDT makes important
5
6 145 distinctions between different types of motivation that make human beings act in different
7
8 146 domains. Using SDT will make it possible to establish whether teachers have the motivation to
9
10 147 use PA as part of their teaching on a daily basis. Furthermore, by applying the SDT perspective
11
12 148 this study will look further into possibilities of maintaining PA in both subject-divided
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14
15 149 teaching and assisted learning.
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18
19 151 At the core of SDT are three basic psychological needs that, according to Edward L. Deci and
20
21 152 Richard M. Ryan, are inherent in all human life and essential for optimal human functioning
22
23 153 and development. The three innate needs are: competence, relatedness and autonomy.
24
25 154 Competence can be described as a feeling of being able to achieve a possible and/or desired
26
27 155 outcome. Relatedness is the feeling of connectedness with others and having a sense of
28
29 156 belonging. Autonomy refers to the feeling of self-determination^{30 31 33 34}. Deci & Ryan
30
31 157 distinguish between intrinsic motivation, external regulation (external, introjected, identified,
32
33 158 and integrated), and amotivation. For example, intrinsic motivation occurs when people
34
35 159 engage in their job for the pleasure and satisfaction they gain from it. External regulation
36
37 160 occurs when the underlying motives are more instrumental and when reward is seen as
38
39 161 originating in a benefit or pressure from without^{31 35}. There are four kinds of external
40
41 162 regulation according to Deci & Ryan. External regulation is a classical type of extrinsic
42
43 163 motivation. It occurs when a task is performed on the basis of rewards or to avoid
44
45 164 punishment. Introjected regulation occurs when the work tasks are performed to avoid
46
47 165 feelings of guilt, or to increase self-worth. Identified regulation occurs when work tasks are
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49 166 performed based on personal beliefs, importance or personal values. According to Deci &
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51 167 Ryan this is the process where people recognize and accept the underlying value of a
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4 168 behaviour or task^{30 35}. Integration occurs when people identify with the importance of the
5
6 169 task and integrate the identification with other aspects of the self³⁰. In this study these
7
8 170 different types of motivation and regulations will be assessed at a task level by applying the
9
10 171 WTMST³². For example, to what extent do teachers feel regulated by external pressure, or to
11
12 172 what extent are they intrinsically motivated when it comes to integrating PA.
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174 **Scaffolding**

175 According to Deci & Ryan all human motivation needs supportive conditions in order to
176 thrive. Negative conditions can, on the contrary, diminish motivation. The mentioned authors
177 see the environment as a key predictor in the maintenance and support of motivation^{30 31}. In
178 order to understand how teachers and their motivation can be supported in the process of
179 integrating PA in teaching, scaffolding will be used as a theoretical framework. In this study
180 the environment will be understood as the school context, consisting of both social, cultural
181 and physical elements^{36 37}.

182
183 Scaffolding is originally a teaching strategy, and originated as the principle of an expert (e.g.
184 teacher) that guides a learner (e.g. student) in a one-to-one interaction. Building on Lev
185 Vygotsky's Zone of Proximal Development, the basic feature of scaffolding is to guide and
186 support children or students to solve problems not by telling them what to do, but by using
187 six types of scaffolding, which, applied appropriately, help the learner in the development
188 process until they are able to solve the task themselves³⁸. The Zone of Proximal Development
189 is characterized as the distance between a child's actual development level and the level of
190 potential development^{36 39}.

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4 191 In this study, scaffolding will not be used as a teaching strategy in its original form. Instead it
5
6 192 will be used as a way of describing and identifying the kind of supportive conditions that exist
7
8 193 in a school environment. Scaffolding is therefore used synonymously with support³⁷, and will
9
10 194 be used to understand what kind of support and scaffolding 'tools' teachers need in order to
11
12 195 carry out PA. It will for example be possible to identify, through the six levels of scaffolding
13
14 196 (recruitment, reduction of degrees of freedom, direction maintenance, marking critical
15
16 197 features, frustration control, and demonstration) what kind of scaffolding strategy is
17
18 198 needed³⁸. Additionally, through the six levels of scaffolding means (feeding back, hints,
19
20 199 instructing, explaining, modelling and questioning) it will be possible to further elaborate this
21
22 200 strategy and understand what kind of assistance and support teachers specifically need⁴⁰.
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28 202 **Study aims**

29 203 This study aims to:

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- 31 205 1) Understand teachers' motivation for using PA in teaching using Self-Determination
32 206 Theory as a theoretical framework
- 33 207 2) Understand how teachers and their motivation can be maintained and supported by
34 208 using the theory of scaffolding.

35 209

36 210 **METHODS AND ANALYSIS**

37 211 In order to understand teachers' motivation, this study uses an Explanatory Sequential Mixed
38 212 Methods Design⁴¹⁻⁴³. The purpose is to explore preliminary quantitative data in a subsequent
39 213 supplementary qualitative phase⁴⁴. The combination of quantitative and qualitative methods
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4 214 will provide a rich and detailed understanding of the study aims. The study started January
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6 215 2016 and will end December 2018.
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9 10 217 **The quantitative phase**

11 12 218 ***Selection of sample***

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15 219 The target population in this study are teachers employed at Danish state schools. Inclusion
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17 220 criteria are: a) employment at a Danish state school, and b) teaching responsibilities (both
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19 221 subject-divided teaching and assisted learning). A pilot study was conducted as part of the
20
21 222 quantitative data collection phase. During the pilot study, it became clear that teaching
22
23 223 assistants with special teaching tasks also carry out PA activities in assisted learning. As a
24
25 224 result, teaching assistants were included in the sample. For the quantitative phase a basic
26
27 225 probability sampling technique was used⁴⁵. In the first stage of sampling, a cluster of schools
28
29 226 was randomly selected. To secure maximum variation and diversity in the sample, schools
30
31 227 were chosen on the basis of their regional and municipal location to reach a variety of schools
32
33 228 to make sure that both countryside, suburban and city schools were included. By using this
34
35 229 type of sampling technique, it was also possible to include schools that show different usage
36
37 230 levels of PA. The final step of the sampling process was identifying the teachers at the sampled
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39 231 schools.
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44 45 233 ***Recruitment***

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48 234 Participants were recruited through school management. Each school manager received a
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50 235 recruitment email consisting of a detailed description of the study, its purpose, time
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52 236 consumption, and possible workload. After approval of the study at management level,
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54 237 teachers at each sampled school received a message through the internal school message
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4 238 system. The message entailed a link to the questionnaire, and provided schools and
5
6 239 participants with knowledge of: handling of data, data security, participation rights and
7
8 240 anonymity (figure 1).
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11 242 ***Questionnaire translation and pilot study***

12 243 A systematic adaptation, pilot-testing and back-translation process of the WTMST were
13
14 244 conducted⁴⁶⁻⁴⁸. The scale was translated from English to Danish using a bilingual translator.
15
16 245 Next, it was culturally adapted, making sure the questionnaire was understandable and
17
18 246 meaningful to the sample. The scale was pilot-tested on teachers employed at a state school
19
20 247 representative of the sample. After the pilot test, the scale was analysed and evaluated by a
21
22 248 qualified and appropriate reference group. The reference group consisted of researchers in
23
24 249 the field of physical activity, well-being and learning within school contexts. On the basis of
25
26 250 the feedback from the reference group, further adaptations were made. The questionnaire was
27
28 251 then back-translated into English. An expert committee consisting of one native English
29
30 252 speaker as well as researchers with specific knowledge of teaching and the Danish school
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32 253 system evaluated the back-translated questionnaire. Meaning variations were discussed. No
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34 254 significant differences in meaning between the two English versions were identified. An
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36 255 original English version of the WTMST can be found in appendix 1.
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46 257 ***Quantitative data collection***

47 258 The target group answered a questionnaire based on the WTMST. The scale is designed to
48
49 259 measure motivation towards six tasks: class preparation, teaching, evaluation of studies,
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51 260 classroom management, administrative tasks, and complementary tasks^{32 35}. At the core of the
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53 261 questionnaire are 15 items specifically designed to measure both internal and external types
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4 262 of motivation such as: intrinsic, identified, introjected, and external regulations and
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6 263 amotivation. Each motivational type contains three items addressing possible reasons for
7
8 264 engaging in a particular task. In this study, questions fall into various types, such as: “Because
9
10 265 I find movement activities interesting to use” (*intrinsic*); “Because I feel guilty if I don’t use
11
12 266 movement activities” (*introjected*); “Because I’m paid to use movement activities” (external);
13
14 267 “Because it is important for me to use movement activities” (*identified*). The 15 items are
15
16 268 scored on a seven point Likert scale. The WTMST will be used to measure teachers’
17
18 269 motivation for using PA as part of their teaching task (both subject-divided and assisted
19
20 270 learning) on a task level. In addition, the questionnaire consists of questions that measure
21
22 271 factors that either hinder or facilitate the integration of PA in a school setting. These factors
23
24 272 are based on findings from a review in which Naylor and colleagues¹ identified several
25
26 273 perceived barriers that may influence the implementation of school-based physical activity
27
28 274 interventions. Five factors were chosen for this questionnaire: time, support, resources, own
29
30 275 competence and relevance. Participants were asked to prioritize the five factors from 1-5 five
31
32 276 in two categories; 1) seen as important for carrying out PA; and 2) acting as a barrier for
33
34 277 carrying out PA. In addition, the participants answered socio-demographic questions
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36 278 concerning gender, age, employment status, subject(s), year(s), school, and experience.
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280 **Data analysis**

281 All data from the questionnaire will be analysed using SPSS statistical software (version 24).
282 Data from the questionnaire will be organised and summarised in a descriptive analysis for
283 the purpose of enhancing understanding of teachers’ level of motivation⁴⁹. In the descriptive
284 analysis questionnaire, information on levels of motivation will be analysed alongside

285 demographic information using frequency counts and cross tabulations. This type of analysis
286 will provide the information needed for the qualitative phase of the study.

287

288 **The qualitative phase**

289 ***Sampling and case selection***

290 Participants for the qualitative phase will be selected based upon the following variables: 1)
291 their level of motivation measured by WTMST – ensuring that both intrinsic and extrinsic
292 levels are represented, and 2) socio-demographic factors such as age, gender, subject, and
293 length of employment. The number of participants for the interviews is based on data
294 saturation, and will be on-going until reaching the point where the data is rich and detailed
295 and no new information arises. Recruitment of participants is an integrated part of the survey
296 process, where respondents are asked to write their email address if they are interested in
297 participating in a subsequent in-depth interview.

298

299 ***Data collection***

300 Against the background of the preliminary quantitative findings, the aim of the qualitative
301 phase is to elaborate on and enhance the understanding of teachers' motivation and of their
302 need for support⁴⁴. Where the quantitative data will provide a general picture of trends, based
303 on the sample of teachers measured by the WTMST, the qualitative phase will deepen the
304 understanding of their motivational levels, based on the three psychological needs highlighted
305 in SDT (competence, relatedness and autonomy). The qualitative phase will also explore
306 teachers' need for support^{41 50}. Data will be collected through individual in-depth interviews
307 ⁵¹, and interviews will be carried out in the participants natural setting (schools)⁵⁰. A semi-
308 structured interview guide will form the basis for the interviews, which will be conducted

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4 309 face-to-face⁵¹. In the qualitative data collection period we will consider teachers' teaching
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6 310 responsibilities and workload, thus staying clear of, for instance, examination periods.
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8 311 Interviews are expected to last approximately one hour.
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12 313 The semi-structured interview guide is primarily informed by the SDT and the theory of
13
14 314 scaffolding. Participants will firstly be asked to identify motivational levels in accordance to
15
16 315 the three basic needs from SDT (competence, relatedness and autonomy). Secondly,
17
18 316 participants will be asked to identify the types of scaffolding levels they currently meet at a
19
20 317 school level. Thirdly, participants will be asked to identify what kind of support they need in
21
22 318 order to carry out PA in teaching – particularly subject-divided teaching. Lastly, participants
23
24 319 will be asked to identify the factors that may hinder or facilitate their motivation for
25
26 320 integrating PA. Before starting data collection, the interview protocol will be pilot-tested on
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28 321 one or two participants selected from the list of participants, whereupon it will be revised and
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30 322 adjusted as needed.
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38 324 ***Data analysis***

39 325 The interviews will be transcribed verbatim. Data will then be analysed through thematic
40
41 326 coding using Nvivo software (v. 11)⁵². The first step in the data analysis is to conduct a
42
43 327 preliminary exploration of the data by reading through the transcripts and any notes taken
44
45 328 during the interview sessions. The second step is to code the data. This will allow for a
46
47 329 thematic analysis on the basis of SDT, while the theory of scaffolding that will be used for
48
49 330 identifying, analysing and reporting on possible patterns concerning need for support and
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51 331 guidance - both at a case level and across cases^{41 53}. As an overall guide the qualitative data
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53 332 analysis follows the six steps of thematic analysis⁵². A systematic double coding process with
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4 333 a second analyst will be conducted in Nvivo in order to secure trustworthiness and test for
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6 334 reliability.

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10 336 ***Discussion of possible outcomes***

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12 337 This study will provide a detailed understanding of teachers' motivation for using PA as part
13
14 338 of their teaching practice. The mixed methods design makes it possible to achieve a theory-
15
16 339 driven perspective on teachers' motivation based on SDT³¹ measured by the WTMST.
17
18 340 Moreover, using the theory of scaffolding³⁸, the study provides information of how teachers
19
20 341 can be supported in their work with integrating PA and what factors may affect their
21
22 342 willingness to do so. The outcomes of this study may inform training programs aiming to
23
24 343 improve the skills of current and future teachers as regards implementation of PA into the
25
26 344 classroom. The study also has the potential to address key factors of importance for designing
27
28 345 future school-based interventions aiming to increase students' level of PA by providing
29
30 346 knowledge of how to foster teachers' motivation. Finally, this study may be used to inform
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32 347 stakeholders, such as school management, board of governors and subject advisors, on how to
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34 348 foster teachers' motivation for integrating PA into the classroom.
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41 350 **ETHICS AND DISSEMINATION**

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43 351 Ethics approval was requested from The Regional Committee on Health Research Ethics for
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45 352 Southern Denmark approval ID S-20162000-40 and The Danish Data Protection Agency
46
47 353 approval ID 16/15491). The study was deemed not notifiable by both authorities. The study is
48
49 354 registered at Clinical Trials with ID NCT02894346. All participants in this study will receive
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51 355 information regarding their participation. This information will outline the study, their
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53 356 voluntary participation and the handling of data. Furthermore, participants have the right to
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4 357 withdraw from the study at any time. Prior to the quantitative phase school management will
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6 358 provide written informed consent. Prior to the qualitative data collection each participant will
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8 359 provide written informed consent. Participants will be anonymous in all publications. All data
9
10 360 will be organised and handled with confidence and only the research team will have access to
11
12 361 the data. Data will be stored according to the rules of The Danish Protection Agency.
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14
15 362 Results will be disseminated continuously in the field of public health, e.g. conference
16
17 363 presentations, scientific articles, and other platforms deemed relevant for the dissemination
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19 364 of this study.
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21 507 **Abbreviations**

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23 508 PA: Physical Activity; WTMST: the Work Task Motivation Scale for Teachers; SDT: Self-

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25 509 Determination Theory

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46
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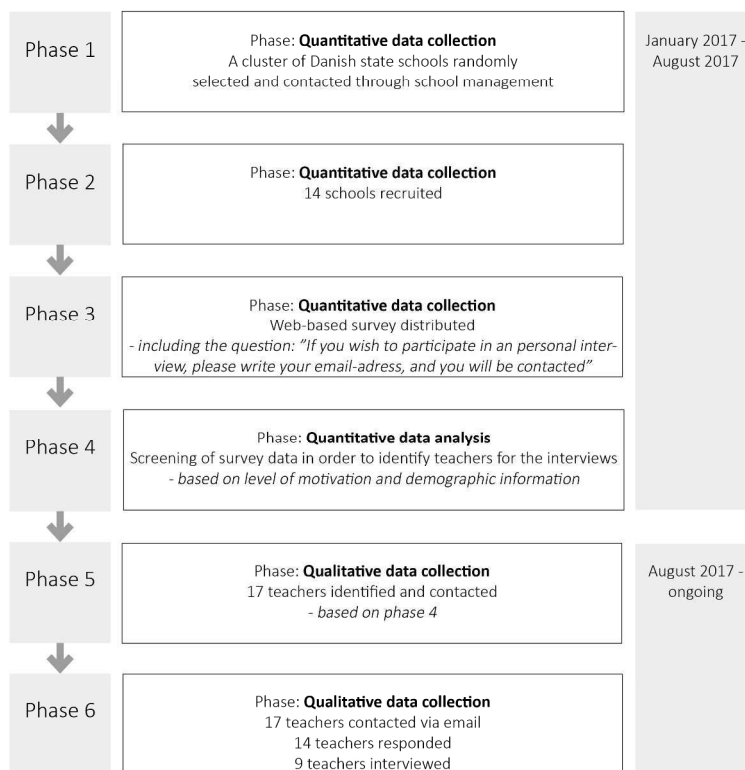
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21 531 **Competing interests**

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23 532 The authors declare that they have no competing interests.
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28 534 **Figure legends**

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30 535 Figure 1 is an overview of recruitment procedures in the quantitative and qualitative data
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32 536 collection phases.
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Appendix 1

The Work Task Motivation Scale for Teachers (WTMST)

The 15 Items Assessing the Motivational Constructs for Each Task.

Intrinsic Motivation

Because it is pleasant to carry out this task.

Because I find this task interesting to do.

Because I like doing this task.

Identified Motivation

Because it is important for me to carry out this task.

Because this task allows me to attain work objectives that I consider important.

Because I find this task important for the academic success of my students.

Introjected Regulation

Because if I don't carry out this task, I will feel bad.

Because I would feel guilty not doing it.

To not feel bad if I don't do it.

External Regulation

Because my work demands it.

Because the school obliges me to do it.

Because I'm paid to do it.

Amotivation

I don't know, I don't always see the relevance of carrying out this task.

I used to know why I was doing this task, but I don't see the reason anymore.

I don't know, sometimes I don't see its purpose.

For peer review only