A CROSS-SECTIONAL STUDY ANALYZING THE INTEGRATION OF THE MOVING SCHOOL CONCEPT AT SECONDARY SCHOOLS IN GERMANY

Paul Englert[1]✉
Jonas Wibowo[2]
Martin Niedermeier[3]
Yolanda Demetriou[4]

[1]Technische Universität München, Germany

[2]Faculty of Human and Social Sciences, Bergische Universität Wuppertal, Germany

[3]Department of Sport Science, University of Innsbruck, Austria

[4]Institute of Sports Science, University of Tübingen, Germany

✉ englert.paul@gmx.de

ABSTRACT

Objectives: The increase in physical activity and the reduction of sedentary time can have positive effects on children´s health. The concept of Moving School was developed to reduce students' sitting time and has evolved in a broadly used concept. Method: This study aims to analyse the degree of the implementation of the concept at secondary schools and investigate associated factors with the intention of teachers to implement it in practice. 345 physical education teachers were asked by questionnaire about their knowledge of the concept, their attitude towards it, and their assessment of the current situation in everyday school life. Results: Moving School is well known among physical education teachers. They gain their knowledge mainly through their university studies. Teachers' expectations in terms of effort and performance, social influence, and, in particular, facilitating conditions are positively associated with the intention to use the concept. Conclusion: Teachers are aware of and believe in the effectiveness of the concept. The level of implementation in practice does not reflect this. The framework conditions should be adapted and practical examples of implementation should become better known among the teachers in order to facilitate implementing the concept in schools.

KEYWORDS

Moving school, physical activity, physical education teachers, pupils, secondary schools

HOW TO CITE

Englert P., Wibowo J., Niedermeier M., Demetriou Y. (2024) 'A Cross-sectional Study Analyzing the Integration of the Moving School Concept at Secondary Schools in Germany', *Journal on Efficiency and Responsibility in Education and Science*, vol. 17, no. 4, pp. 328–337. http://dx.doi.org/10.7160/eriesj.2024.170405

Article history
Received
June 12, 2024
Received in revised form
November 25, 2024
Accepted
December 7, 2024
Available on-line
December 31, 2024

Highlights

- *The Moving School concept is well known among physical education teachers. They gain their knowledge mainly through their university studies.*
- *About half of the teachers participating at the study state that they incorporate elements of Moving School during regular teaching classes and that the infrastructure in the classrooms is poor to very poor.*
- *Teachers' expectations in terms of effort and performance, social influence, and facilitating conditions are positively associated with the intention to use the Moving School concept.*
- *The level of implementation in practice does not reflect teachers' intention to implement the Moving School concept. The framework conditions should be adapted, and practical examples of implementation should become better known among the teachers.*

INTRODUCTION

The World Health Organization (WHO) recommends a minimum amount of moderate to vigorous physical activity of 60 minutes per day on average during a week for three-year-old to seventeen-year-old children and adolescents. Additionally, within these 60 minutes, vigorous-intensity physical activity should be incorporated at least three times per week. Meeting these targets positively impacts the prevention and management of non-communicable diseases such as cardiovascular disease, type 2 diabetes, and breast and colon cancer, for example (Bull et al., 2020). Recent studies indicate that the WHO guidelines are not yet being met in Germany: the second wave of the KiGGS study showed that in Germany, only 22.4% of girls and 29.4% of boys in the 3-17 years age group meet the WHO recommendations. In addition, the prevalence of the recommended level of

physical activity decreases continuously with age, both for girls and boys. For example, among boys aged 14 to 17 years, 16% still meet the WHO guidelines, while among girls, only 7.5% do (Finger et al., 2018).

According to their educational mandate, schools could and should remedy this situation. This could be very effective in increasing physical activity rates because children and young people spend much of their waking time in school (Kohl III and Cook, 2013). However, a current study shows that schools offer few opportunities for physical activity, and children attending all-day schools are, on average, 20 minutes less physically active than half-day school children (Kuritz et al., 2020). Besides inactive screen time in children's and adolescents' leisure time, school is considered an important sedentary factor (Bucksch et al., 2015). On an international average, children sit for about 65% of the school day (van Hecke et al., 2016, van Stralen et al., 2014).

Increased physical activity is associated with health benefits to a certain degree (Rütten and Pfeifer, 2016, Mutz et al., 2021, Carson et al., 2016). In addition, the adverse effects of sedentary behavior are becoming increasingly apparent. As it has been shown that physical activity can compensate for the negative effects of extended sitting (Ekelund et al., 2016), schools should aim to increase periods of physical activity and reduce sitting time in children and adolescents.

So far, there have only been general, non-binding recommendations on physical activity in schools in Germany, e.g., from health insurance companies (Brägger et al., 2017), and there are no specific and binding state guidelines for reducing sitting times at school. Saunders et al. (2022) developed international school-related sedentary behavior recommendations for children and youth and thus provide guidelines such as the necessity to interrupt periods of prolonged sitting, for example, when doing homework, whenever possible. In addition, sedentary learning activities should be replaced by movement-based learning activities whenever possible. Furthermore, for example, the United States and the United Kingdom have their recommendations for physical activity times in schools: at least 30 minutes of the required moderate to high-intensity physical activity should occur during school (Kohl III and Cook, 2013). In addition, Kohl and Cook recommend that pupils participate in at least 30 to 45 minutes of a daily physical education (PE) lesson, with at least half of this time spent being physically active (ibid.). However, it is estimated that only about 50% of schools worldwide can create an environment for sufficient physical activity on school days (Aubert et al., 2018).

Moving School could make an important contribution to the challenge of increasing physical activity and reducing sedentary time in schools. In addition to this health aspect, there are two other arguments to legitimize the concept of Moving School: a developmental or learning theory argument and an educational argument (Thiel et al., 2004). These perspectives each emphasize different approaches and naturally have consequences for an empirical design, particularly the selection of corresponding variables. Developmental and learning theory approaches primarily emphasize the importance of movement for learning processes in other subjects, e.g., by promoting executive functions, motivation, or multisensory access to information that is to be acquired (Aguirre-Loaiza et al., 2019). From an educational science perspective, the focus is primarily on pupils' self-activity in movement-related and cognitive engagement (Wibowo et al., 2021, Wibowo et al., 2023). This article focuses on a health perspective as it was in the original approach, developed by Urs Illi about three decades ago, which aimed to reduce the negative consequences of sitting too long in schools with inappropriate school furniture (Illi, 1998). The concept was well received in German-speaking countries and was popular in sports science research around the turn of the millennium (Thiel et al., 2004).

Nevertheless, suggestions for implementation and concept ideas predominate. However, reports on implementation that take a holistic view of the concept of Moving School, i.e., considering the effect and interaction of several building blocks in everyday school life, are still the exception, especially for secondary schools (Englert et al., 2023). Furthermore, based on a recent study reviewing the information secondary schools publish in their school programs, on their websites, and the information published in the school curriculum, it can be assumed that the Moving School concept has found little implementation in school practice in comparison to recommendations from sports science theory (Englert et al., 2023).

Studies have already investigated the acceptance of individual components in the context of the moving school concept. Neumann and Zimmermann (2020) investigated the acceptance of interruptions to sitting (moving sitting) in lessons. They found that uncertain performance expectations characterize the acceptance process. The teachers surveyed only accepted interruptions to sitting under certain conditions, for example, if the loss of learning time, restlessness, and other disruptions were considered to be as low as possible.

Venkatesh et al. (2003) compared eight prominent models that determined the acceptance of new technologies and their extensions based on empirical data and synthesized them into one single model. This unified model, the Unified Theory of Acceptance and Use of Technology (UTAUT), contains four core determinants of intention and usage and up to four moderators of key relationships. UTAUT was tested using the original data and outperformed the eight individual models (adjusted R^2 of 70%). Nistor et al. tested the UTAUT model using a correlational study characterized by a large sample (N = 2834) and a high diversity of study participants, providing sufficient evidence to validate the model and thereby confirming the fit of the UTAUT model for the intention to use new technologies (Nistor et al., 2012).

The UTAUT model has already been transferred and applied several times, initially in media didactic settings and later in the school education field (Tappe, 2019, Jäger et al., 2014, Pynoo et al., 2011).

Venkatesh's 2003 extensions to the original UTAUT model related primarily to new (information) technologies (e.g., Artificial Intelligence tools) (Venkatesh, 2022). For this reason, the 2003 model was used in all of the above-mentioned transfers since the extensions do not add value to the school's pedagogical context, as the original model was already narrowed down for this purpose.

Furthermore, the key determinants of the intention to use new technologies and the intention itself have been previously shown to differ between women and men and participants of different ages (Morris and Venkatesh, 2000, Venkatesh et al., 2003). When forming an intention to use, social influence and effort expectancy are more salient for women and older people. Also, facilitating conditions are more salient for older people. On the other hand, performance expectancy is more salient for men and younger people (Morris and Venkatesh, 2000; Venkatesh et al., 2000; Miller, 2012; Bem and Allen, 1974).

A unique aspect of this study is that the area analyzed extends to all areas of school and includes the secondary education sector. At the same time, the data is collected on the basis of a broad database. This study aims to provide an overview of the practical implementation of the Moving School concept at secondary schools in Germany, taking into account the effects that the acceptance of the concept and the age and gender of the teachers have on practical implementation. Firstly, we aim to examine the current degree of implementation of the Moving School concept at higher secondary schools in Germany. Secondly, we investigated differences concerning gender and age in PE teachers' knowledge about the Moving School concept and the sources of this knowledge. Thirdly, we investigated the teachers' attitudes towards Moving School and the resulting use or intention to use the concept based on the implications of the UTAUT model. We hypothesized positive associations between performance expectancy, effort expectancy, social influence, facilitating conditions, and intention of use. We also hypothesize that the model will show differences between men and women, analogous to the results of Morris and Venkatesh (see above). Finally, we examined what changes need to be made from the teachers' perspective to better implement Moving School in everyday practice. This study thus provides important information for the planning of Moving School programs that are tailored to the needs of teachers and transferable to other internationally widespread programs that address sub-areas of Moving School, such as Movement Breaks.

METHOD

To report this study, we focused on the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) initiative (Von Elm et al., 2007). We used an analytical cross-sectional study design in which participants were included or excluded based on certain criteria. They were surveyed using a questionnaire, and the data collected was used to describe the current situation and illustrate the influence of various conditions on the implementation of the Moving School concept.

Sampling strategy and participants

The survey was conducted at secondary schools in Germany, focusing on the two most populous federal states, Nordrhein-Westfalen (NRW) and Bayern (Bavaria). A total of 181,100 teachers exist in NRW and 123,098 in Bavaria (Statista, 2023), with only teachers at secondary schools and with a teaching qualification in physical education included in the survey as experts in physical activity. In the German federal state NRW, all secondary schools were contacted by e-mail. Due to differences in school legislation, in the federal state of Bavaria, this was possible for schools in church or private sponsorship. The acquisition of participants at state schools was mainly done through social media. The recruitment period was from August to October 2023. Those participants who refused to publish their details in the questionnaire were excluded, as were teachers who do not teach at secondary schools or do not have a teaching qualification for the subject of sport.

Measurement instrument

To collect the data, a questionnaire was created using the EFS Survey software from Tivian (Tivian XI GmbH. 2023. Enterprise Feedback Suite Survey (Spring, 2023). [Software]), which could be completed online. The questionnaire was evaluated with a pretest. A group of 20 teachers was interviewed and then had the opportunity to add comments to the questionnaire questions. These were incorporated into the final version. The questionnaire consisted of five parts. The first part contained questions about the teachers' personal details (age, professional experience, type of school, federal state, etc.), which ended with a filter question regarding whether the teachers had previously heard of the concept of Moving School and from where they gained their knowledge. For teachers who gave a negative answer (7.2%; $N = 24$), the questionnaire ended after the second part, as parts three to five consisted of content-related questions about Moving School. The second part of the questionnaire dealt with the current implementation status of Moving School at higher secondary schools in Germany. In this part, the teachers were asked on a nine-item scale about the degree to which the seven core building blocks of Moving School, which are Moving Lessons, Sitting in Motion, Moving Physical Education, Movement Break, Physical Activity Offers in Extra-Curricular School Sport, Moving Learning Space and Moving Break (Englert et al., 2023) were implemented at their school on a five-point Likert scale (1-Not at all true, 2-Rather not true, 3-Rather true, 4-Totally true, 5-I don't know). For example, the item "I specifically use movement breaks to rhythmise the lessons" asked about integrating Movement Breaks into lessons. The third part of the questionnaire dealt with the teachers' sources of knowledge about Moving School. The categories "University Education", "Further training", "Self-Study" and "Other sources" were provided for ticking (yes/no response option). In addition, the teachers were offered a free field for entering text using the "other sources" option. This allows gender- and age-related differences in PE teachers' knowledge of the Moving School concept and the sources of this knowledge to be identified. The fourth part of the questionnaire dealt with the teachers' attitudes towards the Moving School concept as a whole (while the second part asks about the use or conditions for using the individual elements) and the resulting use or intention to use based on the UTAUT model. As the model was to be used here to determine user acceptance in a school pedagogical context, an adaptation was necessary as the model does not consider didactic implications (Jäger et al., 2014). The concept of Moving School is not a mandatory element of lesson design in Germany (Englert et al., 2023). It, therefore, has to be assumed

that teachers always integrate elements of the Moving School concept into their lessons voluntarily. The experience was mapped by other parts of the questionnaire (e.g., professional experience and sources of knowledge) (Tappe, 2019). With this section of the questionnaire and the application of the adapted UTAUT model, teachers' attitudes towards Moving School and the resulting voluntary use or intention to use the concept are analyzed. The four determinants of the UTAUT model were recorded with four individual items each and the intention to use two items (see Table 1 in the appendix).

The German translations of the individual subcategories were based on Nistor et al. (2012), where the following reliability values (Cronbach's alpha) for the German version of the questionnaire were given: performance expectancy .817, effort expectancy .838, social influence .793, and facilitating conditions .618. When adapting the model to the Moving School context, care was taken to maintain conformity and thus ensure comparability with the original model (Tappe, 2019). All items of the model were assessed on a four-point Likert scale (1-Not at all true, 2-Rather not true, 3-Rather true, 4-Totally true). The high item correlations within the four determinants, each represented by four items, were confirmed by Venkatesh et al. (2003) using repeated tests. The internal consistency reliability for the four determinants was over .83 in the two repeat tests for Facilitating Conditions and over .91 for the three others (Venkatesh et al., 2003). In the fifth part, teachers are asked what they think would facilitate the integration of the concept into everyday school practice. This shows what changes need to be made from the teachers' point of view in order to better integrate Moving School into everyday school life. Six response categories were provided to tick (e.g., Moving School should be better known among teachers) and three additional free spaces so that respondents could also formulate their suggestions. Multiple answers were possible for this question and the question on sources of knowledge described above.

Statistical analysis

All analyses were performed using IBM SPSS Statistics 29 (IBM Corp (2022), SPSS Statistics for Windows (Version 29.0), Armonk, NY, USA). Participants who did not consent to the further processing of their data or did not complete the questionnaire in full were excluded from the analysis.

Firstly, a descriptive analysis of teachers' statements regarding the current implementation degree of the Moving School concept is presented (mean and standard deviation for continuous variables and relative frequency in percentage for categorical variables).

In a second step, Mann-Whitney-U-Tests were used to identify differences between subgroups in terms of gender (men/women) and age (50 years and older/younger than 50 years) for all ordinal-scaled and metric dependent variables. Mann-Whitney-U-tests were used, as there were two independent samples in each case, and the Likert scales used in the questionnaire were to be assessed as ordinal-scaled. The conditions for T-tests are not met with regard to the normal distribution of the samples (Kolmogorov-Smirnov test). For all dichotomous dependent variables (see 3.3 Source of knowledge about the Moving School concept), χ^2 tests were used to analyze differences in gender and age. Based on the development phases in the teaching profession and the willingness to reform, commitment, and motivation that reaches a plateau around the age of 50, two age groups, under and over 50, were made (Huberman, 1991, Sikes et al., 1985).

Finally, a multiple regression analysis was calculated to assess the influence of the independent variables performance expectancy, effort expectancy, social influence, and facilitating conditions on the intention of use of the components of the Moving School based on the UTAUT model (Venkatesh et al., 2003) as dependent variable. Gender and age were also included as independent variables in the model based on their relevance to the intention of use reported in previous studies (Venkatesh et al., 2000, Morris and Venkatesh, 2000). The level of significance was set at $p < .05$ (two-sided).

RESULTS

Sample Characteristics

A total of 345 teachers participated in the survey. Nine teachers did not consent to their data being used for research purposes, and two teachers were primary school teachers and therefore excluded from further analysis, resulting in a total study sample of 334 teachers (56.9% female), of which 225 teachers came from NRW and 109 teachers from Bavaria. Most teachers were younger than 50 (71.9%) and had heard of the Moving School concept (92.8%).

Implementation degree of the elements of the Moving School concept

According to the teachers, Moving Physical Education is most frequently implemented in practice (Table 1). More than half of the teachers surveyed stated they provided the elements Moving Break, Moving Learning Space, Moving Lessons, and Movement Breaks. Physical Activity Offers in Extra-Curricular School Sport (PAOE), Movement Breaks, and, in particular, Sitting in Motion are implemented to a lower degree. The difference analysis with regard to gender shows that women agree significantly more often (p two-sided = .008) with the statement, "In PE lessons, I make sure that I offer different approaches to exercise (e.g., community experience, self-awareness, self-efficacy, health promotion, etc.)" than men. No significant differences exist when comparing the age groups (≥ 50 years and < 50 years).

Source of knowledge about the Moving School concept

Overall, 54.5% of participants learned about the Moving School concept during their university education (Table 2). There is no significant difference between men and women and between the age groups concerning the proportion of participants who have heard of Moving School. However, the men surveyed stated significantly more frequently that they had acquired knowledge of the Moving School concept by themselves. Differences also existed between the two age groups: the younger teachers acquired knowledge of the Moving School concept significantly more frequently during their university education and less frequently through further training than the older teachers.

Total (*N* = 334)	Totally true	Rather true	Rather not true	Not at all true	I don't know
Moving Physical Education In PE lessons, I make sure that I offer different approaches to exercise (e.g., community experience, self-awareness, self-efficacy, health promotion, etc.).	63.5	32.6	3.0	0.3	0.6
Moving Break Pupils are provided with sports/play equipment during the breaks.	37.2	26.9	19.0	16.3	0.6
Moving Learning Space Our school building and school grounds are designed in such a way that pupils are encouraged to exercise.	18.3	41.1	27.0	13.5	0.0
Moving Lessons I also teach lessons with and through movement.	15.2	38.4	36.9	9.5	0.0
Moving Break During breaks, pupils may use the sports facilities (e.g., sports halls and outdoor sports facilities).	22.5	30.3	20.4	26.4	0.3
Movement Breaks I specifically use movement breaks to rhythmise the lessons.	12.8	36.6	34.8	15.9	0.0
PAOE Alternative non-competitive sports electives are offered (e.g., fitness training, movement arts, etc.).	24.7	24.4	17.2	33.4	0.3
Sitting in Motion The chairs and tables in the classrooms can be individually adjusted.	4.8	8.4	15.9	70.7	0.3
Sitting in Motion The classrooms have various seating options (e.g., seat cushions, beanbags, etc.).	3.0	7.2	24.6	65.0	0.3
Sitting in Motion I allow the pupils to adopt different sitting positions on the chairs during the lesson.	25.5	48.9	18.8	6.7	0.0

Note: *PE = Physical Education*

PAOE = Physical Activity Offers in Extra-Curricular School Sport

Table 1: Degree of implementation (expressed as percentages per category) of the core building blocks of the Moving School concept, 2023

Knowledge about Moving School from:	Total (%) (*N* = 310)	Male (%) (*N* = 133)	Female (%) (*N* = 177)	χ^2-Test P two-sided (Odds ratio)	≥ 50 years (%) (*N* = 90)	< 50 years (%) (*N* = 220)	χ^2-Test *P* two-sided (Odds ratio)
University education	54.5	55.6	53.7	.731 (0.924)	22.2	67.7	**< .001 (7.345)**
Further training	27.7	28.6	27.1	.777 (0.930)	40.0	22.7	**.002 (0.441)**
By themselves	34.2	41.4	28.8	**.021 (0.574)**	41.1	31.4	.101 (0.655)
Other sources	19.7	15.0	23.2	.075 (1.703)	33.3	14.1	**< .001 (0.328)**

Table 2: Differences in gender and age regarding the source of knowledge of the Moving School concept, 2023

Intention to use the Moving School concept among teachers

The mean values of the four variables of the UTAUT model and the intention to use the concept of Moving School are shown in Table 3. The performance expectancy showed the highest mean value of the UTAUT variables. The other variables and the intention of use follow at some distance but also with positive agreement values. The answers of men and women differ significantly in performance expectancy and intention of use, with higher performance expectancy and intention of use in women. The two age groups do not differ significantly in any of the four determinants or the intention of use.

The regression analysis revealed a significant effect in total, $p < .001$, and for each of the four variables of the UTAUT model on the teachers' intention to use the Moving-School-Concept (see Table 4). All four independent variables were positively associated with intention of use. The overall model significantly predicted 45.8% (R^2 corrected) of the variance with regard to the use of the Moving School concept. Neither age nor gender significantly affected the intention of use in the model analyzed.

1 = Not at all true 2 = Rather not true 3 = Rather true 4 = Totally true	Total *M* (*SD*) (*N* = 310)	Male *M* (*SD*) (*N* = 133)	Female *M* (*SD*) (*N* = 177)	Mann-Whitney-U-Test *P* (*r*)	< 50 years *M* (*SD*) (N = 220)	≥ 50 years *M* (*SD*) (*N* = 90)	Mann-Whitney-U-Test *P* (*r*)
Performance expectancy	3.28 (.52)	3.18 (.55)	3.36 (.49)	**.003 (.17)**	3.30 (.59)	3.23 (.58)	.439 (.44)
Effort expectancy	2.66 (.63)	2.58 (.60)	2.71 (.65)	.112 (.09)	2.63 (.70)	2.71 (.69)	.492 (.04)
Social influence	2.37 (.73)	2.36 (.71)	2.38 (.74)	.948 (< .01)	2.38 (.89)	2.35 (.83)	.581 (.03)
Facilitating conditions	2.38 (.57)	2.40 (.53)	2.37 (.60)	.544 (.03)	2.35 (.69)	2.47 (.66)	.126 (.09)
Intention of use	2.49 (.77)	2.38 (.72)	2.57 (.79)	**.023 (.13)**	2.47 (.83)	2.51 (.80)	.599 (.03)

Note: Bold values indicate significant differences.

Table 3: Mean values of the four variables of the UTAUT-Model and the Intention of Use for the total sample and by gender and age group, 2023

	Beta Standardized coefficients	*T*	*p*	95% Confidence interval for *B* Lower Limit	 Upper Limit
Intercept		-1.87	.063	-.98	.03
Performance expectancy	.20	4.12	< .001	.14	.40
Effort expectancy	.20	3.13	.002	.09	.41
Social influence	.20	3.78	< .001	.10	.30
Facilitating conditions	.24	3.49	< .001	.14	.49
Gender	.05	1.04	.298	-.07	.21
Age group	.03	.71	.478	-.09	.20

Table 4: Results of the multiple regression analysis with the dependent variable intention of use, 2023

Facilitators for the implementation of the Moving School concept

When asked what would facilitate the integration of Moving School, 74.9 % of the participants stated that Moving School should be better known among teachers. The second and third most frequently chosen options (73.1% and 72.8% of respondents) were that there should be more practicable examples of implementation and that the workload in everyday working life should be reduced. The least frequent response, from 46.4% of respondents, was that the effectiveness of the concept should be rated higher. In addition to the given options, 14.7% of the participants entered at least one further answer in one of the three free fields. The most frequent answer in the open fields ($N = 11$) was that better equipment would help integrate the concept. The second most frequent answer ($N = 10$) was that the structural design of the school (schoolyards, classrooms, etc.) would have to be changed to better integrate Moving School. Other suggestions included less time pressure, more training, and the development of an App for Moving School.

The difference analysis concerning gender revealed that women stated significantly more frequently (p two-sided = .030) that the workload in everyday working life should be reduced. The group ≤ 50 years stated significantly more frequently that Moving School should be better known among teachers (p two-sided = .019).

DISCUSSION

In this study, we examined the degree of implementation of the Moving School concept at higher secondary schools in Germany. We investigated whether PE teachers know about the concept and whether their attitudes towards Moving School are associated with the use of the concept based on the implications of the UTAUT model (Venkatesh et al., 2003). Finally, we examined what changes need to be made from the teachers' perspective to facilitate implementing Moving School in everyday school practice in the future.

The Moving School concept is known among physical education teachers as 92.8% of the participants state that they are familiar with the term Moving School. Nevertheless, the practical implementation degree of Moving School is much lower. From the teachers' perspective, this is partly due to the lack of adequate equipment in the classroom, such as different seating or individually adjustable desks, which depict the Sitting in Motion element. The degree of implementation of the school buildings or school grounds is rated higher. The teachers' relatively high level of agreement with the items Moving Break corresponds with the fact that the Moving Break is mentioned most frequently in the school programs and on school homepages of all elements of Moving School (Englert et al., 2023) and is also in line with the data from the SPRINT study (2005), the latest large-scale study in this area in Germany: In 2005, 47% of the schools surveyed implemented the Moving Break, whereby elementary schools were also included (Brettschneider et al., 2005). The high degree of practical implementation of the Moving Break element in contrast to other elements of Moving School could also be related to the amount of preparation required since movement options predominate and require a manageable amount of preparation (Thiel et al., 2004). Furthermore, a discrepancy exists in the understanding of PE teachers as physical education

as a subject where they aim to provide students with different approaches to movement while at the same time, only about 50% of these PE teachers incorporate movement breaks during regular lessons in the classroom to make the lesson rhythmic. This gap shows that approximately 50% of PE teachers do not understand or implement movement as part of the lessons in their second teaching subject.

Only about half of the teachers acquired knowledge through university education. The positive change regarding university education is shown in the comparison of the age groups: Among the over 50-year-olds, 22.2% state that they have acquired their knowledge from their studies; among teachers younger than 50 years old, the figure is 67.7%. On the other hand, the group over 50 stated more frequently that they acquired their knowledge through further training, self-study, or other sources. As a result, there is generally no difference between the age groups regarding knowledge about Moving School. The only difference between men and women is that men state more frequently that they have acquired knowledge about Moving School themselves.

Teachers suggested several facilitators for future potential implementation of the Moving School concept. Most teachers (73.1%) stated needing more practicable implementation examples. This number contrasts with the numerous publications in German-speaking countries providing practicable examples of Moving School (Englert et al., 2023, Thiel et al., 2004). It might indicate a lack of connection between research and teachers. More practical implementation examples could also lead to lower effort expectancy. This hypothesis supports that the item 'There should be more practicable implementation examples' shows a significant positive correlation with effort expectancy ($P < .001$; $r = 0.238$). The majority of teachers believe that the general workload would have to be lower to integrate Moving School more. The current stressful situation for teachers is an important starting point for changes that can positively impact the implementation of Moving School. This finding confirms results that highlight time as a crucial factor in the implementation of innovations in the daily practice of PE teachers (Wibowo, 2023) and agrees with studies from other countries that also make this observation. In contrast to the present study, however, this is limited solely to physical activity programs in the classroom (Chorlton et al., 2022, Dinkel et al., 2017, Mullins et al., 2019).

Concerning the four determinants of the UTAUT model, it is striking that the effectiveness of Moving School is rated relatively high. Agreement with the items on effort expectancy is lower. Conversely, this means that teachers consider the effort required to implement the concept in practice relatively high. The answers from men and women differ in the performance expectancy variable and the intention of use. Women rate the impact of Moving School higher than men and intend to use the concept more frequently. The two age groups differ neither in the determinants nor intention of use.

Earlier studies already indicated that teachers seem to be generally accepted for integrating, for example, movement breaks (Neumann and Zimmermann, 2020; Chorlton et al., 2022). The results generated using the UTAUT model confirm these findings and, in contrast to previous studies, also show the teachers' motives in detail, based on a large database. This detailed consideration is also important and complements previous studies, as it has already been found that the attitude of teachers to exercise in the classroom, for example, increases pupils' physical activity (Abi Nader et al., 2018). The regression analysis results show significant positive correlations between the four determinants and the intention of use, and the UTAUT model makes a significant explanatory contribution to the intention to integrate the Moving School concept. The regression coefficient is highest for the determinant facilitating conditions. Therefore, this variable has the strongest effect on the intention of use, and Moving School concepts should focus on practicable implementation, the needs of teachers, and the fit to everyday life in schools. Thus, the disruptive factors established in research that inhibit the integration of sitting breaks into lessons (Neumann and Zimmermann, 2020) should be considered.

Furthermore, facilitating conditions that the school's framework conditions can influence should be established. For example, multipliers at the schools' act as contact persons for the teachers on the topic of physical activity, specifically Moving School. These could publicize the practical examples demanded by teachers in schools, help with problems by providing low-threshold advice to colleagues, and thus act as a link between science and practice. Knowledge about the Moving School concept should be imparted through a wide range of formal and informal learning opportunities and suitable equipment (seats, adjustable desks, etc.) available at schools. Developing suitable, practical training formats for teachers in Moving School is also important, as sustainable professional development can provide teachers with the knowledge and skills to implement such programs in schools (Stylianou et al., 2016).

Some limitations need to be considered when interpreting the data. Firstly, it must be noted that the study does not claim to be representative, and as education in Germany is the responsibility of the federal states, the results cannot be transferred to the whole of Germany without restrictions. In addition, it is possible that, due to voluntary participation, mainly physical activity-interested teachers participated in the study. These teachers might be more open to integrating concepts such as Moving School into their lessons. Not all STROBE criteria were met. In particular, the reasons for non-participation were not recorded.

With regard to the statistical requirements, only those that were relevant to the study design were explained. Furthermore, some of the teachers from Bavaria were recruited via social media, so distortions are also possible. The method of data collection using online questionnaires does not allow an in-depth understanding of the quality of the offers of the Moving School concept. Further studies could, for example, use qualitative data collection to include pupils' motivational aspects or teachers' teaching skills. Nevertheless, this study provides preliminary quantitative data required for the further promotion and implementation of the concept. This alone does allow conclusions to be drawn about the quality of the offers only to a limited extent but is a necessary prerequisite for the development of the positive effects of the concept, as has already been established several times with the use of digital

media in the classroom (Drossel et al., 2019, Tulodziecki et al., 2021). Finally, the development of the questionnaire is based on an adaptation of the UTAUT model to a sports education context. The empirical validity of this adaptation has not yet been tested.

CONCLUSIONS

The study shows that the Moving School concept is well-known among the teachers surveyed. The teachers are also convinced of the effectiveness of the concept. There are major differences in the practical implementation of the individual components of Moving School, and the degree of implementation of the concept does not reflect the level of knowledge of the teachers surveyed. The utilization of the concept depends on the four variables of the UTAUT model. With this information, the study provides an important basis for planning movement integration programs tailored to teachers' needs. According to the teachers, implementation could be improved if they had more knowledge about Moving School and practical implementation examples.

Based on the data, measures that create positive performance expectancies (e.g., through formal and informal learning opportunities) and effort expectancies (e.g., by adapting the infrastructure) appear particularly suitable. Besides facilitating conditions and performance expectancies, responsible persons for Moving School programs might also consider measures to positively influence effort expectancy and social influence to increase the intention of use. They could help to emphasize exercise, games, and sports activities more strongly in the school profile concepts and to strengthen cooperation with sports clubs, especially in all-day schools. On the other hand, the scientific community is challenged to develop easy-to-implement best practice examples for Moving School based on the data created by this study and on the teaching reality at the schools, including the existing obstacles. While the literature focuses on primary school environments, this study shows a clear demand for secondary school environments.

To achieve this, an analysis of the quality of the already existing offers by the teachers could provide profitable insights for the continuation of the research since the present study primarily represents an analysis of the quantitative implementation of the Moving School concept. Based on this, teachers' training and further education, which has been significantly expanded at the universities in Moving Schools in the last decades, can be adapted.

Funding: This research received no external funding.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Conflicts of Interest: The authors report no competing interests to declare.

REFERENCES

Abi Nader, P., Hilberg, E., Schuna, J. M., John, D. H. and Gunter, K. B. (2018) 'Teacher-Level Factors, Classroom Physical Activity Opportunities, and Children's Physical Activity Levels', *Journal of Physical Activity and Health*, Vol. 15, No. 9, pp. 637–643. https://doi.org/10.1123/jpah.2017-0218

Aguirre-Loaiza, H., Arenas, J., Arias, I., Franco-Jímenez, A., Barbosa-Granados, S., Ramos-Bermúdez, S., Ayala-Zuluaga, F., Núñez, C. and García-Mas, A. (2019) 'Effect of Acute Physical Exercise on Executive Functions and Emotional Recognition: Analysis of Moderate to High Intensity in Young Adults', *Frontiers in Psychology*, Vol. 10. https://doi.org/10.3389/fpsyg.2019.02774

Aubert, S., Barnes, J. D., Abdeta, C., Abi Nader, P., Adeniyi, A. F., Aguilar-Farias, N., Andrade Tenesaca, D. S., Bhawra, J., Brazo-Sayavera, J., Cardon, G., Chang, C.-K., Delisle Nyström, C., Demetriou, Y., Draper, C. E., Edwards, L., Emeljanovas, A., Gába, A., Galaviz, K. I., González, S. A., … Tremblay, M. S. (2018) 'Global Matrix 3.0 Physical Activity Report Card Grades for Children and Youth: Results and Analysis From 49 Countries', *Journal of Physical Activity and Health*, Vol. 15, No. s2, pp. S251–S273. https://doi.org/10.1123/jpah.2018-0472

Bem, D. J. and Allen, A. (1974) 'On predicting some of the people some of the time: The search for cross-situational consistencies in behavior', *Psychological Review*, Vol. 81, No. 6, pp. 506–520. https://doi.org/10.1037/h0037130

Brägger, G., Hundeloh, H., Posse, N. and Städtler, H. (2017) *Bewegung und Lernen: Konzepte und Praxis Bewegter Schulen*. Bad Langensalza: Beltz.

Brettschneider, W. D., Prohl, R., Breuer, C., Rittner, V., Heim, R., Schmidt, W. and Altenberger, H. (2005) *Sportunterricht in Deutschland. Die Sprint-Studie. Eine Untersuchung zur Situation des Schulsports in Deutschland,* Aachen: Meyer and Meyer.

Bucksch, J., Sperlich, B. and Sudeck, G. (2015) 'Faktoren der wahrgenommenen sozialen und physischen Umwelt als Determinanten des Bewegungsverhaltens bei Jugendlichen', Das Gesundheitswesen, Vol. 77, No. 08/09. https://doi.org/10.1055/s-0035-1563253

Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., Carty, C., Chaput, J.-P., Chastin, S., Chou, R., Dempsey, P. C., DiPietro, L., Ekelund, U., Firth, J., Friedenreich, C. M., Garcia, L., Gichu, M., Jago, R., Katzmarzyk, P. T., … Willumsen, J. F. (2020) 'World Health Organization 2020 guidelines on physical activity and sedentary behaviour', *British Journal of Sports Medicine*, Vol. 54, No. 24, pp. 1451–1462. https://doi.org/10.1136/bjsports-2020-102955

Carson, V., Hunter, S., Kuzik, N., Gray, C. E., Poitras, V. J., Chaput, J.-P., Saunders, T. J., Katzmarzyk, P. T., Okely, A. D., Connor Gorber, S., Kho, M. E., Sampson, M., Lee, H. and Tremblay, M. S. (2016) 'Systematic review of sedentary behaviour and health indicators in school-aged children and youth: an update', *Applied Physiology, Nutrition, and Metabolism*, Vol. 41, No. 6 (Suppl. 3), pp. S240–S265. https://doi.org/10.1139/apnm-2015-0630

Chorlton, R. A., Williams, C. A., Denford, S. and Bond, B. (2022) 'Incorporating movement breaks into primary school classrooms; a mixed methods approach to explore the perceptions of pupils, staff and governors', *BMC Public Health*, Vol. 22, No. 1. https://doi.org/10.1186/s12889-022-14551-5

Dinkel, D., Schaffer, C., Snyder, K. and Lee, J. M. (2017) 'They just need to move: Teachers' perception of classroom physical activity breaks', *Teaching and Teacher Education*, Vol. 63, pp. 186–195. https://doi.org/10.1016/j.tate.2016.12.020

Drossel, K., Eickelmann, B., Schaumburg, H. and Labusch, A. (2019) 'Nutzung digitaler Medien und Prädiktoren aus der Perspektive der Lehrerinnen und Lehrer im internationalen Vergleich', New York: Waxmann. https://doi.org/10.25656/01:18325

Ekelund, U., Steene-Johannessen, J., Brown, W. J., Fagerland, M. W., Owen, N., Powell, K. E., Bauman, A. and Lee, I.-M. (2016) 'Does physical activity attenuate, or even eliminate, the detrimental association of sitting time with mortality? A harmonised meta-analysis of data from more than 1 million men and women', *The Lancet*, Vol. 388, No. 10051, pp. 1302–1310. https://doi.org/10.1016/s0140-6736(16)30370-1

Englert, P., Andrä, C. and Demetriou, Y. (2023) 'The Concept of Moving School and Its Practical Implementation in Bavarian Higher Secondary Schools', *Children*, Vol. 10, No. 8, 1395. https://doi.org/10.3390/children10081395

Finger, J. D., Varnaccia, G., Borrmann, A., Lange, C. and Mensing, G. B. M. (2018) 'Physical activity among children and adolescents in Germany. Results of the cross-sectional KiGGS Wave 2 study and trends', *Journal of Health Monitoring,* Vol. 3, No. 1, pp. 23–30. https://doi.org/10.17886/RKI-GBE-2018-023

Huberman, M. (1991) 'Der berufliche Lebenszyklus von Lehrern: Ergebnisse einer empirischen Untersuchung', in E. Terhart (ed.) *Unterrichten als Beruf. Neuere amerikanische und englische Arbeiten zur Berufskultur und Berufsbiografie von Lehrerinnen und Lehrern***,** Köln: Böhlau-Verlag. pp. 249–267.

Illi, U. (1998) Die "Sitzballbewegung" in Schweizer Schulen. *Der große Ball - eine runde Sache. Über seine Verwendung in den Bereichen Therapie, Schule, Arbeitsplatz und Fitness.* Berlin: Springer-Verlag.

Jäger, P., Kieffer, A., Lorenz, A. and Nistor, N. (2014) 'Der Einfluss der didaktischen Gestaltung auf die Akzeptanz und Nutzung von moodle in der Hochschullehre', Waxmann: Münster u.a. https://doi.org/10.25656/01:10114

Kohl III, H. W. and Cook, H. D. (2013) *Educating the student body: Taking physical activity and physical education to school*, Washington DC: The National Academic Press

Kuritz, A., Mall, C., Schnitzius, M. and Mess, F. (2020) 'Physical Activity and Sedentary Behavior of Children in Afterschool Programs: An Accelerometer-Based Analysis in Full-Day and Half-Day Elementary Schools in Germany', *Frontiers in Public Health*, Vol. 8. https://doi.org/10.3389/fpubh.2020.00463

Miller, J. B. (2012) *Toward a new psychology of women*, Boston, MA: Beacon Press.

Morris, M. G. and Venkatesh, V. (2006) 'Age differences in technology adoption decisions: implications for a changing work force', Personnel Psychology, Vol. 53, No. 2, pp. 375–403. https://doi.org/10.1111/j.1744-6570.2000.tb00206.x

Mullins, N. M., Michaliszyn, S. F., Kelly-Miller, N. and Groll, L. (2019) 'Elementary school classroom physical activity breaks: student, teacher, and facilitator perspectives', *Advances in Physiology Education*, Vol. 43, No. 2, pp. 140–148. https://doi.org/10.1152/advan.00002.2019

Mutz, M., Reimers, A. K. and Demetriou, Y. (2020) 'Leisure Time Sports Activities and Life Satisfaction: Deeper Insights Based on a Representative Survey from Germany', *Applied Research in Quality of Life*, Vol. 16, No. 5, pp. 2155–2171. https://doi.org/10.1007/s11482-020-09866-7

Neumann, P. and Zimmermann, R. (2020) 'Zur Akzeptanz von Sitzunterbrechungen im Unterricht aus der Perspektive von Lehrkräften', *Sportunterricht*, Vol. 69, No. 1, pp. 2–10.

Nistor, N., Wagner, M. and Heymann, J. O. (2012) 'Prädiktoren und Moderatoren der Akzeptanz von Bildungstechnologien. Die Unified Theory of Acceptance and Use of Technology auf dem Prüfstand', *Empirische Pädagogik,* Vol. 26, No. 3, pp 343–371.

Pynoo, B., Devolder, P., Tondeur, J., van Braak, J., Duyck, W. and Duyck, P. (2011) 'Predicting secondary school teachers' acceptance and use of a digital learning environment: A cross-sectional study', *Computers in Human Behavior*, Vol. 27, No. 1, pp. 568–575. https://doi.org/10.1016/j.chb.2010.10.005

Rütten, A. and Pfeifer, K. (2016) *Nationale Empfehlungen für Bewegung und Bewegungsförderung,* Erlangen: FAU University Press.

Saunders, T. J., Rollo, S., Kuzik, N., Demchenko, I., Bélanger, S., Brisson-Boivin, K., Carson, V., da Costa, B. G. G., Davis, M., Hornby, S., Huang, W. Y., Law, B., Ponti, M., Markham, C., Salmon, J., Tomasone, J. R., Van Rooij, A. J., Wachira, L.-J., Wijndaele, K. and Tremblay, M. S. (2022) 'International school-related sedentary behaviour recommendations for children and youth', *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 19, No. 1. https://doi.org/10.1186/s12966-022-01259-3

Sikes, P. J., Measor, L. and Woods, P. (1985) *Teacher careers: Crises and continuities*, London, UK: Falmer Press

STATISTA, G. (2023) *Statista,* [Online], Available: https://de.statista.com/statistik/impressum/

Stylianou, M., Kulinna, P. H. and Naiman, T. (2015) '…because there's nobody who can just sit that long', *European Physical Education Review*, Vol. 22, No. 3, pp. 390–408. https://doi.org/10.1177/1356336x15613968

Tappe, E-H. (2019) 'Prädiktoren der Intention zum didaktischen Einsatz von digitalen Medien im Unterricht - Überführung der Unified Theory of Acceptance and Use of Technology (UTAUT) in ein schulisches Untersuchungssetting', *Kopaed*. https://doi.org/10.25656/01:17387

Thiel, A., Teubert, H. and Kleindienst-Cachay, C. (2004) *Die "Bewegte Schule" auf dem Weg in die Praxis. Theoretische und empirische Analysen einer pädagogischen Innovation,* Baltmannsweiler: Schneider Hohengehren.

Tulodziecki, G., Herzig, B. and Grafe, S. (2021) *Medienbildung in Schule und Unterricht: Grundlagen und Beispiele,* Bad Heilbrunn: Julius Klinkhardt.

Van Hecke, L., Loyen, A., Verloigne, M., van der Ploeg, H. P., Lakerveld, J., Brug, J., De Bourdeaudhuij, I., Ekelund, U., Donnelly, A., Hendriksen, I., & Deforche, B. (2016) 'Variation in population levels of physical activity in European children and adolescents according to cross-European studies: a systematic literature review within DEDIPAC', *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 13, No. 1. https://doi.org/10.1186/s12966-016-0396-4

Van Stralen, M. M., Yıldırım, M., Wulp, A., te Velde, S. J., Verloigne, M., Doessegger, A., Androutsos, O., Kovács, É., Brug, J. and Chinapaw, M. J. M. (2014) 'Measured sedentary time and physical activity during the school day of European 10- to 12-year-old children: The ENERGY project', *Journal of Science and Medicine in Sport*, Vol. 17, No. 2, pp. 201–206. https://doi.org/10.1016/j.jsams.2013.04.019

Venkatesh, V. (2021) 'Adoption and use of AI tools: a research agenda grounded in UTAUT', *Annals of Operations Research*, Vol. 308, No. 1–2, pp. 641–652. https://doi.org/10.1007/s10479-020-03918-9

Venkatesh, V., Morris, M. G., Davis, G. B. and Davis, F. D. (2003) 'User Acceptance of Information Technology: Toward a Unified View', MIS Quarterly, Vol. 27, No. 3, p. 425. https://doi.org/10.2307/30036540

Venkatesh, V., Morris, M. G. and Ackerman, P. L. (2000) 'A Longitudinal Field Investigation of Gender Differences in Individual Technology Adoption Decision-Making Processes', *Organizational Behavior and Human Decision Processes*, Vol. 83, No. 1, pp. 33–60. https://doi.org/10.1006/obhd.2000.2896

von Elm, E., Altman, D. G., Egger, M., Pocock, S. J., Gøtzsche, P. C. and Vandenbroucke, J. P. (2007) 'The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies', *The Lancet*, Vol. 370, No. 9596, pp. 1453–1457. https://doi.org/10.1016/s0140-6736(07)61602-x

Wibowo, J. (2023) 'Informal learning processes in the daily practice of one German PE teacher', *Physical Education and Sport Pedagogy*, pp. 1–13. https://doi.org/10.1080/17408989.2023.2260396

Wibowo, J., Krieger, C., Gaum, C. and Dyson, B. (2022) 'Bildung: A German student-centered approach to health and physical education', *European Physical Education Review*, Vol. 29, No. 2, pp. 233–250. https://doi.org/10.1177/1356336x221133060

Wibowo, J., Krieger, C., Gerlach, E. and Bükers, F. (2021) 'Konzepte zur Aktivierung im Sportunterricht–ein fachdidaktischer Vergleich', *Aktivierung im Sportunterricht,* Vol. 2**,** pp. 184–203.

APPENDIX

Performance Expectancy
I find the concept of Moving School useful for promoting my pupils.
With the help of Moving School, the students' movement can be increased.
By incorporating elements of Moving School, I can increase productivity in the classroom.
By integrating elements of Moving School, I can promote the motivation of my pupils.
Effort Expectancy
I know how to integrate the elements of Moving School into everyday school life.
It is easy for me to familiarize myself with the concept of Moving School and the possibilities of concrete implementation.
I find it easy to integrate Moving School into everyday school life.
I find it easy to learn how elements of Moving School can be applied in practice.
Social Influence
People who influence my behavior think I should integrate Moving School into my lessons.
People who are important to me think I should integrate Moving School into my lessons.
The school management supports the implementation of Moving School.
In general, my school supports the implementation of Moving School.
Facilitating Conditions
I have everything I need to integrate the Moving School into everyday school life.
I have the knowledge necessary to integrate Moving School into everyday school life.
Moving School is not compatible with the forms of learning I usually use.
There is one person I can turn to if I have problems with the practical implementation of elements of Moving School.
Intention of Use
I regularly include elements of Moving School in my lessons.
I intend to integrate elements of Moving School into my lessons in the coming weeks.

Supplementary Table 1: Adapted items of the UTAUT model