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Does a cooperative training design influence pre-service teachers' perceived quality of life?

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Purpose: One of the main challenges of teacher education is to prepare pre-service teachers (PSTs) to implement various instructional models that promote the quality of learning at school. Beyond individualistic efforts and competition, cooperative learning (CL) environments provide PSTs with opportunities to experience positive interpersonal relationships and support. However, both instructional content knowledge acquisition and motivation for serenely implementing learning environments later in classrooms depend on PSTs being trained to make links between theory, research, and practice. The purpose of this study is to explore the effects of CL instructional programs on PSTs' quality of life in light of their motivation and competencies for teaching in comparison with traditional direct instruction in the physical education (PE) setting.

Method: After a pre-test, 69 PE-PSTs were randomly assigned to one of the following three training conditions comprising a theoretical presentation of CL designs coupled with (a) a Learning Jigsaw experience (LJE), (b) a Teaching Jigsaw experience focused on instructional acts (TJE), and (c) a Direct Instruction experience (DI).

Results: Although integrating CL into the PE-PST training program positively influenced instructional content knowledge acquisition, unexpected results related to participants' motivation were obtained when the instructor made links between theory, research, and practice focusing on the teaching activity during Jigsaw training sessions.

Discussion: Recommendations for planning innovative conditions in PE-PSTs' training with respect to CL instruction and quality of life are discussed.

KEYWORDS

Jigsaw approach, direct instruction, novice teachers training, self-determination, instructional knowledge

1. Introduction

Students' quality of life at school partly depends on the opportunity to escape from a "dog-eat-dog world" where competition is the only means to succeed (Johnson et al., 2007). This requires that teacher training provides early content and instructional models focused on students' competencies to share a variety of experiences considered vital for productive members of society in the 21st century (e.g., Csanadi et al., 2020; Legrain et al., 2021). This challenge concerns pre-service teachers (PSTs) training and whether they can be taught to serenely implement fruitful learning environments at school under the supervision of an instructor (Reeve and Cheon, 2021). Among the wide array of instructional models, direct instruction is one of the most traditional training procedures used during training sessions involving an unambiguous presentation of the curriculum through demonstration, and guided and independent practice in activities directly related to the newly learned material (Jayantilal and O'Leary, 2016). As a consequence, PSTs mainly use the direct instruction model during teaching sessions and internship periods. Cooperative Learning (CL, Johnson et al., 1989) is also presented as a suitable environment fostering critical pedagogy to create an inclusive learning environment positively influencing the quality of life at school (Dyson et al., 2010). Nevertheless, in teacher training, content knowledge related to CL consists primarily of formal lectures and is often restricted to the presentation of the social cognitive bases of CL through its five main group work characteristics: (1) positive interdependence of goals, (2) face-to-face interaction, (3) individual accountability, (4) interpersonal and small group working skills, (5) group processing. Thus, despite its relevance for creating fruitful social conditions for learning (Deci et al., 1991), CL designs are rarely put into practice during PST practical training sessions, and obviously less implemented at school. Because novice teacher training needs to drop the assumption that the instruction of PSTs will only be based on what they have learned theoretically, narrowing the gap between theory, research and practice is still a challenge (Adamakis and Zounhia, 2015; Hemphill et al., 2015; Ward et al., 2021). With regard to the development of the professional experiences, giving PSTs the opportunity to experience CL configurations during their training would be the first option. However, this option does not ensure that the link between theoretical bases and pedagogical practices will be preserved in a reflection centered on instructional practices that take into account the students' well-being (Cornish and Jenkins, 2011). Furthermore, there is no guarantee that these peer teaching and peer analyzing conditions will help PSTs to have a quality instructional experience that will help them to manage the various social cognitive consequences of small group figurations serenely. The aim of the present study was to consider the characteristics of two CL training programs oriented through learning vs. teaching experience to test their potential effects on PSTs' professional competencies and motivation to teach a new physical activity in comparison to a DI training condition in the physical education (PE) setting.

2. Experiencing Jigsaw making theoretical and practical links

The Jigsaw procedure, one of the group-based instructional methods, is grounded in a peer-learning method designed to optimize the benefits of working groups. With reference to Aronson's historical account (Aronson and Patnoe, 2011), Jigsaw is a CL environment in which students are arranged in heterogeneous groups in terms of gender, race, and personal academic performance considerations to reach a common goal. First, the instructor divides up the material to be learned asking team members to endorse individual accountability and an engagement to learn one piece of the puzzle at a specific station (Expert Group). Then, expert group members are invited to return to their team to teach partners in Jigsaw groups the knowledge and skills they have learned and to prepare for a test on all of the material.

Jigsaw has become one of the classic peer-learning designs in education to such an extent that it has recently been introduced in university-based educator preparation programs. Nevertheless, Jigsaw does not always provide the expected positive learning outcomes, and empirical research that examined its effect on learning remains relatively scarce and debated (Stanczak et al., 2022). This statement stresses this importance of focusing on the teachers' competencies to implement CL in classrooms. Specifically, with regard to Jigsaw which elicits both cooperative, competitive, and individualistic goals (Roseth et al., 2019), little is known about the best arrangements to be made within the framework of training for equipping PSTs with strong pedagogical knowledge. In this respect, it could be expected that beginning teachers' training helps them to develop skills in gathering information about their own attitudes and teaching practices when experiencing Jigsaw. These instructional skills (i.e., observing students' tutoring behaviors when demonstrating the task and focusing students' attention on dominant characteristics of the movement, planning verbal instruction providing a rationale, asking questions rather than giving answers to problems, and distributing feedback specifically to some students or to the whole group to help them endorse their role) would be useful for coping with the social and cognitive characteristics of Jigsaw considering its constraints and levers to be activated (e.g., Crone and Portillo, 2013; Roseth et al., 2019; Legrain et al., 2021).

2.1. Social characteristics of Jigsaw

Given its main social psychology foundations, the Jigsaw configuration is considered to be an opportune way to foster social interdependence within learning groups. According to the social interdependence theory (Deutsch, 1949, 1985), the Jigsaw method is based on constructive social interactions built on the interdependence of positive means (sharing resources, tasks and

roles) and outcomes (sharing goals and rewards). In the first stage, students join a temporary expert group and are assigned the same subset of materials. This initial breakdown is designed to help each participant to develop life skills comprised in the future tutor role in heterogeneous groups. The success of this first stage depends not only on the individual effort made by each member to attain the personal goal of being a competent tutor but also on the rationale the instructor provides when presenting the task to elicit cooperation in line with the common goal (helping each other to gain tutor expertise). In the second stage, when returning to the Jigsaw group, it is expected that independent effort to acquire knowledge and skills will nurture the cooperative dynamic contributing to teammates' performance. The success of this second stage depends on the personal accountability each tutor invests in using pedagogical techniques discovered during the previous stage under the instructor's supervision and not considering that this jeopardizes the time he/she needs for personal progress (Johnson et al., 1989; Ortiz et al., 1996).

2.2. Cognitive characteristics of Jigsaw

Another theoretical perspective emphasized that PSTs would be confronted with pedagogical problems considered in terms of social cognitive conflict theory (Doise and Mugny, 1984). Given that social interactions among groups may be regulated in different ways, the task design is expected to provide opportunities for exchanges of viewpoints and controversial ideas, nurturing students' experience and development. Traditionally, the Jigsaw setting is built to engage students in epistemic processes (i.e., taking into account other viewpoints and providing further information necessary to tackle the problem). Nevertheless, it may also push students to defend personal competence while facing peer pressure and share disagreement with another individual viewpoint (Butera et al., 2011). These cognitive processes lead to the recognition that "simply distributing resources among jigsaw group members does not result in optimal outcomes" (Roseth et al., 2019, p. 149).

Because the quality of life in a teaching-learning setting is more than just a concept, implementing a fruitful interpersonal environment implies thoroughly preparing PSTs to cope with social cognitive Jigsaw characteristics making links between theory, research, and practice. For the instructor, this implies selecting and enacting common and specialized content knowledge (Ward et al., 2021) for creating congruence in instruction and learning that would improve not only PSTs' professional competencies, but also motivation to acquire new skills.

3. PSTs' motivation for improving teaching skills under CL conditions in physical education

Self-determined motivation theory-based interventions are a recent area of inquiry to examine whether teachers might demonstrate more instructional behaviors favoring student motivation (Aelterman et al., 2013; Perlman, 2015). However, according to Fletcher and Casey's (2014) conclusions, this line of research has more rarely taken into consideration PST and instructor relationships when the different types of knowledge required to teach the "hows" and "whys" of a model-based approach are considered in physical education (PE). Similar to other instructional approaches, the social psychological benefits of CL may partly depend on the perceived autonomy support provided by the instructor (Leroy et al., 2007; Deci and Ryan, 2008) that nurtures the PE-PSTs' basic psychological needs which in turn may influence the highest level of self-determined motivation for teaching (Ryan and Deci, 2000). Since novice teachers' quality of life could depend on the instructional climate, the influence of the instructor's choices for providing detailed content knowledge focused on teaching skills on the three basic needs (autonomy, competence, and relatedness) is of interest.

The need for autonomy refers to an individual's disposition to feel responsible for their own behavior (deCharms, 1968). For PE-PSTs, this need can be satisfied when the instructor explicitly provides a meaningful rationale for performing the instructional tasks, emphasizing choice rather than control, and acknowledging student teachers' feelings and perspectives (Lavigne et al., 2007). The need for competence is the individual's inclination to interact effectively with the environment. For PE-PSTs, this need could be satisfied when the instructional procedure gives them the opportunity to teach the contents focusing on instructional task management nurtured by personal and vicarious experiences (Bandura, 1997). The need for relatedness concerns the degree to which an individual feels accepted by others and connected with peers while working in a small group (Baumeister and Leary, 1995). For PE-PSTs, the satisfaction of this need may depend on the clarity of responsibilities related to the roles they endorse, generating epistemic conflict regulations in the expert group based on the validity of different answers (Butera et al., 2011). In the physical education (PE) setting, it is possible that satisfaction of the three needs could be strengthened by the positive resource interdependence (Johnson et al., 1989; Ortiz et al., 1996) generated by the instructor's guidance. Nevertheless, focusing on teaching practices, Ntoumanis (2001, p. 236) underlined that "*PE teachers are not well trained or do not feel comfortable to experiment with teaching styles which reduce their control over the class, and provide a great degree of student involvement*."

Since professional training brings up the recurring questions of novice teachers' autonomy-guidance needs to gain pedagogical knowledge and skills (Tessier et al., 2010; Reeve and Cheon, 2021), light needs to be shed on the specific question of the conditions required to integrate Jigsaw into the PE-PST training. Beyond the results of a range of studies underlining the inadequacy of PST training (Sacli and Demirhan, 2011; Ward et al., 2021), the development of PE training programs refers to whether the CL environment should be reshaped to explicitly emphasize instructional acts involved in Jigsaw implementation.

Considering that self-determination is a predictor of perceived quality of life, the conditions under which PE-PSTs are trained to build knowledge and skills during training sessions should impact their motivation depending on opportunities to become informed causal agents in their teaching activity (Wehmeyer and Little, 2009). Starting from this assumption, we examined the effects of three training programs—a theoretical presentation of CL designs coupled with (a) a learning Jigsaw experience (LJE), (b) a teaching Jigsaw experience (TJE), and (c) a direct instruction experience (DI)—on PE-PSTs' motivation and knowledge for instruction. From a motivational standpoint, provided with additional rationales focused on the instructors' pedagogical acts, it was expected that the TJE participants would express higher: (a) perceived autonomy support, (b) basic needs satisfaction for autonomy, competence and relatedness, and (c) intrinsic motivation to teach a new physical activity, in comparison to participants in LJE and DI conditions. From a pedagogical standpoint, both LJE and TJE participants were expected to express higher knowledge related to instruction than DI participants.

4. Materials and methods

4.1. Participants and design

Sixty-nine PSTs (46 males and 23 females, mean age = 21 years ±1.5) enrolled in the third year of training in the "Education and motor skills" specialization at the same university and volunteered to participate in the study. The experiment occurred during a training program comprising sports activities they had never done. French boxing was institutionally part of the PE curriculum in French secondary schools, and not taught in the first years of basic PST training. No expertise bias would occur with regard to the participants' novice level in this physical practice while they were asked to express their motivation for teaching. This sports practice was also chosen because it entails tutoring guidance involving many demonstrations and instructions in the early phases of the motor skill acquisition (e.g., Schmidt and Lee, 1999; Legrain et al., 2003). Participants were informed they would be filmed for the purpose of this experiment, but that confidentiality would be respected. Prior to the study, ethical permission was attained from the University Institutional Review Board, and all participants provided their informed consent.

4.2. Procedure

The procedure included in this order: (a) an 8-h presentation of the theoretical basis of group work learning conditions (i.e., cooperative learning, peer tutoring) and an illustration of French-boxing practice at school, (b) a pre-test, (c) three 2-h physical practice sessions in dyads (DI) or small groups (LJE and TJE), (d) a provision of instructional knowledge for TJE participants only, and (e) a post-test.

4.2.1. Presentation of the theoretical basis of group work learning conditions

During the first semester, a full Professor in the sports faculty presented to all participants the theoretical frameworks of cognitive and social-cognitive theories (Piaget, 1985; Vygotsky, 2012). During a 4-h presentation, he emphasized the foundation of peer-assisted learning strategies and the importance of taking care to train pupils to interact when integrating cooperative learning designs in PE lessons (Dyson and Casey, 2012). During the same semester, an Associate Professor expert in French boxing introduced a 4-h lecture centered on historical and technical standpoints of physical practice. The instructor presented in detail the various techniques (i.e., punching, foot kicks) and explained safe conditions for school practice for pupils (assault).

Then, participants were randomly assigned to one of the three conditions. In the LJE condition, 21 participants (14 males and 7 females) experienced the Jigsaw design. In the TJE condition, 28 participants (20 males and 8 females) were provided with instructional knowledge while experiencing the same Jigsaw configuration. In the DI condition, 20 participants (12 males and 8 females) only theoretically instructed about CL designs discovered the physical activity under direct instruction. Participants were ensured that they will not be subject to penalty for not taking part and were free to withdraw from the research at any time without giving a reason and without a prejudice.

4.2.2. Pre-test

At the beginning of the session, participants' skills in French boxing were pre-tested. Participants were paired in dyads to alternate the boxer and sparring-partner roles to be pre-tested in two basic French-boxing situations asking them to carry out 10 times in succession: (a) a combination of three straight punching actions maintaining the distance and protection, and (b) a combination of two actions of a foot-technique (fouetté) keeping balance and protection. The instructor both described and demonstrated each exercise twice, specifying the target placements for the sparring partner. Motor performance was scored by two raters both qualified physical education teachers and blind to the study purposes and experimental conditions. For the punching and kicking technique combinations, they used a 5-point scale ranging from perfect stable performance (5 points) to imperfect stable performance (1 point) to assess: (a) general balance; (b) distance for execution, (c) precision on targets, (d) execution speed, (e) power control, and (f) full recovery. The motor performance was calculated meaning the six assessed elements, respectively. Interrater reliability was calculated and is presented in the Results section.

The participants also completed two questionnaires assessing: (a) the psychological needs satisfaction (Gillet et al., 2008) relative to previous physical practice sessions under the supervision of

instructors, and (b) their motivation to teach a new physical activity at school (Tessier et al., 2010).

4.2.3. Physical practice sessions

Participants of the three conditions practiced physical activity over 3 weeks as follows. Whereas DI participants practiced the physical activity in dyads under the instructor's explanation and demonstration, LJE and TJE participants were split into four mixed-sex teams of four to seven members respecting the traditional group size concerns for cooperative learning (Johnson and Johnson, 2005). Following a Jigsaw procedure (Aronson and Patnoe, 2011), each team was asked to freely distribute the members over four specific fit-out stations in order to practice exercises they would have to teach to teammates later, according to the following instructions: "During the first period, you will practice a task in order to perform a movement with ease and be able to explain and model this movement to your team members. During the second period, you will come back to your team to instruct teammates, in turn, using relevant technical comments and incentives in order to help them to perform. When your group-mates come to instruct, you will also become a tutee."

Following the Legrain et al. (2019) procedure, JE participants received a one-hour period of training students in the Jigsaw cooperative learning environment. The instructor focused on: (a) the procedure for mixed group composition, (b) the most effective way of allocating roles and responsibilities in small groups, and (c) the specific timing necessary to ensure equity for individuals doing the instructional task. At the end of the expert-group session, LJE participants were asked to prepare autonomously their teaching intervention for 5 min before returning to their Jigsaw group. However, no precision was provided to emphasize how the instruction was embedded in this cooperative learning environment.

4.2.4. Instructional training within cooperative learning conditions

According to the structured Jigsaw condition, TJE participants received additional knowledge related to the instructional activity. Prior to the first session, PE-PSTs observed videos describing how the instructor took precautions to demonstrate and explain a task in expert groups. Focusing on the validity of different viewpoints, the instructor asked participants to comment on the video clips giving significance to several pedagogical choices when: (a) presenting a situation verbally (i.e., instructions relative to goals, operations, and environmental constraints), (b) demonstrating a movement (i.e., changing the placement into two demonstrations, breaking the movements down into elements), (c) observing learners' behaviors (i.e., examining the situation from a number of perspectives before deciding to break up the learners motor experience, questioning instead of giving advice in a directive way), and (d) regulating the situation (i.e., only selecting several learners or deciding to interrupt all the classroom to attract the attention on one important element to improve the motor realization). Prior to the second session, observing audio-video recording of teaching sequences recorded the year before with other groups, the participants had access to confidential feedback the instructor provided to tutors. For higher both individual accountability and perceived interdependence, the instructor asked the participants to identify the instructional abilities comprised in the tutor's role: (a) stressing the most important features when explaining and demonstrating the task, (b) attentively observing peers identifying the nature of specific characteristics of incorrect behavior (i.e., lack of attention, misinterpretation of an instruction, deficiency in the body-preparation, uncontrolled speed), and (c) advising peers to help them make progress (i.e., reminding them of the sparring partner's responsibility in clearly presenting targets to be touched). Finally, to favor epistemic conflict regulations during the period of transition expert-group and Jigsaw periods (5 min), participants were asked to share instructional knowledge relative to the selection, the implementation of contents taught, and the regulation of teammates' behaviors. These three distributed periods made a total of 2 h for the explicit instructional scaffolding session.

4.2.5. Post-test

Participants completed the Perceived Autonomy Support Scale for Sport Settings (Gillet et al., 2010). Furthermore, they completed again two questionnaires assessing: (a) the psychological needs satisfaction (Gillet et al., 2008), and (b) their motivation to teach new physical activities at school (Tessier et al., 2010). Finally, they were tested on knowledge for instruction referring to the precautions to be taken when demonstrating and presenting verbally a motor task in small groups. For this purpose, participants were asked to provide a written answer to the following PE context: "In a PE lesson for novice secondary school pupils, you will have to present a French-boxing situation comprising a combination of a middle straight foot-technique from the front leg and a low circular foot-technique from the rear leg." They were asked to precisely indicate the precautions they would take when demonstrating the movement and explaining the task to be learned.

4.3. Measures

4.3.1. Perceived autonomy support

The Gillet et al.'s (2010) questionnaire, adapted to the PE-PST training was used to assess perceptions of the autonomy support provided by the instructor (e.g., "I feel that my instructor provides me with choices, options, and opportunities regarding how to do this sports activity"). Answers to the 12 items given on a 7-point scale ranging from 1 (Strongly disagree) to 7 (Strongly agree) were summed to obtain the perceived autonomy support score. Internal validity was satisfactory ($\alpha = 0.87$), consistent with previous research that found this scale to have acceptable convergent validity, temporal stability, and internal consistency reliability ($\alpha = 0.91$; e.g., Gillet et al., 2010).

4.3.2. Psychological needs satisfaction

Needs Satisfaction was measured using the Basic Psychological Needs in Sport Scale (Gillet et al., 2008) adapted to the PE-PST training context, assessing the need satisfaction for competence (5 items, α = 0.93; e.g., "I often feel very competent"), autonomy (5 items, α = 0.74; e.g., "I have the opportunity to make decisions"), and relatedness (5 items, α = 0.85, e.g., "I have a lot of sympathy for the other learners"). Gillet et al. (2008) reported adequate factorial validity of the questionnaire as well as good internal consistencies for its subscales (α = 0.72; α = 0.80; and α = 0.83, respectively). Participants were asked to rate how true each of the statements was on a scale ranging from 1 (Not at all true) to 7 (Completely true). After controlling the internal consistencies for the three needs ($\alpha = 0.69$; $\alpha = 0.74$; and $\alpha = 0.91$, respectively), three scores were calculated by summing each item referring to competence, autonomy, and relatedness, respectively.

4.3.3. Intrinsic motivation

Participants completed the six items extracted from the Self-Determination of the Physical Education Motivation Scale (Tessier et al., 2010) that referred to the intrinsic aspect of the motivation to teach a new physical activity. Each item followed the stem "Why do you engage in this training session?" The participants had to provide responses with items reflecting intrinsic motivation to experience stimulation (e.g., for the excitement I feel when I am really involved in the activity"), toward knowledge (e.g., "for the pleasure it gives me to know more about this sport"), and accomplishment (e.g., "for the satisfaction I experience while I am perfecting my abilities"). The score was calculated by summing the participant's responses provided on a 7-point scale ranging from 1 (Never) to 7 (Always). Consistent with previous validation efforts (e.g., Boiché et al., 2008), this scale provided scores with acceptable reliability ($\alpha = 0.76$; $\alpha = 0.82$, respectively).

4.3.4. Knowledge for instruction

The participants' responses were analyzed using a grid comprising a 10-point scale for demonstration (i.e., changing the orientation to help each pupil to observe the demonstration from different angles, using several demonstrations at different rates beginning by breaking down the technique into separate sub-skills finishing with a real execution), and explanation (i.e., indicating the goal with respect to open skills, stressing the displacement between the two techniques to stay at an appropriate distance). This measure was assessed, meaning the ratings of the two independent judges involved in the pre-test motor performance assessment who drafted the grid.

5. Results

5.1. Preliminary analyses

The results of the Kolmogorov–Smirnov test indicated that for each dependent variable the data follow a normal distribution (p-value >0.05). A one-way ANOVA was computed to assess whether the three groups did not differ as regards the criteria used to select the participants. No significant differences between the three groups were found on scores at the motor pre-test, $F(2, 66) = 0.18$, $p = 0.83$. Interrater reliability analyses yielded satisfactory results and good intra-class correlation coefficients for punching and kicking techniques ($r = 0.79$, 0.75, respectively).

5.2. Main analyses

To examine the difference between the three training conditions on the perceived autonomy support and the knowledge for instruction, one-way ANOVAs were computed on these two variables (see Table 1). Furthermore, although no significant difference between the three conditions was found in the pre-test on basic needs satisfaction ($p = 0.17$) and intrinsic motivation ($p = 0.90$), repeated-measures multivariate analyses of variance (RM-MANOVAs) were computed on these variables to examine the variation of participants' scores (see Table 2). Effect sizes (d) were also calculated using polled standard deviations (Hedges and Olkin, 1985).

5.2.1. Perceived autonomy support

The one-way ANOVA computed at post-test indicated a significant difference between the three training conditions, $F(2, 66) = 6.42$, $p < 0.01$, $d = 0.16$. Results showed that LJE participants scored higher than TJE ($p < 0.001$), and DI ($p < 0.01$) participants.

5.2.2. Psychological needs satisfaction

The results of the RM-ANOVAS revealed a significant training condition X time effect only for satisfaction of the autonomy need, $F(2, 66) = 5.60$, $p < 0.01$, $d = 0.15$, The LJE participants' score improved between pre and post-test in comparison to TJE and the DI participants. No training condition X time interaction effect was observed on the two other basic needs satisfaction: relatedness, $F(2, 66) = 1.13$, $p = 0.33$, and competence, $F(2, 66) = 0.58$, $p = 0.56$.

5.2.3. Intrinsic motivation

The results of the RM-ANOVA revealed a training condition X time interaction effect, $F(2, 66) = 8.28$, $p < 0.001$, $d = 0.20$, showing that LJE and TJE participants' motivation score increased from pre-test to post-test ($p = 0.001$), whereas it remained stable over time for DI participants ($p = 0.64$). Further post-hoc analyses indicated that LJE and TJE participants scored significantly higher at the post-test than DI participants ($p < 0.001$; $p < 0.05$, respectively). No difference was observed between LJE and TJE training conditions ($p = 0.14$).

5.2.4. Knowledge for instruction

The one-way ANOVA computed on knowledge for instruction indicated a difference between the three training conditions, $F(2, 66) = 9.45$, $p < 0.001$, $d = 0.22$. The results showed that both LJE and

TABLE 1 Means (and standard deviations) for perceived autonomy support, and knowledge for instruction by training type conditions (N=69).

	Teaching Jigsaw experience (TJE; n=28)	Learning Jigsaw experience (LJE; n=21)	Direct instruction (DI; n=20)
	M (SD)	M (SD)	M (SD)
Perceived autonomy support**	61.87 (10.47)	71.24 (6.12)	63.55 (10.55)
Knowledge for instruction***	6.46 (2.09)	6.57 (2.09)	4.25 (1.58)

*p < 0.05; **p < 0.01; ***p < 0.001.

TABLE 2 Means (and standard deviations) for psychological needs satisfaction, and intrinsic motivation, by training type conditions and time (N=69).

	Teaching Jigsaw experience (TJE; n=28)		Learning Jigsaw experience (LJE; n=21)		Direct instruction (DI; n=20)	
	T1	T2	T1	T2	T1	T2
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Psychological needs satisfaction for						
Autonomy**	23.89 (4.24)	21.61 (5.37)	25.71 (2.88)	27.00 (4.55)	25.50 (4.49)	21.90 (5.49)
Competence	23.96 (3.16)	24.36 (4.07)	22.71 (3.68)	24.14 (4.80)	23.10 (4.49)	23.00 (6.18)
Relatedness	28.75 (2.43)	31.11 (2.57)	29.52 (2.54)	31.00 (4.15)	30.25 (2.59)	31.15 (3.31)
Self-determined motivation***	32.43 (4.35)	35.07 (3.84)	32.09 (4.66)	37.14 (3.72)	32.75 (5.00)	32.30 (7.01)

*p < 0.05; **p < 0.01; ***p < 0.001.

TJE participants expressed higher detailed knowledge than DI participants when presenting the instructional precautions needed for instructing a movement. No difference was observed between the LJE and TJE conditions (p = 0.85).

5.3. Correlations

Consistent with the SDT theory, the results of post-test correlation analysis revealed positive correlations between participants' perceptions of autonomy support and satisfaction of autonomy (r = 0.62, p = 0.001), competence (r = 0.26, p = 0.03), and relatedness (r = 0.35, p = 0.003) needs. Additionally, the three needs were positively correlated to the intrinsic motivation (r = 0.34, p = 0.004; r = 0.26, p = 0.03; r = 0.32, p = 0.008, respectively). Nevertheless, no significant correlation was found between intrinsic motivation and knowledge for instruction (r = 0.17, p = 0.16).

6. Discussion

Evaluating whether PSTs will contribute toward nurturing the quality of life of students at school within a more inclusive society through education requires an active interest in teacher training. Beyond the objective of connecting various models in a school curriculum, helping novice teachers to address the complexity of the cooperative learning (CL) model remains a major instructional challenge to motivate them to effectively implement CL later in real classrooms (Dyson et al., 2010). The purpose of the present study was to examine whether PSTs' training would impact their perceived quality of life through instructional knowledge and motivation to teach a new physical activity. The results confirm previous studies showing that integrating a CL training condition within the professional socialization stage (Lawson, 1986) required mastery of requisite knowledge when discovering new content involved in a future teaching function (Roseth et al., 2019; Legrain et al., 2021).

On the instructional knowledge, the results confirmed that just providing theoretical information on innovative pedagogical designs in a lecture is insufficient to encourage novice teachers to diversify their teaching practice. Although the effect size on PE-PSTs' knowledge for instruction is small, this result is interesting with regard to the level of expertise novice teachers need to build new motor tasks preserving clear instructions for safe learning conditions. Nevertheless, the results also emphasized that by massaging various information, the TJE condition did not help the participants to score higher compared to the LJE condition. We acknowledge that the structured training TJE condition led to exposing the PE-PSTs to three novelties (physical activity, instructional design, and teaching knowledge). In accordance with the Legrain et al. (2019) conclusion, it can be advanced that participants were probably more concerned about acquiring enough responses to then teach the motor

technique to their team than sharing knowledge in a positive interdependent way during the expert phase. Consequently, such a structured CL training condition needs to be reconsidered in order to better nurture a professional dialog based on epistemic conflict regulations expected in the transition of the two phases of the Jigsaw configuration under the provision of instructional alternatives.

From a motivational standpoint, we also examined whether a structured Jigsaw instructional condition would be more relevant to motivate PE-PSTs to teach a new physical activity than experiencing the Jigsaw environment with a focus on group organization. This second assumption was supported by empirical studies based both on resource interdependence (Johnson et al., 1989) and epistemic conflict regulations (Butera et al., 2011) specifically generated when the instructor gave a rationale emphasizing the instructional skills comprised in the tutor's role. Partly consistent with previous research in education conducted on the basis of the self-determined theory (e.g., Ryan and Deci, 2000; Deci and Ryan, 2002; Reeve and Cheon, 2021), the results are not in agreement with this last assumption. On the contrary, the participants who experienced the Jigsaw procedure without being focused on the instructional activity perceived that the instructor gave them more opportunities to lead their next teaching activity autonomously when returning to their team. Thus, they probably felt freer (Lavigne et al., 2007) in deciding whether they would help teammates to develop new skills under their instruction. Contrary to our hypothesis, the structured Jigsaw training condition partly dedicated to attracting the attention of PSTs to instructional acts did not help novice teachers to perceive the instructor as more autonomy supportive. Given that choice-making opportunities are part of the quality of life perceptions, it could even be argued that TJE participants perceived the instructional precautions modeled by this instructor as promoting control rather than autonomy. This result suggests that it would be useful to examine in greater depth whether the instruction would have thwarted TJE participants' psychological needs (Reeve and Cheon, 2021). Although the instruction design was built to foster PE-PSTs' participation, it also probably stressed the difference in expertise between the instructor and the participants rather than masking it, thus attenuating the expected vicarious effect of the training experience (Bandura, 1997). In fact, as beginners in physical practice, PE-PSTs viewed the pedagogical procedures used by the instructor more as models to reproduce rather than options to consider. Whether or not this difference remained at a motor skill level in the Jigsaw and direct instruction conditions, it might be suggested that the TJE condition explicitly highlighted this difference also in instructional skills by increasing dependence on the instructor. Finally, although LJE and TJE participants were better than DI participants at providing detailed precautions for instruction and expressed a higher level of intrinsic motivation, these two variables were not related. These separate benefits are questionable with regard to the quality of life provided by the instructional context.

There were several limitations to our study. First, the small sample size means that caution needs to be exercised in drawing conclusions. Additional research may be warranted with a larger sample size. A second limitation concerns the lack of peer modeling conditions that could have served as reminders of the instructional procedure for various movements. Future research could examine whether giving participants the opportunity to lead an observation on a peer model would nurture a relevant second training phase introducing peer-questioning based on epistemic conflicts (Butera et al., 2011). Third, a longer formal period would be required to study the effects of the instructional program from a longitudinal perspective (Roseth et al., 2019). The fourth limitation is related to the lack of analysis of instructional strategies used by novice teachers during Jigsaw instruction. According to recent recommendations with respect both to self-determination (Vansteenkiste et al., 2020) and epistemic conflict regulation (Csanadi et al., 2020) theories, relevant qualitative data should be added in order to examine the finer details of whether PE-PSTs perceived their behavior as self-directed.

7. Conclusion

Teachers' perceptions of quality of life are the result of a dynamic and evolving process that begins in their initial training. Further research is needed to highlight PE-PSTs' knowledge acquisition from peers at this stage of their career (Ward et al., 2021), especially when the training concerns the future implementation of CL designs at school. From a teacher's professional development point of view, the results of this study confirm that the PE-PST's quality of life depends on well-structured training in CL. Nevertheless, they also question the institutional conditions under which the instructors are frequently asked to seek to do better in less time. In particular, this suggests progressively planning the instruction through different stages, taking into consideration that spontaneously experiencing the Jigsaw design would be the best choice in an initial training period. While the instructional rationale was relevant for involving the participants in the teaching role, the distribution of information related to pedagogical precautions would be given at appropriate times to help them perceive the instructional climate as autonomy supportive. In the present case, it would have been more appropriate to help PE-PSTs feel personally accountable for their teaching as a first instance, rather than prematurely providing justifications for instructional choices perceived as work pressures that damage autonomy support (Leroy et al., 2007). This may explain why motivational and instructional benefits do not coexist in this study. Mixed methods, collecting qualitative data to assess whether PSTs are collaboratively involved in the training sessions would be useful for better access to the expected supportive climate based on fruitful conflict regulations (Perlman, 2015). These new recommendations need to be taken into consideration in future research to better illuminate the conditions under which CL training could be tailored, step by step, to favor both PE-PSTs' professional competencies and motivational needs which could contribute additionally to teachers' and students' well-being.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by University Institutional Review Board. The patients/participants provided their written informed consent to participate in this study.

Author contributions

JL and SS-L contributed to the conception and design of the study. GE wrote sections of the manuscript and contributed to the final version of the submitted manuscript. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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