

The Effectiveness of Autonomy Support Interventions With Physical Education Teachers and Youth Sport Coaches: A Systematic Review

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Researchers consider motivation a key determinant of physical activity. In physical education (PE) and youth sport, the more children and adolescents evaluate their teachers and coaches to be autonomy supportive, as opposed to controlling, the more self-determined they are in their motivation. Therefore, it appears valuable to help PE teachers and youth sport coaches optimize their interactions with the individuals they work with. This study was designed to systematically review the literature related to autonomy support interventions with PE teachers and youth sport coaches. After relevant databases were searched and duplicates were removed, 1,523 potentially pertinent articles were found. These were subsequently screened based on specific inclusion criteria. This systematic review process helped identify 21 studies that were included for further analyses. Overall, the interventions were frequently successful in enhancing PE teachers' and youth sport coaches' behavior. Additional research appears justified to foster self-determined motivation among children and adolescence.

Keywords: athletes, autonomy-supportive behavior, basic psychological needs, motivation, self-determination theory, students

Insufficient physical activity is a key risk factor for a multitude of human health problems including obesity, cardiovascular diseases, and diabetes (Reiner, Niermann, Jekauc, & Woll, 2013), yet, especially in industrialized countries, many individuals adhere to a sedentary lifestyle. Particularly alarming is that many adolescents between the ages of 11 and 17 years regularly do not meet general physical activity guidelines (World Health Organization, 2016). This indicates the value of instilling a preference for an active lifestyle at an early age, which, in turn, helps to build the foundation for lifelong participation in physical activity (Telama, Yang, Hirvensalo, & Raitakari, 2006). Such inclinations not only help to enhance people's physical and mental health but also increase their overall quality of life (Reiner et al., 2013). To accomplish that objective, it is imperative to foster individuals' motivation, which has been found to strongly affect the duration and frequency of physical activity (Teixeira, Carraca, Markland, Silva, & Ryan, 2012).

Self-determination theory (Ryan & Deci, 2017) provides a framework to comprehensively interpret the antecedents, mediators, and consequences of motivation and, thus, understand "what energizes and gives direction to behavior" (Ryan & Deci, 2017, p. 13). More specifically, the framework offers an understanding of the complex and dynamic nuances of behavioral regulation (e.g., the different types of autonomous and controlled motivation) and the social conditions that either support or undermine cognitive, affective, and behavioral outcomes. That is, a person can demonstrate different types of motivation, which lay on a continuum from amotivation to intrinsic motivation. Whereas amotivation indicates a complete lack of interest in a behavior, intrinsic

motivation suggests an engagement primarily for the enjoyment of and interest in the activity itself. Between amotivation and intrinsic motivation, there is a spectrum of extrinsic forms of regulation that can contribute to an individual's reason to participate in an activity. Among these behavioral regulations are external (to receive rewards or avoid punishment), introjected (out of self-imposed pressure), identified (to aid in the achievement of another related goal), and integrated regulation (to confirm one's self). External and introjected regulations are characterized as nonself-determined because a person's actions are determined by sources completely or partially external to the individual. In contrast, identified and integrated regulations are considered to be self-determined because the individual participates in behaviors with a sense of free will (Ryan & Deci, 2017). Researchers have found that children and adolescents who are self-determined in their motivation are more likely to be physically active (e.g., Dishman, McIver, Dowda, Saunders, & Pate, 2015) and experience various other cognitive, affective, and behavioral benefits (e.g., higher levels of well-being; Cheval, Chalabaev, Queded, Courvoisier, & Sarrazin, 2017).

According to Ryan and Deci (2017), these positive outcomes can be nurtured by satisfying the inherent basic psychological needs of competence (i.e., feeling capable of being physical active); autonomy (i.e., having a certain amount of choice in regard to the engagement); and relatedness (i.e., feeling like a valued and accepted member of a group). In turn, need fulfillment is influenced by various motivational determinants—or social factors—within the environment. It is not surprising that the role of physical education (PE) teachers and youth sport coaches as social factors (or agents) has received particular consideration in the literature because children and adolescents are typically introduced to physical activity through either PE in school or youth sport. These social agents can foster need fulfillment by engaging in autonomy support, which entails that "an individual in a position of authority takes the other's perspective, acknowledges the other's feelings, and provides the other with pertinent information and opportunities for choice, while minimizing the use of pressures and demands" (Black & Deci, 2000, p. 742). In fact, several researchers

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have concluded that the more individuals evaluated their PE teachers and youth sport coaches to be autonomy supportive, as opposed to controlling, the more competent, autonomous, and related they felt (e.g., Cheval et al., 2017; Standage, Gillison, Ntoumanis, & Treasure, 2011).

In light of these empirical findings, it is important to educate PE teachers and youth sport coaches about autonomy support and how to cultivate an aspiration for lifelong engagement in physical activity among children and adolescents. Researchers have demonstrated that an autonomy-supportive style can be taught (e.g., Readdy & Raabe, 2016; Reeve, 1998), and intervention programs have been shown to be effective in enhancing interpersonal conditions across a variety of domains (e.g., parenting; Su & Reeve, 2011). However, there is currently no systematic evidence for the effectiveness of such interventions with PE teachers and youth sport coaches. Accordingly, the purpose of the present research was to systematically review the existing literature on autonomy support interventions with PE teachers and youth sport coaches. More specifically, this study was designed to accomplish the following two objectives: (a) to describe and evaluate research on autonomy support interventions with PE teachers and youth sport coaches and (b) to provide an overview of the effectiveness of the respective interventions.

Method

Procedure

This study was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (Moher, Liberti, Tetzlaff, & Altman, 2009). To identify potentially relevant articles, a list of search terms was developed based on a review of applicable literature and trialed in multiple preliminary searches on the EBSCOhost database. The final combination of search terms was

("autonomy support" OR "autonomy supportive" OR "autonomy-supportive" OR "autonomous support" OR "need support" OR "needs support" OR "need supportive" OR "need-supportive" OR "need satisfaction" OR "satisfaction of needs" OR "need fulfillment" OR "need fulfilment" OR "motivational climate" OR "self-determination") AND (teacher* OR coach* OR parent*) AND ("physical education" OR "physical activity" OR sport* OR exercise) AND (intervention* OR program* OR evaluat* OR training OR experiment* OR workshop OR education* OR treatment OR effect*)

Using this list of search terms, on April 1, 2018, the following three electronic research platforms with 12 individual databases were reviewed for potentially relevant articles: EBSCOhost (Academic Search Premier, ERIC, Education Source, MEDLINE, PsycARTICLES, PsycINFO, PSYINDEX, and SPORTDiscus), ISI Web of Knowledge, and ProQuest (Applied Social Sciences Index and Abstracts, Physical Education Index, Social Services Abstracts, and Sociological Abstracts).

The initial search revealed 3,491 potentially relevant articles across all databases that had been published by April 1, 2018. After removing duplicates, 1,523 articles remained which were screened based on specific inclusion criteria (see Table 1).

Figure 1 provides a flowchart of the study review process. Initially, two independent reviewers (i.e., second and third author) screened the titles of the 1,523 remaining articles and identified 503 studies that met the inclusion criteria. In this process, the two

Table 1 Inclusion Criteria for Article Screening

1. Peer-refereed journal article.
2. Article published in English or German.
3. Study was grounded in self-determination theory.
4. Research entailed an intervention.
5. Intervention was conducted with physical education teachers and/or youth sport coaches.
6. Intervention aimed at fostering students' and/or youth athletes' perceived autonomy support, basic psychological need satisfaction, and/or motivation.
7. Study utilized a control group.

reviewers had an agreement rate of 87.9%, which represented a "substantial" Cohen's kappa (κ) for interrater reliability (Cohen, 1960) of .73 (Landis & Koch, 1977). The two reviewers discussed titles they did not agree on until consensus was reached to either include or exclude the article. Subsequently, the two reviewers examined whether the abstracts of the remaining 503 articles met the inclusion criteria. With an agreement rate of 95% and a "substantial" κ of .79 (Landis & Koch, 1977), this process revealed 67 articles that were included for further screening. Finally, the second author reviewed the full texts of the remaining 67 articles and identified 21 studies that fulfilled the inclusion criteria and were included for further analysis as part of this systematic review.

Data Extraction

Based on the recommendations of Higgins and Green (2008) and Liberati et al. (2009), standardized forms were developed to extract relevant data from the selected studies. To describe autonomy support interventions with PE teachers and youth sport coaches (Objective a), the following study characteristics were extracted: authors, year of publication, theoretical framework, location (i.e., country the intervention was conducted), setting (i.e., PE or youth sport), study design (i.e., cluster randomized controlled trials or controlled trials), sample characteristics (i.e., number and age of participants, experience of social agents), intervention characteristics (i.e., content, duration, and frequency), and instruments. Furthermore, several methodological characteristics were considered to evaluate the methodological quality of each selected study (see Table 2). To assess the effectiveness of the respective interventions (Objective b), descriptive statistics for the outcome variables of interest (see Analysis of the Effectiveness of Interventions section) were derived.

Assessment of Methodological Quality

In systematic reviews, it is essential to assess the methodological quality of studies because this process allows researchers to account for any influence on the estimates of an intervention's effectiveness (Liberati et al., 2009). Many different scales and checklists have been proposed for the evaluation of methodological quality (see Armijo-Olivo et al., 2008). However, Liberati et al. (2009) argued that these often lack the necessary generalizability to be used across different studies. Instead, Higgins and Green (2008) recommended using a component approach that is based on domains for which there is a good empirical evidence. Thus, in accordance with the Cochrane risk of bias tool (Higgins et al., 2011), seven criteria were developed to assess the reviewed

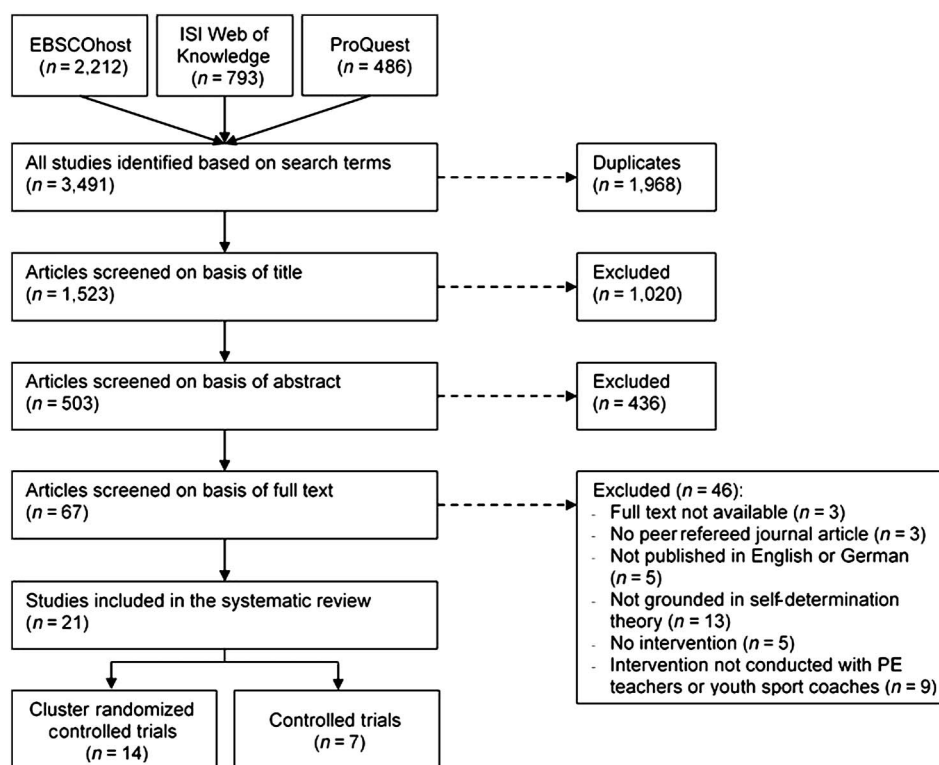


Figure 1 — Flowchart of the study review process. PE = physical education.

Table 2 Criteria for the Assessment of Methodological Quality

Criteria	Description
Randomization	Was participants' assignment into the IG and CG randomized (i.e., via clusters)?
Pretest analysis	Were the participants' characteristics and central outcome variables analyzed before the beginning of the intervention? Were differences between participants in the IG and CG controlled for statistically?
Dropout rate	Was the dropout rate among participants below 20% in studies with a follow-up of <6 months and below 30% in studies with a follow-up of >6 months?
Timing of assessment	Were data collected at comparable times in the IG and CG?
Blinded assessment	Were the individuals collecting the data unaware of participants' group membership (i.e., IG or CG)?
Follow-up	Was a follow-up assessment conducted at least 3 months following the completion of the intervention?
Systematic dropout	Were there no significant differences between participants who maintained their participation and those who dropped out?

Note. IG = intervention group; CG = control group.

studies' methodological quality in the current research (see Table 2). Studies received one point for each of the criteria they fulfilled. No points were awarded when a criterion was either not fulfilled or the authors failed to provide sufficient supporting information in their article. Studies with zero to one point were considered to be of low methodological quality, studies with two to four points of moderate quality, and studies with five or more points of high methodological quality (Demetriou & Höner, 2012).

Analysis of the Effectiveness of Interventions

In line with the motivational sequence (i.e., social factors, psychological mediators, motivation, and consequence; Vallerand & Losier, 1999), the effectiveness of the interventions was analyzed based on the following four categories of outcome measures

(gauged using different types of assessments and instruments): PE teachers' and youth sport coaches' autonomy-supportive behavior (i.e., observed by the researchers, self-reported by PE teachers and youth sport coaches, and evaluated by students and athletes); students' and athletes' satisfaction of the three basic psychological needs (i.e., competence, autonomy, and relatedness); students' and athletes' motivation (i.e., amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, and intrinsic motivation); and affective, cognitive, and behavioral outcomes (e.g., burnout, classroom engagement).

Cohen (1988) *d* was computed for every tested interaction effect (Time $\times$ Group) to classify the practical relevance of significant effects and compare the studies' results. The effect sizes were characterized as small ($0.2 \leq d \leq 0.5$), moderate ($0.5 < d \leq 0.8$), and large ($d > 0.8$) based on the recommendations of Cohen (1988).

To provide an overview of the effectiveness of interventions, the range and median (*Mdn*) of all effect sizes (i.e., significant and nonsignificant) for the outcome measures and the percentages of significant effects (relative frequency of significant effects) were calculated. This approach was chosen instead of a meta-analysis because “a common criticism of meta-analyses is that they ‘combine apples with oranges’”. If studies are clinically diverse then a meta-analysis may be meaningless, and genuine differences in effects may be obscured” (Higgins & Green, 2008).

As Higgins and Green (2008) highlighted “decisions concerning what should and should not be combined are inevitably subjective, and are not amenable to statistical solutions but require discussion and clinical judgement.” In the current research, the authors believed that there was too much heterogeneity in the included studies (e.g., research design, instruments) and, most importantly, the dependent variables to conduct a meta-analysis (Higgins & Green, 2008). More specifically, all effect sizes derived from the reviewed studies were divided into four categories of outcome measures representing conceptually different constructs within the motivational sequence (Vallerand & Losier, 1999). Thus, it did not seem appropriate to calculate an overall effect across the four categories (e.g., synthesize the behavior of PE teachers and the motivational tenets of students). Within the individual categories, there were five, four, seven, and 16 different outcome measures, respectively (see [Supplementary Materials](#) [available online]); only nine comprised more than five tested effects. Thus, there did not seem to be enough effects to adequately conduct a meta-analysis independently for each outcome measure and too much conceptual heterogeneity to analyze them collectively (e.g., there is—at least no inherent—relationship between many of the affective, cognitive, and behavioral outcomes). Furthermore, there was a lack of homogeneity with respect to measurement across the 21 studies (i.e., researchers used different instruments to assess the outcome measures).

Results

Study Characteristics and Methodological Quality

An overview of the individual study characteristics is provided in Table 3. The 21 studies that were included in this systematic review were published between 2006 and 2018. Most researchers conceptually grounded their intervention solely in self-determination theory (19 studies; 90.5%). The majority of the included intervention research was conducted in the context of PE (18 studies; 85.7%) and comprised samples of 1–62 PE teachers ($M = 18.33$; $SD = 16.32$) and 0–2,380 students ($M = 706.5$; $SD = 638.02$). Three studies (14.3%) were conducted in youth sport. These endeavors included 6–18 youth sport coaches ($M = 10.67$; $SD = 6.43$) and 87–113 athletes ($M = 103$; $SD = 14$). Interventions ranged anywhere from a single lesson to 20 meetings over the course of 7 months. Of the 21 studies selected for this systematic review, 14 (66.7%) employed an experimental, longitudinal design using cluster randomized controlled trials. Seven studies (33.3%) utilized controlled trials with a quasi-experimental pretest and posttest design. Across all included studies, researchers examined a number of different variables related to the four categories of outcome measures: autonomy support (assessed in 17 studies); basic psychological needs (12 studies); motivation (13 studies); and cognitive, affective, and behavioral outcomes (12 studies).

The analysis of the methodological quality revealed an average score of 3.43 out of 7 ($SD = 1.50$) across all studies in this review (see Table 4). The majority of the included studies were of moderate methodological quality ($n = 16$; 76.2%). In addition, five studies were characterized as high in quality (23.8%), whereas no research included in this review was considered to be of low quality. An examination of the individual criteria highlights that more than half of the studies randomly assigned participants to the intervention and control groups (all 14 cluster randomized controlled trials studies; 66.7%), had acceptable dropout rates ($n = 14$; 66.7%), and measured intervention and control groups in similar time frames ($n = 19$; 90.5%). Selected studies included blinding procedures ($n = 8$; 38.1%), utilized a pretest analysis ($n = 8$; 38.1%), and indicated no significant differences between those individuals who maintained their participation and those who dropped out ($n = 7$; 33.3%). Only Cheon and Reeve (2013) and Cheon, Reeve, and Song (2016) conducted a follow-up assessment at least 3 months after the completion of the intervention ($n = 2$; 9.5%). Finally, although not statistically significant ($p = .227$), studies using cluster randomized controlled trials were, on average, descriptively of higher methodological quality ($M = 3.71$; $SD = 1.49$) than those with controlled trials ($M = 2.86$; $SD = 1.46$).

Effectiveness of Interventions

Overall, it was possible to calculate effect sizes for 97 individual variables across the four categories of outcomes measures. (Tables indicating all effect sizes are given in the [Supplementary Materials](#) [available online].) There was a noticeable discrepancy with respect to the studies’ setting, as 91 effect sizes were tested in PE and only six in youth sport. The review revealed that no negative intervention effects and positive significant intervention effects were found for 77.3% of the examined variables (75 of 97). The effects ranged in size from small to large, $Mdn(d) = 0.36$; $0.00 \leq d \leq 2.79$. When accounting for the respective studies’ methodological quality, significant positive effects across all outcome measures were found for 69.3% of the variables (43 of 62) in the 16 studies with moderate methodological quality and for 91.4% of the variables (32 of 35) in the five studies with high methodological quality.

PE Teachers’ and Youth Sport Coaches’ Autonomy-Supportive Behavior. Differences in PE teachers’ and youth sport coaches’ behavior (i.e., autonomy support and controlling behavior) were evaluated in 14 of the 21 studies (66.7%; 33 tested effects). In PE, regardless of measurement, the results indicated a general increase in autonomy-supportive behaviors based on the interventions with 90.9% of the tested effect sizes (20 of 22) reaching significance. When changes in the use of autonomy support were assessed by an external observer, all tested effect sizes (eight of eight) were found to be significant with primarily large effects, $Mdn(d) = 1.29$; $0.73 \leq d \leq 2.79$. Decreases in observed controlling behaviors were found to be significant for 33.3% of the tested effect sizes, one of three; $Mdn(d) = 0.36$; $0.18 \leq d \leq 1.27$. For self-reported autonomy support, 33.3% of the tested effect sizes (one of three) were found to be significant, $Mdn(d) = 0.51$; $0.18 \leq d \leq 1.09$. In addition, there were 19 tested effect sizes for students’ perceptions of their PE teachers’ behavior. Based on students’ evaluation, all interventions—that used this type of assessment—were successful in enhancing PE teachers’ interactions. That is, 91.7% of the tested effect sizes (11 of 12) for perceived autonomy support, $Mdn(d) = 0.43$; $0.08 \leq d \leq 1.83$, and 85.7% of the tested effect sizes (six of seven) for perceived controlling behavior (i.e., lower levels), $Mdn(d) = 0.58$;

Table 3 Overview of Study Characteristics

Authors (year)	Country	Setting	Outcome measures ^a	Sample size (total)		Sample size (males)		Sample size (females)		Sample size (gender unspecified)		M_{age} (SD)	$M_{Exp.}$ (SD) of social agents ^b	Study design
				Social agents ^b	Students/athletes ^b	Social agents ^b	Students/athletes ^b	Social agents ^b	Students/athletes ^b	Social agents ^b	Students/athletes ^b			
Abos, Sevil, Julian, Abarca-Sos, and Garcia-Gonzalez (2017)	Spain	PE	1, 4	2	35	16		19	2		15.4 (0.5)			CRCT
Aelterman, Vansteenkiste, Berghe, De Meyer, and Haerens (2014)	Belgium	PE	1	39	669	31	424	8	245		38.5 (10.4)	14.6 (1.9)	15.5 (10.4)	CRCT
Amado et al. (2014) ^c	Spain	PE	2, 3	1	47	18		1	29			14.6 (0.5)		CT
Amado, Sanchez-Miguel, and Molero (2017) ^c	Spain	PE	1, 2, 3	12	921	500		421	12		13.2 (1.1)			CT
Bennie, Peralta, Gibbons, Lubans, and Rosenkranz (2017) ^c	Australia	PE		13		4		9						CRCT
Cheon and Reeve (2013)	South Korea	PE	2, 3, 4	17	953	11	486	6	467					CT
Cheon and Reeve (2015)	South Korea	PE	1, 2, 3, 4	16	598	11	277	5	321		33.5		5.5	CRCT
Cheon, Reeve, and Moon (2012)	South Korea	PE	1, 2, 3, 4	19	1,158	608		550	19		30.5			CRCT
Cheon, Reeve, and Ntoumanis (2018)	South Korea	PE	1, 2, 4	33	1,824	25	771	8	1,053		36.0 (4.4)		6.5 (2.6)	CRCT
Cheon et al. (2016)	South Korea	PE	1, 2, 3, 4	19	1,017	15		4		1,017	36.5		7.9	CRCT

(continued)

Table 3 (continued)

Authors (year)	Country	Setting	Outcome measures ^a	Sample size (total)		Sample size (males)		Sample size (females)		Sample size (gender unspecified)		M_{age} (SD)	M_{Exp} (SD) of social agents ^b	Study design
				Social agents ^b	Students/athletes ^b	Social agents ^b	Students/athletes ^b	Social agents ^b	Students/athletes ^b	Social agents ^b	Students/athletes ^b			
Escriba-Boulley, Tessier, Ntoumanis, and Sarrazin (2018)	France	PE	1, 4	15	293	5	141	10	152			8.3 (1.1)	9.5 (6.3)	CRCT
Franco and Coterón (2017)	Spain	PE	1, 2, 3	2	53		30		23	2		13.4 (0.6)		CT
Jaakkola and Liukkonen (2006)	Finland	PE	3	4	437		227		210	4		45.0		CT
Langan, Lonsdale, Blake, and Toner (2015)	Ireland	Gaelic football	1, 3, 4	6	87					6	87			CRCT
Mahoney, Ntoumanis, Gucciardi, Mallett, and Stebbings (2016)	United Kingdom	Rowing	1, 2, 4	18	113	17	35	1	78					CT
Meng and Keng (2016)	Singapore	PE	1, 2, 3, 4	8	648		334		314	8		14.4		CRCT
Perlman (2015)	United States	PE	1, 3	62	752	32	384	30	368					CRCT
Pulido, Sanchez-Oliva, Leo, Matos, and Garcia-Calvo (2017) ^c	Spain	Soccer	1, 2, 3, 4	8	109	8	109					32.5 (14.3)		CT
Reeve and Cheon (2016)	South Korea	PE	1	42	2,380	30	1,330	12	1,050			35.2	8.0	CRCT
Sánchez-Oliva, Pulido-Gonzalez, Leo, Gonzalez-Ponce, and Garcia-Calvo (2017)	Spain	PE	1, 2, 3, 4	21	836		424		412	21		12.8 (0.9)	11.0 (4.6)	CRCT
Tessier, Sarrazin, and Ntoumanis (2008)	France	PE	1	5	96	3	47	2	49			14.6 (2.3)		CRCT

Note. PE = physical education; CRCT = cluster randomized controlled trials; CT = controlled trials.

^aOutcome measures: 1 = PE teachers' or youth sport coaches' behavior; 2 = students' or athletes' basic psychological need satisfaction; 3 = students' or athletes' motivation; 4 = affective, cognitive, and behavioral outcomes.

^bPE teachers or youth sport coaches. ^cAuthors failed to provide sufficient data to calculate effect sizes.

Table 4 Methodological Quality of the 21 Included Studies (Ranked by Overall Score)

Study	R	PTA	DR	TA	BA	FU	SDO	Score
Cluster randomized controlled trials								
Cheon and Reeve (2015)	1	1	1	1	1 ^a	0	1	6
Cheon et al. (2012)	1	1	1	1	1 ^a	0	1	6
Langan et al. (2015)	1	1	1	1	1 ^a	0	1	6
Aelterman et al. (2014)	1	1	0	1	1 ^a	0	1	5
Cheon et al. (2016)	1	0	1	1	0 ^b	1	0	4
Reeve and Cheon (2016)	1	0 ^b	1	1	0 ^b	0	1	4
Bennie et al. (2017)	1	0	1	1	0	0	0 ^b	3
Cheon et al. (2018)	1	0	1	1	0 ^b	0	0	3
Perlman (2015)	1	0 ^b	0 ^b	1	1	0	0 ^b	3
Sánchez-Oliva et al. (2017)	1	0	1	1	0 ^b	0	0 ^b	3
Tessier et al. (2008)	1	0	0 ^b	1	1	0	0 ^b	3
Abós et al. (2017)	1	0	0 ^b	1	0 ^b	0	0 ^b	2
Escriba-Boulley et al. (2018)	1	0	0	1	0	0	0 ^b	2
Meng and Keng (2016)	1	0 ^b	0 ^b	1	0 ^b	0	0 ^b	2
	$\Sigma = 14$	$\Sigma = 4$	$\Sigma = 8$	$\Sigma = 14$	$\Sigma = 6$	$\Sigma = 1$	$\Sigma = 5$	$M = 3.71$
Controlled trials								
Cheon and Reeve (2013)	0	1	1	1	1 ^a	1	1	6
Amado et al. (2017)	0	1	1	1	0 ^b	0	0 ^b	3
Pulido et al. (2017)	0	0	1	1	0 ^b	0	1	3
Amado et al. (2014)	0	1	1	0	0 ^b	0	0	2
Franco and Coterón (2017)	0	0	1	1	0 ^b	0	0 ^b	2
Jaakkola and Likkonen (2006)	0	1	1	0 ^b	0 ^b	0	0 ^b	2
Mahoney et al. (2016)	0	0 ^b	0	1	1 ^a	0	0 ^b	2
	$\Sigma = 0$	$\Sigma = 4$	$\Sigma = 6$	$\Sigma = 5$	$\Sigma = 2$	$\Sigma = 1$	$\Sigma = 2$	$M = 2.86$

Note. R = randomization; PTA = pretest analysis; DR = dropout rate; TA = timing of assessment; BA = blinded assessment; FU = follow-up; SDO = systematic dropout; PE = physical education.

^aAssessment was blinded only for PE teacher and/or youth sport coach observations. ^bAuthors failed to provide sufficient supporting information in their article with respect to this criterion.

$0.33 \leq d \leq 0.84$, reached significance and ranged from small to large. In youth sport, no significant effect sizes were found for changes in youth sport coaches' behavior, zero of two; $Mdn(d) = 0.09$; $0.06 \leq d \leq 0.12$.

Students' and Athletes' Satisfaction of the Three Basic Psychological Needs. Effects on students' and athletes' basic psychological need satisfaction were tested in nine of the 21 studies (42.9%; 20 tested effects). In PE, 84.2% of the tested effect sizes (16 of 19) were found to be significant with mainly small to moderate effect sizes across the three basic psychological needs: autonomy, six of six; 100%; $Mdn(d) = 0.40$; $0.05 \leq d \leq 0.56$, competence, five of six; 83.3%; $Mdn(d) = 0.30$; $0.02 \leq d \leq 0.90$, and relatedness, three of five; 60%; $Mdn(d) = 0.07$; $0.00 \leq d \leq 0.38$. In addition, three studies reported effects for a summary score comprising all three basic psychological needs with 66.7% reaching significance, two of three; $Mdn(d) = 0.36$; $0.36 \leq d \leq 0.56$. There was one tested effect size in youth sport, and it was found to be small and nonsignificant for a similar variable combining need fulfillment ($d = 0.12$).

Students' and Athletes' Motivation. Changes in students' and athletes' motivation were considered in 11 of the 21 studies (52.4%; 19 tested effects). In PE, six variables were measured with respect to amotivation, indicating lower levels in 83.3% of

the tested effect sizes (five of six) with primarily small effects, $Mdn(d) = 0.32$; $0.00 \leq d \leq 0.43$. In regard to nonself-determined motivation, 100% of the tested effect sizes (one of one) for external regulation ($d = 0.34$) and 0% of the tested effect sizes (zero of one) for introjected regulation ($d = 0.13$) were found to be significant. The only tested effect size for the self-determined identified-regulation type of motivation was not found to be significant ($d = 0.03$). In seven studies, researchers explored a cumulative variable for motivation. In those, 50% of the effect sizes for some form of the relative autonomy index (three of six; Grolnick & Ryan, 1987) and 100% of the effect sizes for an average of autonomous motivation (two of two) were found to be significant, indicating predominantly small effects, $Mdn(d) = 0.29$; $0.04 \leq d \leq 0.50$. Finally, 50% of the tested effect sizes for intrinsic motivation were found to be significant, one of two; $Mdn(d) = 0.27$; $0.05 \leq d \leq 0.48$. In youth sport, the only tested effect size for a form of the relative autonomy index was not significant ($d = 0.46$).

Affective, Cognitive, and Behavioral Outcomes. Researchers assessed a variety of affective, cognitive, and behavioral outcomes to evaluate the effectiveness of their interventions. In PE, 82.6% of the tested effect sizes (19 of 23) reached significance with small to large effects, $Mdn(d) = 0.35$; $0.04 \leq d \leq 2.64$. Fourteen variables were only assessed in one or two studies. An exception was classroom engagement, which was measured in five studies; all tested

effect sizes were found to be significant, five of five; $Mdn(d) = 0.41$; $0.15 \leq d \leq 0.45$. Investigations of affective, cognitive, and behavioral outcomes in youth sport included two tested effect sizes with 50% reaching significance, one of two; $Mdn(d) = 0.36$; $0.11 \leq d \leq 0.60$.

Discussion

Motivation has a meaningful influence on people's engagement in physical activity (Teixeira et al., 2012), which, in turn, is associated with a number of health benefits (Reiner et al., 2013). PE teachers' and youth sport coaches' behavior plays an important role in fostering children and adolescents' motivation (e.g., Cheval et al., 2017; Standage et al., 2011). Thus, this study was conducted to systematically review the existing literature on autonomy support interventions with PE teachers and youth sport coaches. In this process, both the effectiveness of the respective interventions and the methodological quality of the individual studies were examined.

Effectiveness of Autonomy Support Interventions With PE Teachers and Youth Sport Coaches

This review revealed a promising trend for the effectiveness of autonomy support interventions with PE teachers and youth sport coaches, as positive significant changes were observed for 77.3% of all tested effect sizes across the 21 studies.

PE Teachers' and Youth Sport Coaches' Autonomy-Supportive Behavior. Interventions were predominantly successful in enhancing PE teachers' and youth sport coaches' use of autonomy-supportive behavior regardless of study design (i.e., cluster randomized controlled trials and controlled trials) or assessment (i.e., observed, self-reported, or evaluated by students and athletes). Cheon and Reeve (2013) explored the reasons for the increase of autonomy support in their study through qualitative teacher reports. All participants in their research emphasized the student benefits (e.g., more motivation and engagement) they observed and the improvements in their teacher–student relationships as the main underlying reasons for their change in behavior. It appears surprising that the percentage of significant effects was larger for observed and perceived than self-reported changes because people typically tend to overestimate their own characteristics or behavior (see Pedregon, Farley, Davis, Wood, & Clark, 2012). However, the studies in this review only included a small number of assessments for these outcome measures (i.e., eight effect sizes for observed, three for self-reported, and 12 for perceived autonomy support). Regardless, the findings highlight that PE teachers' and youth sport coaches' behavior can be modified and therefore provide additional support for the conclusions of previous researchers who have suggested that an autonomy-supportive style can be taught (e.g., Readdy & Raabe, 2016; Reeve, 1998). Thus, this study offers systematic empirical evidence that should encourage researchers and sport psychology professionals to develop and implement educational programs for PE teachers and youth sport coaches. Yet, as previously noted, only two studies included a follow-up assessment, and therefore, it is not possible to conclude whether improvements in behavior are due to changes in participants' beliefs and intentions (see Fishbein & Ajzen, 2010) and can be maintained long term or if they are attributed primarily to social desirability (Pedregon et al., 2012).

Students' and Athletes' Basic Psychological Need Satisfaction. The current results highlight positive intervention effects on students' and athletes' basic psychological need satisfaction. Although the effects were primarily small, this represents a meaningful finding; particularly, given the fact that these changes were found so shortly after the intervention was completed. This not only indicates that modifications in PE teachers' and youth sport coaches' interpersonal style likely had immediate effects but also highlights the possibility that such behavioral adjustments will continue to nurture students' and athletes' need fulfillment, as they maintain their participation in this more autonomy-supportive climate (see Adie, Duda, & Ntoumanis, 2012). Of course, it is impossible to assess the accuracy of such assumptions until more longitudinal studies are conducted.

Students' and Athletes' Motivation. Interventions had a positive impact on students' and athletes' motivation. Despite the small effect sizes, this is a noteworthy finding as scholars in many other topic-related systematic reviews have reported only a small number of studies in which significant intervention effects were found for motivation (e.g., Demetriou & Höner, 2012). Perlman (2015), whose research was conducted in PE, argued that “while student motivation is malleable, it is difficult to expect significant change from students who have developed their motivational profile during the previous 9–10 years of schooling” (pp. 127–128). Similarly, Jaakkola and Liukkonen (2006) suggested that not only the length of interventions but also the overall duration and frequency of PE lessons may not be sufficient to nurture intrinsic motivation. Nevertheless, the current results highlight that although there are other influential social (e.g., classmates, teammates) and contextual factors (e.g., time), PE teachers and youth sport coaches play a crucial role in determining students' and athletes' motivation.

Due to the purpose and search criteria of this review, the included studies primarily focused on enhancing PE teachers' and youth sport coaches' autonomy-supportive behavior as well as students' and athletes' need fulfillment. However, Bartholomew, Ntoumanis, and Thøgersen-Ntoumani (2009) suggested that authority figures typically also—willingly or unwillingly—engage in controlling motivational strategies that actively undermine athletes' motivation (i.e., need thwarting), and are conceptually different from autonomy support (see Costa, Ntoumanis, & Bartholomew, 2015). Thus, while some studies in this review assessed controlling behaviors (e.g., Cheon & Reeve, 2015), it is possible that because the included interventions primarily focused on the positive aspects (i.e., autonomy support and need fulfillment)—which were enhanced—they were unable to concurrently limit PE teachers' and youth sport coaches' use of negative strategies. It may be beneficial for researchers to consider both of these interpersonal styles simultaneously when designing future interventions to further increase the magnitude of their effect.

Cognitive, Affective, and Behavioral Outcomes. Interventions had a positive influence on a variety of cognitive, affective, and behavioral outcomes that were evaluated across the different studies (e.g., future intentions to engage in physical activity). These findings support the conclusions of previous researchers, who have demonstrated that autonomy support can contribute to optimal social functioning, well-being, and self-development (e.g., Cheval et al., 2017). In addition, the present results highlight that these benefits can be intentionally fostered through interventions with PE teachers and youth sport coaches.

Limitations in the Literature

A common problem in systematic reviews is the heterogeneous research designs across the included studies, which impact their resulting findings and, in turn, pose a challenge in reporting accurate conclusions (Murr, Raabe, & Höner, 2018). The current review was limited to studies that employed controlled trials, and effect sizes were calculated to compare findings. Yet, the individual studies still had meaningful differences in methodology (e.g., cluster randomized controlled trials vs. controlled trials) that limit the ability to comprehensively evaluate the effectiveness of interventions. As previously described, this heterogeneity was a main argument against the use of a meta-analysis in this study (Higgins & Green, 2008). A potential alternative that should be considered by future researchers is the use of an individual participant data meta-analysis (IPD-MA; Riley, Lambert, & Abo-Zaid, 2010). In contrast to traditional meta-analyses in which aggregate data from the reviewed studies (i.e., averaged or estimated findings as reported by the authors) are synthesized, raw individual level data (i.e., data for each participant from every study) are utilized for IPD-MA. Thus, IPD-MA allows more flexibility in adjusting for issues, such as heterogeneity, overlapping samples, measurement error, confounding variables, missing data, or publication bias (Depray et al., 2015; Riley et al., 2010). This methodological consideration highlights the benefits of open data (i.e., data that are publicly accessible to other researchers)—a requirement for IPD-MA—in the field of sport and exercise psychology (Tamminen & Poucher, 2018).

Although this systematic review was limited by the heterogeneity of the included studies, the individual interventions were predominantly found to be effective. However, although a meaningful number of studies have been conducted in the PE setting, there is a distinct lack of published autonomy support interventions with youth sport coaches. This limits the generalizability of findings in the athletic environment and highlights an important gap within the literature. There is a depth of research exploring the tenets of self-determination theory (Ryan & Deci, 2017) and their relationships as well as the benefits of autonomy support (e.g., Cheval et al., 2017). Yet, in particular in the athletic context, there seems to be a disconnect between *what is known* and *what is done* to enhance the practice of coaches, which can ultimately create a theory–practice gap (Cushion, Ford, & Williams, 2012). Based on the positive trend found in this systematic review, researchers should be encouraged to develop and evaluate additional interventions to foster autonomy-supportive interpersonal styles among youth sport coaches.

The methodological quality of the studies included in this review was moderate or high, which indicates a promising trend. It is not surprising that due to the use of randomization, the quality of cluster randomized controlled trials studies was higher than in controlled trials studies. However, this finding is particularly important, as a larger percentage of significant effect sizes was found when studies were of high quality and used cluster randomized controlled trials. This result might be counterintuitive, as it generally appears to be easier to obtain significant effect sizes in less controlled studies of lower methodological quality. Thus, the current review can hopefully encourage researchers to be more cognizant of their methodology when designing the intervention studies. In addition, only Cheon and Reeve (2013) and Cheon et al. (2016) examined the sustainability of intervention effects through follow-up assessment. Future researchers should evaluate the long-term impact of autonomy support interventions in PE and youth sport, which have been shown to be sustainable in other

settings (e.g., weight loss; Silva et al., 2011). Furthermore, the conclusions in this systematic review are based on studies that were primarily conducted with small numbers of PE teachers and youth sport coaches. Due to such small sample sizes, single persons who might have possessed an idiosyncratic interpersonal style could have had a strong influence on the results. This shortcoming makes the studies susceptible to being biased by outliers.

Conclusions

Overall, the current review of autonomy support interventions with PE teachers and youth sport coaches provides systematic evidence for their effectiveness in changing variables across the four categories of outcome measures. However, it also highlights a meaningful gap within the literature, as only three studies were found that were conducted in the youth sport setting. Combined with the heterogeneity in study designs, this limits the generalizability of conclusions and calls for future researchers to further develop and evaluate interventions. Nevertheless, the present findings should encourage researchers to invest in the education of these important social agents to enhance the interpersonal style of PE teachers and youth sport coaches. Such efforts can help to foster more self-determined motivation for physical activity among children and adolescents.

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