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Original Article

Digital survey to detect factors that determine successful implementation of cooperative learning in physical education

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Abstract:
One possibility of successfully dealing with the increasing heterogeneity of students is cooperative learning. Various positive effects of cooperative learning on mental, physical and social health of students have already been documented. However, cooperative learning is still rarely used in physical education. Moreover, there is a lack of information about factors that determine the successful implementation of cooperative learning in physical education. Therefore, the objective of the current study was to find out these factors using a digital questionnaire. In addition to socio-demographic data, frequency of using cooperative learning, implementation strategies and positive and negative effects of cooperative learning were conducted. Furthermore, teachers were asked to rate the success of implementation of cooperative learning in physical education using a 6-point rating scale (1-very successful to 6-not successful at all). For statistical analysis, multiple linear regression was performed setting success of implementation as dependent variable. A total of 225 teachers (mean age: 44.81±10.60 years; 58% male) took part in the current study. Overall 39% of participants stated that they never use cooperative learning in their physical education classes. The successful implementation of cooperative learning is related to a theory-based preparation (e.g. formation of heterogeneous groups) and a student-centered implementation tailored to the needs and conditions of students (e.g. possibility of individual work). Compared to teachers who solely implemented cooperative learning theory-led or student-adapted, teachers who switched from theory-led preparation to students-centered implementation reported more successful implementation ($t=5.312$; $p<.001$). No other variable showed a significant connection to the success of implementation of cooperative learning. Corresponding to the results of the current study, it seems advisable that teachers gather enough knowledge about cooperative learning during their education and to point out the need to adapt the learning structure according to the diversity of their students. In order to analyze implementation strategies of teachers more deeply, qualitative methods and guided interviews with teachers are needed.
Key Words: **Teaching Styles, Healthy Development, Educational Technology, Collaboration**

Introduction

The increasing heterogeneity of students and the desired implementation of the diversity approach require adjustments of teaching structures to the diverse individual characteristics of children and adolescents (Bragg, Renold, Ringrose, & Jackson, 2018). Cooperative learning can be seen as a teaching structure that enables teachers to deal with the diversity of students and to use the potential of all children and adolescents effectively (Johnson & Johnson, 1989; Johnson, Johnson, & Holubec, 1998). Within the structure of cooperative learning, all students work together in small groups to help each other to deal with different tasks or problems (Slavin, 1995). Cooperative learning is divided into three phases: think phase (individual working), pair phase (partner or group working) and share phase (presentation of solutions). Combining social and academic learning, cooperative learning can be considered as a teaching structure that improves both interpersonal and social skills in youth (Gröben & Prohl, 2012; Singh & Agrawal, 2011). The peculiarity of cooperative learning structures is reflected in the fact that several objectives, which are often considered to be incompatible, can be achieved at the same time: school learning performance, social skills and joy of learning (Johnson, 1994; Slavin, 1995). During cooperative learning lessons, learning performance is promoted by actively dealing with the learning material (Shi & Han, 2019).

The knowledge increases due to the fact that students explain different circumstances to their classmates using their own words. Furthermore they have to restructure contents of learning material independently when explaining the content to their classmates (Hänze & Berger, 2007). During the interchange with other children and adolescents, students learn and consolidate social skills such as communication skills, a change of perspective, active listening, the ability to compromise, patience, helpfulness and the ability to take criticism (Schulze & von Huth, 2022). The autonomous confrontation with different learning objects and the self-determined selection of content lead to more satisfaction and higher intrinsic motivation of students (Jenkins, Antil, & Wayne, 2003). The underlying concept is that learning occurs in and through social interaction. The

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starting point of positive interdependence during cooperative learning lessons are intended to ensure students not only working together, but showing better performance compared to individual work (Johnson, 2003). Within cooperative learning structures, the existing heterogeneity of students is not considered as a burden but as a resource for effective learning processes (Singh & Agrawal, 2011).

Physical education offers special opportunities with regard to the integration of social and technical learning goals due to the specific structure of the learning subject. There is often not only the possibility but also the necessity for cooperation within physical education (Ovens, Dyson, & Smith, 2012). Professional and personality-related learning are pursued equally and integrative during cooperative learning in physical education (Gröben & Prohl, 2012; Ovens et al., 2012). Accordingly, cooperative learning lessons do not only consider the development of current sports and movement culture, but physical education is conceptualized with regard to personal development of students. The purpose is to provide the opportunity, that students try out movement solutions taking their individual learning path into account. This learning path should be reflected on during discussions with classmates and changed if necessary (Johnson, Johnson, & Johnson, 2002). In this way, self-determination of children and adolescents can be addressed in an effective way. At once, students should have the possibility to reflect their own learning path to classmates and to support them in finding a successful movement solution just as well. In this way, togetherness and teamwork of youth can be developed. Accordingly, cooperative learning can enhance skills in sense of general education (e.g. self-determination, ability to work in a team) and in sense of physical activity (gain in motor skills, quality of experience) (Schulze & von Huth, 2022). The structural entanglement of technical and personal learning in physical education does not only require the implementation of games and exercises with regard to trust and cooperation. Rather, tasks should be implemented didactically in such a way, that students work on and solve problems hand in hand. Furthermore, it seems necessary that students are dependent on mutual support, trust and cooperation from their classmates (Polvi & Telema, 2000).

Various positive effects of cooperative learning in physical education lessons have already been documented (Schulze, 2022; Schulze & von Huth, 2022). However, further investigations are required that examine not only effects, but also move the process character of cooperative learning lessons in physical education to the fore. Accordingly, the question of successful conditions for the implementation of cooperative learning in physical education can be seen as an important contribution for further investigations.

Demands on teaching and learning have changed radically in our society in recent decades. This requires the development of key competences (Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee to the Regions, 2009). Key competences are defined as acquirable, general skills, attitudes and knowledge elements that are useful for solving problems and gaining new competences in as many areas as possible. Consistent integration of cooperative learning (CL) can be a prerequisite for developing and improving these key competences. In present school practice, structures that create homogeneous learning groups are most used. In contrast, the potential of alternative, internally differentiated, open, reform-oriented and student independent structures for successfully dealing with heterogeneity of students is emphasized (Decristan, Fauth, Kunter, Büttner, & Klieme, 2017).

CL was developed in the 1970s based on concerns that students have few opportunities to demonstrate their personal skills in traditional and competitive environments (Johnson, 1994; Johnson & Johnson, 1989; Roger & Johnson, 1994; Slavin, 1995). Combining social and academic learning, the structure of CL is a way to improve personal and social skills of students (Schulze & von Huth, 2022). CL is characterized by students working in small groups to help each other to deal with learning materials (Slavin, 1995). It combines principles of various student-centered or experience- and problem-oriented approaches. The teacher acts in a subordinate role, i.e. he or she takes an accompanying function in order to educate the students to work independently. This enables students to solve problems standalone, develop learning strategies and use different concepts of learning. Using CL, five basic elements are required: positive interdependence, individual accountability, promotion interaction, social skills and group processing (Johnson & Johnson, 1989). The promotion of students' interaction does not only serve the pure acquisition of knowledge but also the strengthening of social skills.

Within physical education (PE), various positive effects of CL on mental, physical and social health of students have already been documented (Schulze & von Huth, 2022). It enables the development of current movement and sports culture ('education for sport') as well as the development of personality and social skills ('education through sport', e.g. self-determination, co-determination, solidarity) (Casey & Goodyear, 2015). The structure of CL is therefore appropriate in PE classes in order to satisfy the double task of PE, since both professional and social-psychological contents are integrated into the teaching process. However, CL is still rarely used in PE classes. Furthermore, there is a lack of information about factors that determine the successful implementation of CL in PE. Therefore, the aim of the current study was to detect potential variables that determine the successful implementation of CL in PE classes and that may contribute to CL being used more frequently in PE.

Material & methods

To substantiate variables that lead to a successful implementation of CL in PE, a digital survey was conducted from November to December 2022.

Participants

A total of 69 schools throughout Germany were contacted via E-Mail to recruit possible participants. If contacted schools signaled their interest in taking part in the study, subject information sheets and declaration of consent as well as the link to the digital survey were transmitted. The only inclusion criteria was that participants were PE teachers. Otherwise there were no restrictions regarding age, educational background, gender or length of teaching.

Procedure

The digital survey was conducted from November to December 2022. Subjects were asked for information about socio-demographic data (age, gender, teaching experience, educational background and type of school) and the frequency of using CL in PE. Furthermore, possible difficulties during the implementation of CL in PE were determined. In addition, the subjects were asked about perceived positive and negative effects in children and themselves when using CL in their PE lessons. To determine methodologically implementation of CL, teachers were asked to indicate whether they proceed theory-conforming or student-centered during preparation (e.g. formation of

Statistical analysis

SPSS version 26.0 (IBM Corp., Released 2019) was used for statistical analysis. Data were evaluated descriptively (age, gender, teaching experience, educational background, type of school, frequency of using CL in PE, difficulties during implementation, implementation strategies, positive and negative effects). A multiple linear regression was performed to identify potential variables that determine successful implementation of CL in PE. Successful implementation (self-reported grades from 1-very successful to 6-not successful at all) was set as criterial variable. Predictors were age, gender, teaching experience, type of school, frequency of CL used in PE and CL implementation strategies. Significance level was set at $\alpha \leq .05$.

Results

A total of 251 teachers took part in the survey. Complete data from 225 teachers aged between 28 and 65 years (mean age 44.81±10.60 years; male=58%) could be evaluated. No teacher indicated gender as 'diverse'. Teaching experience ranged from one to 35 years with a mean of 12.71±10.64 years. Most of the teachers (62%) were trained or studied as a PE teacher. Of the 86 teachers with a career change, 16% received additional training after starting as a PE teacher. Teachers taught at secondary schools (25%), at junior high schools (24%), at elementary schools (20%), lower secondary schools (15%), special needs schools (12%) or comprehensive schools (3%). A total of 39% of teachers stated that they never use CL in their PE classes. Another 33% used this learning structure irregularly during PE (less than once a month). In total 28% of teachers regularly (more than once a month) used CL in their PE lessons, with 17% implemented CL on a weekly basis. Reasons against implementation of CL in PE were no time for preparation (74%) or implementation (61%) and too high heterogeneity of students (55%). Mentioned difficulties of CL were uncertainties about the correct procedure (54%), heterogeneous performance of students (54%), composition of students (53%), lack of discipline in students (49%) and lack of time resources (43%).

Regarding implementation strategies, three different types emerged: Type 1 implemented CL structures solely theory-based (preparation and implementation), type 2 taught exclusively student-centered within the preparation (e.g. formation of homogeneous groups with friendships, omission of rules) and implementation (individual work possible, omission of phases of CL) and type 3 implements preparation of CL in accordance with theory and switched to a student-centered implementation of CL. In total 42% of teachers can be assigned to type 1, 38% to type 2 and 21% to type 3. Positive effects were mainly reported with regard to increased motivation of students (42%), improved class cohesion (31%), increased independence of students (26%) and more joy of students during PE lessons (18%).

A total of 7% of the teachers reported no positive effects regarding implementation of CL in PE. The main negative effects were unpredictability (29%), confusion (24%), restlessness (24%), increased occurrence of conflicts (17) and increased stress among teachers (16%). A total of 29% of participants reported no negative effects regarding the implementation of CL in PE classes. Overall 8% of the teachers reported that they were able to successfully implement CL in their PE classes (grade 1). Another 10% reported well (grade 2) and 32% satisfactory successful implementation (grade 3). A sufficient successful implementation (grade 4) was reported by 25% of teachers, 10% indicated poor (grade 5) and 5% insufficient (grade 6) successful implementation.

Results of regression analysis showed that 55% of variability for the success of implementation of CL in PE can be explained by the model. The model can be assumed to be significant ($F=8.689$; $p<.001$). The results of individual coefficients are reported in Table 1. Only implementation style showed a significant influence on the success of implementation of CL in PE. Compared to teachers who solely implemented CL theory-led or student-centered, teachers who switched from a theory-led to student-centered implementation of CL during preparation and implementation phase, reported significant better successful implementation ($t=5.312$; $p<.001$). Neither age, gender, teaching experience, type of school or frequency of CL used in PE were significant predictors for the success of implementing CL in PE lessons.

Table 1: Results of regression analysis.

	unstandardized		standardized coefficients	t	significance (p)
	B	standard error	Beta		
age	.008	.153	.005	.050	.960
gender	.145	.888	.007	.163	.870
teaching experience	-.106	.178	-.066	-.594	.553
type of school	.218	.544	.020	.402	.689
frequency of CL	-.921	-.008	.777	.931	.157
implementation strategies	6.193	.855	.571	7.247	.000

Notes: CL=cooperative learning; dependent variable=self-reported success of implementation of cooperative learning in physical education

Discussion

Due to the changing society, soft skills related to social interaction and personal development are becoming more and more important in order to meet the requirements (Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee to the Regions, 2009). Due to the documented various positive effect for using CL in PE on mental, social and physical health (Schulze & von Huth, 2022), it seems advisable for teachers to use this teaching structure frequently and successfully in their PE classes. Overall, the study is able to underline that CL is still rarely used in PE. A total of 82% of PE teachers did not implement CL at all or very irregularly within their PE classes. The reported problems of time (preparation, implementation), show above all the need to rethink and restructure schooling system in Germany. Results indicated that only implementation strategies had a significant influence on the success of implementing CL in PE. Teachers who implemented basic requirements (such as heterogeneous groups, establishment of rules and rituals, improvement of social skills) based on theory and then switched to a student-centered implementation of CL (considering special needs and requirements of students), reported a more successful implementation compared to teachers who solely implemented CL theory-led or student-centered. Therefore, it seems essential, regardless of the characteristics of the students, to create initial conditions that prepare children for CL and that offers them safety and confidence. The formation of heterogeneous groups can ensure the optimal use of resources and strengths of children. The promotion of social skills (e.g. communication or conflict training) during the preparation phase, enables a more trouble-free implementation of CL. In addition, children were qualified to deal with conflict situations in an independent and responsible way. Thus, the teachers can act as moderators and do not have to intervene as much. This offers children the opportunity to learn by making mistakes and an education with content of self-determination and co-determination. However, within the implementation of CL in PE, it seems important that the needs of students are addressed. For example, it can be essential to flexibly adapt the phases of CL on students' needs and the situation (e.g. omit the think-phase). Furthermore, successful teachers enable single students to work individually. Although this excludes single students from CL, it enables the class to successfully deal with CL. The successful implementation of CL thus can improves children's motivation and therefore contribute to lifelong sport participation of students (Cecchini Estrada, 2019; Rivera-Perez, Fernandez-Rio, & Gallego, 2021; Viciana, Casado-Robles, Perez-Macias, & Mayorga-Vega, 2020). As patterns of physical activity established in childhood and tend to continue into adulthood (Tammelin et al., 2014), an active lifestyle earlier in life may protect against inactivity and chronic diseases in later life. Nevertheless, moving away from a solely teacher-centered and a competitive model towards a student-centered pedagogy takes a lot of time, effort in adaption and critical reflection. Educators and practitioners should be aware of the multidimensional nature of PE and physical activity and the variety of educational possibilities when PE should fully recommend the double task. To support changes in learning structures in PE, university researchers should work with pedagogical school staff on their professional development to improve the use of CL in PE. It is recommended to teach in cooperative teams, e.g. in cooperation with research staff to reduce time of preparation and implementation of CL. Furthermore, it is important that teachers receive sufficient theoretical background knowledge for the preparation of CL. Teachers should be aware that rules, rituals, heterogeneous groups and sufficient levels of social skills are prerequisites for successfully implementing CL in PE lessons. In addition, teachers should be sensitized to the fact that individual needs of students should be taken into account during implementation of CL. A successful implementation of CL can therefore be associated with a restructuring, e.g. by omitting individual phases of CL. Facing the complex setting of schooling and burdens from society imply constant development of knowing and using teaching structures that consider individual requirements and needs of children and adolescents. In this sense, researchers and teachers should reflect the theory and practice of pedagogical approaches to encourage lifelong engagement in physical activity and healthy development of children and adolescents. However, this study has some limitations. The survey was conducted exclusively online and was not monitored. Therefore, it cannot be guaranteed that teachers answered questions conscientiously. Furthermore, some teachers were excluded from statistical analysis due to discontinuing from study prematurely or incomplete data. Finally, we were not able to detect all relevant variables that may have an influence on the success of implementing CL in PE lessons (e.g. age of children, size of class, characteristics of children).

Conclusions

A teaching style that can impact positive development of children and adolescents is CL (Schulze & von Huth, 2022). The current study was able to show that only few teachers regularly use this teaching style during their PE lessons. Teachers who implemented CL in PE lessons reported various positive effects (e.g. higher motivation of students, improved class cohension). Furthermore, a switch from theoretical preparation to student-centered implementation is required for the successful use of CL in PE. Teachers should therefore gain enough experience and knowledge regarding this teaching structure and should be able to react flexibly to the requirements and conditions of their students. This should be conveyed to teachers during their training in order to provide good conditions for the use of CL in PE. In order to reduce barriers for implementing CL in PE classes, collaborative work with other teachers and with research staff seems important.

Conflicts of interest - None declared.

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