Promoting schoolchildren's self-esteem in physical education: Testing the effectiveness of a five-month teacher training

Postprint

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Abstract

Background: Schoolchildren's personality development is considered a central goal of physical education (PE) globally (Bailey, 2006). With regard to the close relationship between psychological well-being and global self-esteem over the life course (Trzesniewski et al., 2006), the promotion of positive self-esteem is an issue of particular significance. According to the "exercise and self-esteem model" (EXSEM; Sonstroem & Morgan, 1989; Sonstroem, Harlow, & Josephs, 1994), enhanced perceived sports competence leads to positive self-esteem development. Past research revealed that PE taught with an individualized teacher frame of reference (iTFR; Lüdtke et al., 2005) and a reflexive teaching style is associated with positive effects on different facets of children's perceived sports competence (Schmidt, Valkanover, Roebers, & Conzelmann, 2013). However, it remains an open question whether this teaching style has the potential to promote positive self-esteem development.

Purpose: The present study investigated whether a five-month teacher training, aimed to enhance the teachers' iTFR and their reflexive teaching style in PE, has a positive effect on students' perceived sports competence and their global self-esteem. To analyse the implementation quality, changes in students' perceived iTFR and perceived reflexive teaching style were investigated.

Method: A total of 21 teachers were assigned to either an intervention group (n = 13), receiving the five-month teacher training, or a control group (n = 8) consisting of regular teaching without teacher training. The teacher training encompassed five three-hour consecutive sessions (15 hours in total) during which the teachers acquired theoretical and practical knowledge about the promotion of competence perceptions in PE with a reflexive teaching style and an iTFR. Between the sessions, the teachers were instructed to implement an iTFR and a reflexive teaching style into their own PE classes. To evaluate the effects of the teacher training, their students' (N = 315, 53.7% girls, M_{age} = 13.2 y, SD_{age} = 1.3 y) perceived teaching style (iTFR and reflexive teaching), perceived sports competence and global self-

esteem were measured with paper-pencil questionnaires at three measurement points (pre, post and follow-up).

Findings: Linear mixed effect models showed that students of the intervention group reported an increase in their teachers' reflexive teaching style, but there were no changes with regard to iTFR. With regard to students' perceived sports competence and global self-esteem, there were significant interaction effects between time and group over a period of eight months (from pre-test to follow-up), indicating positive effects on these self-concept dimensions due to the teacher training.

Conclusion: In summary, the present study indicates that a long-term teacher training (5 months) supports PE teachers to implement specific teaching styles with the aim to promote students' self-concept development. Furthermore, the findings lead to the assumption that a more pronounced iTFR in combination with an enhanced reflexive teaching style has the potential to positively influence schoolchildren's perceived sports competence and global self-esteem over a long-term period. The findings of the present study are valuable for PE teachers and for people working in the field of teacher education.

Keywords: self-worth, physical self-concept, individual teacher frame of reference, self-reflexion, teacher education

Introduction

Global self-esteem, defined as overall feelings of self-worth (Harter, 2012), is consistently viewed as an important personality characteristic being closely linked to well-being throughout the life course (Trzesniewski et al., 2006). Individuals with high levels of global self-esteem are generally more satisfied with their lives (Moksnes & Espnes, 2013; Sowislo & Orth, 2013). Conversely, low global self-esteem is associated with various negative outcomes, such as increased substance abuse (Fisher, Zapolski, Sheehan, & Barnes-Najor, 2017) and delinquent behaviour (Farrington, Gaffney, & Ttofi, 2017). In view of empirical studies indicating a decline in self-esteem from childhood through adolescence (Robins & Trzesniewski, 2005; Schaffhauser, Allemand, & Schwarz, 2017), the development of positive global self-esteem in adolescence is regarded as a crucial developmental task and an important aim of PE (Bailey, 2006).

The general assumption that physical activity enhances children's self-esteem is well recognised, with meta-analyses revealing a weak to moderate relationship (e.g. Ahn & Fedewa, 2011; Ekeland, Heian, & Hagen, 2005; Liu et al., 2015). However, based on the theory of a hierarchical structured self-concept (Shavelson et al., 1976), and according to the "exercise and self-esteem model" EXSEM (Sonstroem & Morgan, 1989; Sonstroem et al., 1994), physical activity does not affect global self-esteem directly, but indirectly mediated by perceived sports competence, encompassing competence perceptions in sports and games (Estevan & Barnett, 2018). The EXSEM describes the mechanism as a bottom-up process by which physical activity initially promotes physical self-efficacy, thus leading to an increase in perceived sports competence, and ultimately influencing global self-esteem. The mediational role of perceived sports competence has been reported for children (Slutzky & Simpkins, 2009), adolescents (Wagnsson, Lindwall, & Gustafsson, 2014) and adults (Fox, 2000; Levy & Ebbeck, 2005). Considering this, the specific promotion of perceived sports competence is considered an important factor in terms of self-esteem promotion in PE (Harter, 2012).

Specific teaching styles are supposed to enhance schoolchildren's sense of competence (Edmunds, Ntoumanis, & Duda, 2008). According to Sedikides and Skowronski (1995), people derive knowledge about themselves from self-reflection, social comparison and reflected appraisal. Self-reflection means that individuals draw inferences about themselves by observing their own behaviour and abilities (Sedikides & Skowronski, 1995). With a reflexive teaching style, including methods such as documenting performance, asking questions that encourage self-reflections and providing opportunities for self-observation, the integration of individual competence perceptions into one's self-concept can be fostered (Magnaguagno et al., 2016; Schmidt et al., 2013). To evaluate one's abilities, individuals are assumed to compare their own ability with that of significant others (e.g. classmates) and use this social reference as a baseline for their self-evaluations (Sedikides & Skowronski, 1995). If students in PE compare their sports competence to that of more able students, a "negative social comparison effect" occurs (Chanal, Marsh, Sarrazin, & Bois, 2005; Margas, Fontayne, & Brunel, 2006). An individualized teacher frame of reference (iTFR; Lüdtke et al., 2005) is believed to counteract such "negative social comparison effects" and enhance students' self-perceptions (Lüdtke et al., 2005). Teachers with an iTFR prefer an individual instead of a social reference standard to evaluate students' performances (Rheinberg, 1980). Hence, teachers with an iTFR give positive feedback if students display intraindividual improvements, even if the students are underperforming (Lüdtke & Köller, 2002; Lüdtke et al., 2005). Hence, it is believed that an iTFR is linked to reflected appraisal (Sedikides & Skowronski, 1995), especially for underperforming students. It is therefore hypothesized that a reflexive teaching style and an iTFR trigger the three primary sources of self-knowledge; self-reflection, social comparison and reflected appraisal (Sedikides & Skowronski, 1995). This subsequently results in perceptions of competence and the fostering of positive global self-esteem.

Two short-term interventions studies had already shown that PE taught with a reflexive teaching style and an iTFR promotes specific self-concept dimensions. Schmidt et al. (2013) investigated the effect of a 10-week PE-intervention on fifth-graders' self-concept. Teachers completed a half-day training programme instructing them in the basic principles, aims and purposes of the intervention programme and demonstrating the specific contents with teaching materials. Afterwards, the teachers were allocated to carry out both an endurance and a strength training programme in PE taught with a reflexive teaching style and an iTFR. After 10 weeks, this specific intervention led to beneficial effects on self-concept of endurance and strength, whereas normal PE lessons (without intervention) had no effect (Schmidt et al., 2013). Whereas Schmidt et al. (2013) investigated effects on two facets of the self-concept, endurance and strength, Oswald, Schmidt, Valkanover and Conzelmann (2013) investigated the effect of such a kind of PE on perceived sports competence. Students who received this specific kind of PE over a period of 20 weeks displayed a more positive development of perceived sports competence compared to a control group (Oswald, Schmidt, Valkanover, & Conzelmann, 2013). The authors of both studies explained the absence of an effect on more global facets of the self-concept by referring to the relatively short intervention period. Based on the assumption that changes in global self-esteem are caused by previous changes in specific dimensions or facets (Harter, 2012; Shavelson et al., 1976), it has been argued that changes in global self-esteem need a number of competence perceptions on lower self-concept levels (e.g. perceived sports competence), which is likely to take longer than 10 weeks to achieve (O'Mara, Marsh, Craven, & Debus, 2006; Reddon, Meyre, & Cairney, 2017). In sum, there is evidence for the positive effects of iTFR and reflexive teaching style in PE on specific facets of the physical self-concept (e.g. sports competence, endurance, strength), but it is not clear whether such a kind of PE also enhances global self-esteem over a long-term period.

Teacher trainings are considered an effective tool to sustainably support an iTFR and reflexive teaching style, however, the nature and quality of teacher trainings in PE received only limited attention in past research. According to Kyriakides, Creemers and Antoniou (2009), teaching behaviour and the quality of teaching is closely linked to student outcomes. Therefore, it is assumed that teachers need to implement an iTFR and a reflexive teaching style of high quality to achieve the intended effects on students' self-esteem. Teacher trainings help teachers acquire specific knowledge, ideas and methodological skills (Kealey, Peterson, Gaul, & Dinh, 2000). Magnaguagno et al. (2016) showed the importance of teacher trainings with regard to implementation quality of a reflexive teaching style. Teachers who received didactic materials and additional coaching during a 13-week PE-based intervention outperformed teachers who received only didactic materials. Although there is no specific literature about teacher trainings to promote an iTFR, the systematic review by Lander et al. (2017) focusing on characteristics of teacher trainings in school-based PE to improve fundamental movement skills and physical activity provides additional insights into relevant aspects of effective teacher trainings. According to Lander et al. (2017), teacher trainings are effective if the training programmes: (1) last more than one day, (2) are framed by a theory or model, (3) provide comprehensive subject and pedagogy content, (4) provide follow-up or ongoing support to the teachers, and (5) consider teacher satisfaction and fidelity. Thus, long-term teacher trainings, which consider these aspects, are believed to sustainably improve teacher's reflexive teaching style and iTFR in PE. This should promote individual competence perceptions what in turn might enhance students' global self-esteem.

The aim of the present study was to investigate long-term effects of a teacher training designed to promote an iTFR and reflexive teaching style in PE on primary schoolchildren's global self-esteem. Therefore, a longitudinal quasi-experimental study was conducted, with teachers in the intervention group participating in a five-month teacher training, and teachers in the control group receiving no training. Specifically, it is assumed that students from

teachers in the intervention group report an increase in iTFR and reflexive teaching style of their teacher. Consequently, the students in the intervention group are believed to display a more pronounced development of perceived sports competence and global self-esteem compared to the students in the control group.

Method

Participants

A total of 315 students and 21 PE teachers from 21 Swiss PE classes participated in this study. The teachers of the intervention group registered voluntarily to participate in the publicly announced teacher training. The announcement was made over the website of the Bernese University of Teacher Education. In addition, leaflets were handed out to increase the teachers' awareness of the training. The control group was acquired by contacting randomly selected PE teachers of fifth to ninth graders. The teacher sample consisted of 21 individuals (M_{age} = 37.6 y, SD_{age} = 10.8 y), with a higher proportion of women (57%) than men. This approximately matches the unequal gender distribution in primary and secondary school teachers in Switzerland. Their professional experience ranged from 0.5 to 28 years with a mean of M = 9.7 years (SD = 8.0). Thirteen teachers participated in the intervention group and eight teachers in the control group. The two groups did not differ with regard to sex (χ^2 = 0.27, df = 1, p = .604, Cramer's V = .11), age ($t(19)$ = -0.70, p = .494, d = 0.31) and professional experience ($t(19)$ = -0.49, p = .628, d = 0.22). With regard to the sample of students (N = 315, 53.7% girls, M_{age} = 13.2 y, SD_{age} = 1.3 y), 200 individuals were part of the intervention group (62% girls, M_{age} = 13.2y, SD_{age} = 1.1 y) and 115 of the control group (40% girls, M_{age} = 13.3 y, SD_{age} = 1.5 y). The two groups did not differ in terms of their age ($t(195.53)$ = 0.57, p = .570, d = 0.07) but with regard to gender (χ^2 = 13.57, df = 1, p < .001, Cramer's V = .21).

Measures

Reflexive Teaching Style. The students' perceived teachers' reflexive teaching style was analysed using a scale developed by Magnaguagno et al. (2016). In a sample of early adolescents (M_{age} = 10.92 y, SD_{age} = 0.64 y), Cronbachs alpha was .73, indicating acceptable reliability (Magnaguagno et al., 2016). The scale consists of four items with one example of an item being: "*In physical education we are encouraged to think about our behaviour*". All items were rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). High scores on this scale indicate that the students perceive pronounced reflexive teaching style in PE. The analysis of internal consistency revealed Cronbach's alpha of .69 for pre-test, .70 for post-test and .77 for follow-up-test in the present sample.

Individualized Teacher Frame of Reference (iTFR). In order to check whether students from the teachers in the intervention group reported an increase in iTFR compared to controls, the students' perceived iTFR was measured with the scale from Lüdtke et al. (2005). Previous studies using this scale in a sample of adolescents reported a Cronbach's alpha above .70, indicating acceptable psychometric properties (see Lüdke at al., 2005; Oswald et al., 2013; Schmidt et al., 2013). The scale consists of four items with one example of an item being: "*If a student improves his/her achievement, the teacher praises him/her, even if he/she is below class average*". Students responded to each item on a scale ranging from 1 (strongly disagree) to 4 (strongly agree). High scores on this scale indicate that the teacher was perceived to have a pronounced iTFR. At pre-test, Cronbach's alpha was .84, at post-test .87 and at follow-up-test .89.

Perceived Sports Competence. To measure perceived sports competence, a subscale from the German version (Braun, Martin, Alfermann, & Michel, 2018) of the short version of the Physical Self Description Questionnaire (PSDQ-S; Marsh, Martin, & Jackson, 2010) was used. Evidence of the reliability and validity of the PSDQ-S in a sample of early adolescents has been shown by Brown and Bonsaksen (2019). The subscale for perceived sports

competence consists of three positively worded items with one example of an item being: "*I am good at most sports*". All items were rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree), since Freund, Tietjens, and Strauss (2013) have demonstrated better psychometric properties for the four response categories format in children and adolescents. High scores on this scale indicate that the students perceive themselves as competent in PE and sports. The analysis of internal consistency indicated a Cronbach's alpha of .81 at pre-test, of .76 at post-test and of .81 at follow-up-test in the present sample.

Global Self-Esteem. Global self-esteem was measured with the corresponding subscale from the German version of the PSDQ-S (Braun et al., 2018). Out of the five items, two items are negatively worded, with one example of a positive item being: "*Most things I do, I do well*". All items were rated on a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). High scores on this scale indicate that the students have a positive sense of overall self-worth. The analysis of internal consistency with regard to the present sample indicated Cronbach's alpha of .74 at pre-test, .75 at post-test and .77 at follow-up-test.

Procedure

The study was carried out in cooperation with schools from the German speaking part of Switzerland. After receiving the permission of the participating school principals, the teachers were contacted for study enrolment. The legal guardians of all participants have signed an informed consent form approved by the Institutional Review Board. The researchers emphasised to the students that completing the questionnaire was voluntary, that they could discontinue at any time without any reason, and that all data would be treated confidentially. All students underwent the initial measurement and completed the questionnaires. Next, the teachers in the intervention group completed a five-month training designed for the development of practical teaching skills in individualized and reflexive teaching style. The participating teachers were instructed to implement an iTFR and a reflexive teaching style

into their own PE classes. The PE-teachers in the control group did not attend the training and were not instructed to adopt an iTFR and a reflexive teaching style. After finishing the training programme, all participants completed the questionnaires again and after three months, the measurement procedure was repeated again.

Teacher Training (Intervention)

The teacher training consisted of five three-hour consecutive sessions (15 hours in total), which took place over a period of five months (see table 1). In the first two sessions, the teachers acquired theoretical and empirical knowledge about the structure, the sources and the development of self-esteem, and how it can be promoted with a reflexive teaching style and an iTFR. The next three sessions focused on the application of an individualized and reflexive teaching style and the implementation in the participant's PE classes. Every session included interactive and practical sequences where the teachers analysed case studies, discussed their own experiences and applied the theory into practice[1]. Between the sessions over the period of five months, the teachers were instructed to implement an iTFR and a reflexive teaching style into their own PE classes.

[Insert Table 1 here]

Statistical analyses

All statistical analyses were completed using the software R (R Core Team, 2016). There was some loss of data because of incomplete questionnaires. However, the percentage of missing values did not exceed 2.9%, and the MCAR-Test (Little & Rubin, 2002) revealed that the missing values were missing completely at random (χ^2 = 327.14, *df* = 306, *p* = .194). Therefore, the full sample (*N* = 315) was retained for all procedures. Initially, variables were screened for violations of statistical assumptions (e.g., normality, linearity). Because the data did not satisfy the assumption of normality and violating this assumption has undesirable effects on parameter estimates, their associated standard errors, confidence intervals and *p*-

[1] Lesson plans and materials used in the teacher training can be obtained from the corresponding author.

values (Field & Wilcox, 2017), robust statistical methods were used. Yuen's (1974) robust *t*-tests using the yuenbt() function from the package "WRS2" (Mair & Wilcox, 2018) were conducted to compare differences between intervention and control group at baseline (20% trim and 2000 bootstrap iterations).

The hypotheses were tested with robust mixed effects modelling using the rlmer() function from the package "robustlmm" (Koller, 2016). Primary outcomes were assessed for the impact of group (control vs. intervention), time (baseline vs. post-test and baseline vs. follow-up) and their interaction. Additionally, gender (female vs. male) was included as a fixed effect, because the distribution of gender differed between control (40% girls) and intervention group (62% girls). The intercepts are allowed to vary by participants (random intercept model) and the clustered nature of the data (ICC values of 0.00 to 0.09) is taken into account by specifying the students as nested in classes. In robust linear mixed models, there is no *p*-value given (Koller, 2016). Therefore, instead of *p*-values, 95% Wald confidence intervals for the beta-coefficients was computed. Cohen's (1988) *d* according to the formula by Westfall, Kenny and Judd (2014) were used to determine effect sizes (Cohen's d = 0.20, 0.50, 0.80).

Results

Preliminary Analyses

Table 2 shows descriptive statistics and the results of the preliminary analyses. Skewness values of -1.06 to 0.27 and kurtosis values of -0.63 to 2.19 revealed weak to high deviations from a normal distribution (Blanca, Arnau, López-Montiel, & Bendayan, 2013). Independent robust *t*-tests showed that the intervention and the control group differed at baseline in terms of iTFR (M = -0.35, $p < 0.001$, d = 0.35) with higher means in the intervention group. There were no significant differences regarding the other dependent variables.

[Insert Table 2 here]

Primary Analyses

Effects on reflexive teaching style and iTFR

Whether teachers in the intervention group implemented an iTFR and a reflexive teaching style in PE was tested by mixed effects models in which the students' perception of the iTFR and reflexive teaching style were treated as dependent variables. With regard to reflexive teaching style, there was a significant negative linear effect of time (β = -0.12, 95% CI [-0.23, -0.01], *d* = 0.18) from baseline to post-test, suggesting a decline of perceived reflexive teaching style in the whole sample over the period of five months. There were no differences of means between the intervention and control group (β = 0.10, 95% CI [-0.06, 0.27], *d* = 0.15) but there was a significant interaction effect between time and group (β = 0.18, 95% CI [0.03, 0.32], *d* = 0.26) from pre- to post-test. Figure 1 shows that teachers in the intervention group increased reflexive teaching style, whereas the control group decreased during the teacher training and three months beyond the end of the training. From baseline to follow-up there was still a significant negative effect of time (β = -0.15, 95% CI [-0.23, -0.01], *d* = 0.23). Again, there were no differences between the groups (β = 0.11, 95% CI [-0.06, 0.27], *d* = 0.16), but a significant interaction effect between time and group (β = 0.26, 95% CI [0.11, 0.41], *d* = 0.40), indicating that the positive effect of the training on perceived reflexive teaching style persisted over time.

In terms of perceived iTFR, there was no effect of time (β = -0.02, 95% CI [-0.12, 0.08], *d* = 0.03) but significant moderate effects of group (β = 0.22, 95% CI [0.07, 0.37], *d* = 0.36), indicating higher perceptions of iTFR in favour of the intervention group (see figure 2). Furthermore, there was no significant interaction between time and group (β = -0.01, 95% CI [-0.21, 0.05], *d* = 0.13). A similar pattern revealed the results from pre-test to follow-up with regard to the effect of time (β = -0.08, 95% CI [-0.19, 0.03], *d* = 0.13), group (β = 0.22, 95% CI [0.03, 0.30], *d* = 0.36) and the interaction (β = 0.00, 95% CI [-0.13, 0.14], *d* = 0.01). Hence, the teacher training had neither immediate nor delayed effects on perceived iTFR.

However, students in the intervention group reported a more pronounced perception of iTFR, independently of the measurement time point.

[Insert Figure 1 here]

[Insert Figure 2 here]

Effects on perceived sports competence and global self-esteem

Next, it was explored whether there were effects of the teacher training on students' perceived sports competence and global self-esteem from baseline to post-test and from baseline to follow-up. With regard to changes in perceived sports competence from pre- to post-test, there was a significant negative effect of time (β = -0.10, 95% CI [-0.18, -0.02], *d* = 0.18), indicating an overall decline in the sample. There were no mean differences between the intervention and control groups (β = 0.00, 95% CI [-0.13, 0.13], *d* = 0.00). There was no significant interaction effect from pre- to post-test (β = 0.08, 95% CI [-0.01, 0.18], *d* = 0.15). Consequently, there is no beneficial treatment effect on perceived sports competence after the completion of the whole teacher training. From baseline to follow-up, the results with regard to the effects of time (β = -0.17, 95% CI [-0.25, -0.10], *d* = 0.31) and group (β = 0.00, 95% CI [-0.14, 0.14], *d* = 0.00) remained similar. In contrast to the results from baseline to post-test, there was a small but significant interaction effect from baseline to follow-up (β = 0.14, 95% CI [0.04, 0.24], *d* = 0.25). Figure 3 shows that the decline in perceived sports competence is more pronounced in the control group compared to the intervention group.

With regard to changes in global self-esteem over the period from pre- to post-test, there were no significant effects of time (β = -0.04, 95% CI [-0.11, 0.03], *d* = 0.10), group (β = 0.07, 95% CI [-0.02, 0.16], *d* = 0.19), and no interaction between time and group (β = 0.06, 95% CI [-0.03, 0.15], *d* = 0.16). The same pattern of results was evident from pre-test to follow-up with regard to the effects of time (β = -0.06, 95% CI [-0.13, 0.00], *d* = 0.16) and group (β = 0.07, 95% CI [-0.03, 0.16], *d* = 0.17). Again, in contrast to the results from baseline to post-test, there was a small significant interaction effect between time and group

(β = 0.10, 95% CI [0.02, 0.19], *d* = 0.27) from baseline to follow-up. As can be seen in Figure 4, there was a beneficial effect on global self-esteem in favour of the intervention group. The global self-esteem in the intervention group slightly improved over time, whereas the global self-esteem in the control group gradually declined.

[Insert Figure 3 here]

[Insert Figure 4 here]

Discussion

The aim of the current study was to evaluate whether a five-month teacher training enhances teachers' reflexive teaching style and iTFR in PE, consequently promoting students' perceived sports competence and global self-esteem. In summary, the results showed that the teacher training was effective in promoting the teachers' reflexive teaching style, but not their iTFR. With regard to students' perceived sports competence and global self-esteem, there were no beneficial treatment effects over a period of five months (from pre-test to post-test). However, over a period of eight months (from pre-test to follow-up), significant time x group interaction effects occurred.

The teacher training had a positive effect on teachers' reflexive teaching style, primarily indicated by significant time x group interaction effects from pre- to post-test and from pre-test to follow-up. However, since the interaction effects were evoked by decreases in the control group and small increases in the intervention group, the evidence for the effectivity is somewhat limited. Nevertheless, the significant increase in reflexive teaching style over a period of eight months in the intervention group (see table 2) indicates a positive influence of the teacher training on this variable. Magnaguagno et al. (2016) reported a similar pattern of results for the intervention group, which received didactic materials and coaching during the 13-week intervention phase. Although the short-term training by Magnaguagno et al. (2016) achieved a similar effect from baseline to post-test, it should be noted that the effect of the long-term training from this study persisted after the training period of five months. Even

more, the larger effect size from pre-test to follow-up in the present study suggests a potential sleeper effect in which the impact of the teacher training grew larger over time. In contrast to our results, the effect from the short-term training by Magnaguagno et al. (2016) decreased from post-test to follow-up. This difference to Magnaguagno et al. (2016) indicates that an intensive teacher training outperforms short-term trainings with regard to sustainability of changes in teacher behaviour.

In terms of teachers' iTFR, in both groups the mean levels did not change over time, indicating no effect of the teacher training on the teaching style. Hence, this study could not replicate the results from previous short-term interventions (Oswald et al., 2013; Schmidt et al., 2013). In contrast to those studies, there were significant mean differences in favour of the intervention group at all measurement points, and the means of iTFR ranging from 3.27 to 3.38 (max = 4) were relatively high compared to previous studies. The lacking treatment effect might be due to the voluntary registration for the training, which might have caused a ceiling effect. The teachers in the intervention group seemed to use a very pronounced iTFR already before taking part in the teacher training.

Although the descriptive statistics showed the expected pattern of results, there were no beneficial treatment effects on perceived sports competence and global self-esteem from pre- to post-test. Hence, past findings regarding perceived sports competence (Babic et al., 2014; Oswald et al., 2013; Schmidt et al., 2013) and global self-esteem (Ahn & Fedewa, 2011; Liu et al., 2015) could not be replicated. The indirect nature of the teacher training could help explain the relatively small effects on students' self-concept. O'Mara et al. (2006) showed that indirect self-concept treatments display minor effects compared to direct treatments. Furthermore, teachers in the intervention group decided on their own how often and how pronounced they wanted to implement an iTFR and reflexive teaching style. Therefore, it is comprehensible that previous short-term interventions (e.g. Oswald et al., 2013; Schmidt et al., 2013), which clearly specified what teachers in the intervention group had to do, displayed

larger effects. Another explanation for the absence of an immediate effect can be seen in the lacking effect on iTFR. The baseline difference in iTFR in favour of the intervention group made it more difficult to achieve the hypothesised additional effects.

Considering the timeframe from pre-test to follow-up (eight months), as expected the more individual oriented and reflexive taught PE in the intervention group was associated with positive effects on perceived sports competence and global self-esteem, indicated by significant interaction effects. Whereas perceived sports competence and global self-esteem in the intervention group remained stable, negative development trends occurred in the control group. Again, the decreases in the control group contributed to the significant interaction effects. However, previous work revealed that global self-esteem and physical self-concept decreases over the time from late childhood to adolescence (Robins & Trzesniewski, 2005; Schaffhauser et al., 2017). Hence, the observed decreases in the control group are in line with the negative development trends found in other studies. Therefore, the stability in the intervention group could be cautiously interpreted as a beneficial treatment effect. Whereas the present study found a positive effect of PE taught with pronounced iTFR and reflexive teaching style on global self-esteem, the studies investigating the same kind of PE on students' self-concept, found no effects of a 10-week (Schmidt et al., 2013) and 20-week (Oswald et al., 2013) intervention. According to the bottom-up model (Shavelson et al., 1976; Sonstroem et al., 1994), it is theorised that changes in global self-esteem need a number of competence perceptions on a low self-concept level. Therefore, it can be concluded that previously chosen 10 to 20 weeks of individualized and reflexive taught PE do not provide sufficient competence perceptions to affect global self-esteem, but eight months appear to be adequate. However, in view of the small effects in the present study, the effectivity should not be overestimated.

With regard to the aim of PE concerning the goal of personality development, the present study provides implications on what teachers in PE can do, and how they can be

supported to achieve this goal. For PE teachers and practitioners in the field of exercise psychology, the present findings illustrate the relevance of an iTFR and reflexive teaching style to promote global self-esteem development. If students consequently receive individualized PE accompanied by guided reflections on their improvements, not only perceived sports competence becomes more positive (Oswald et al., 2013) and realistic (Schmidt et al., 2013), but there are also benefits to the development of global self-esteem. However, a long-term implementation appears to be crucial to achieve positive effects on global self-esteem. Therefore, teachers need specific knowledge and skills, which can be provided by a teacher training. For people working in the field of teacher education, the present study shows that an intensive training helps to achieve sustainable changes in teaching style. Characteristics of the present teacher training and potential key factors for success in the present teacher training are the long duration (15 hours distributed over 5 months), the evidence based theoretical foundation, and the interactive and applied nature of the training (Lander et al., 2017).

Some limitations of the present study are worth noting as directions for future work. First, a well-known problem of quasi-experimental studies and a limitation of the current study is the non-randomized sample. Therefore, selection effects, evoked through the voluntary registration to the teacher training, could not be controlled. Hence, the generalizability of the results is somewhat limited. Second, whether the beneficial effects on self-concept in favour of the intervention group were caused through the more pronounced iTFR, the increase in reflexive teaching style or the interaction between iTFR and reflexive teaching style remains open. Because the teacher training did not affect iTFR, it is not clear whether the positive effects on self-concept were indeed caused through the teacher training. To get more insight into the psychological mechanisms behind self-esteem promotion in PE, future research should analyse in more detail how these didactic principles affect perceived competence and global self-esteem. Third, from an economic point of view, it was not

possible to get knowledge about the actual teaching. Therefore, the content of the PE lessons and the implementation frequency of an iTFR and reflexive teaching style were not controlled, which might have influenced the effects on students' perceived sports competence and self-esteem. Hence, more research into the processes and factors influencing the implementation quality and frequency with regard to successful self-esteem promotion is of great interest to optimize further efforts in teacher education.

In sum, the central findings of this study revealed that a five-month teacher training sustainably enhanced teachers' reflexive teaching style, which in turn, after a period of eight months, led to minor declines in perceived sports competence and global self-esteem. Considering the high relevance of global self-esteem with regard to psychological well-being (Trzesniewski et al., 2006), the small effect sizes reported in the present study are of considerable importance.

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Declaration of interest statement

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Figures

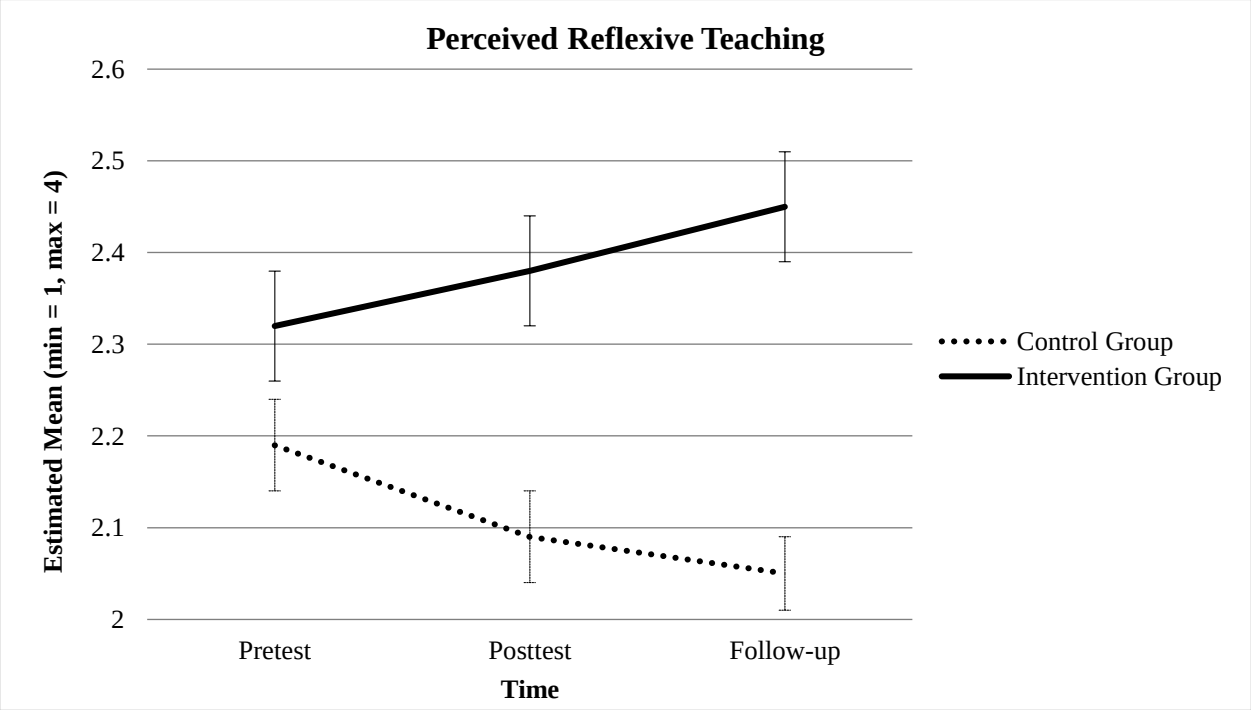

Figure 1. Means of reflexive teaching style for the intervention and control group. Error bars represent standard error of the means.

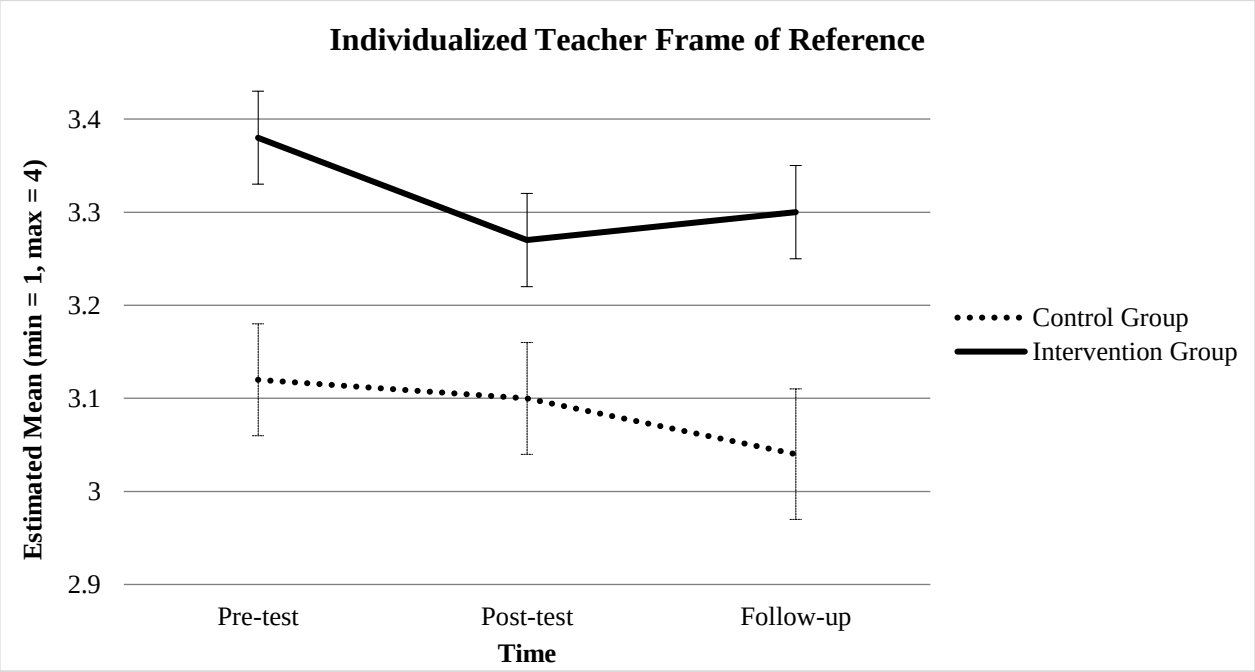

Figure 2. Means of iTFR for the intervention and control group. Error bars represent standard error of the means.

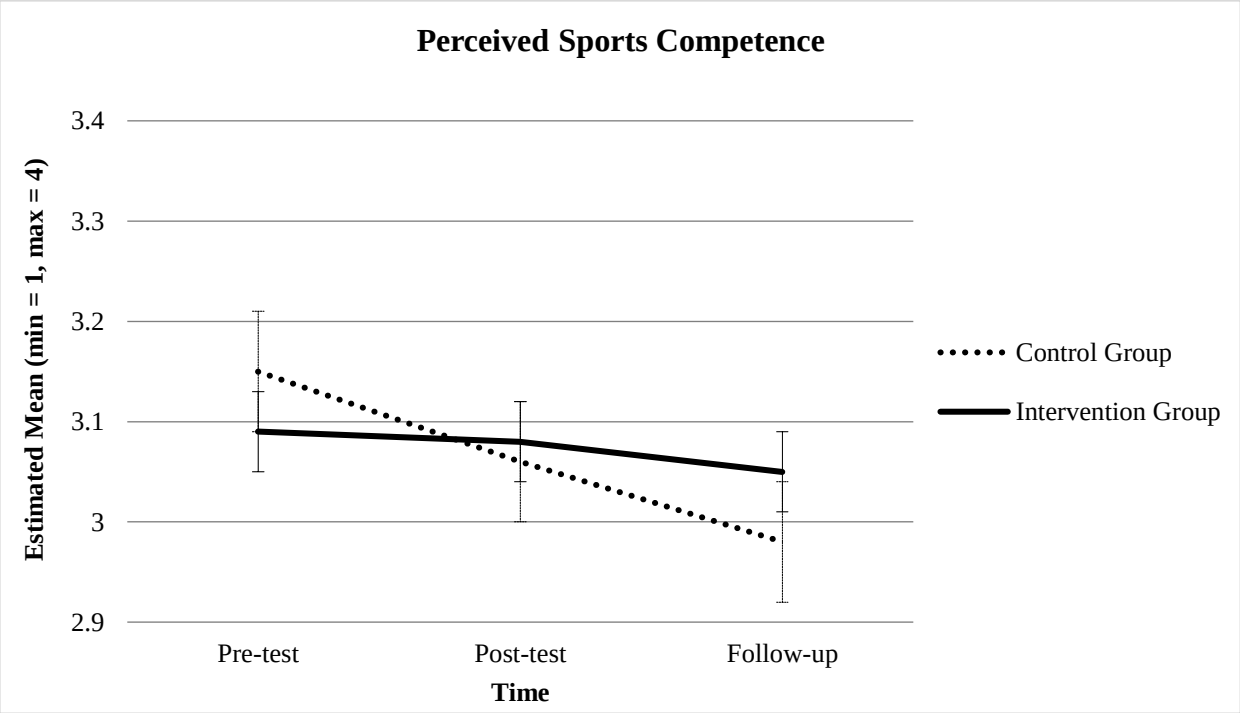

Figure 3. Means of perceived sports competence for the intervention and control group. Error bars represent standard error of the means.

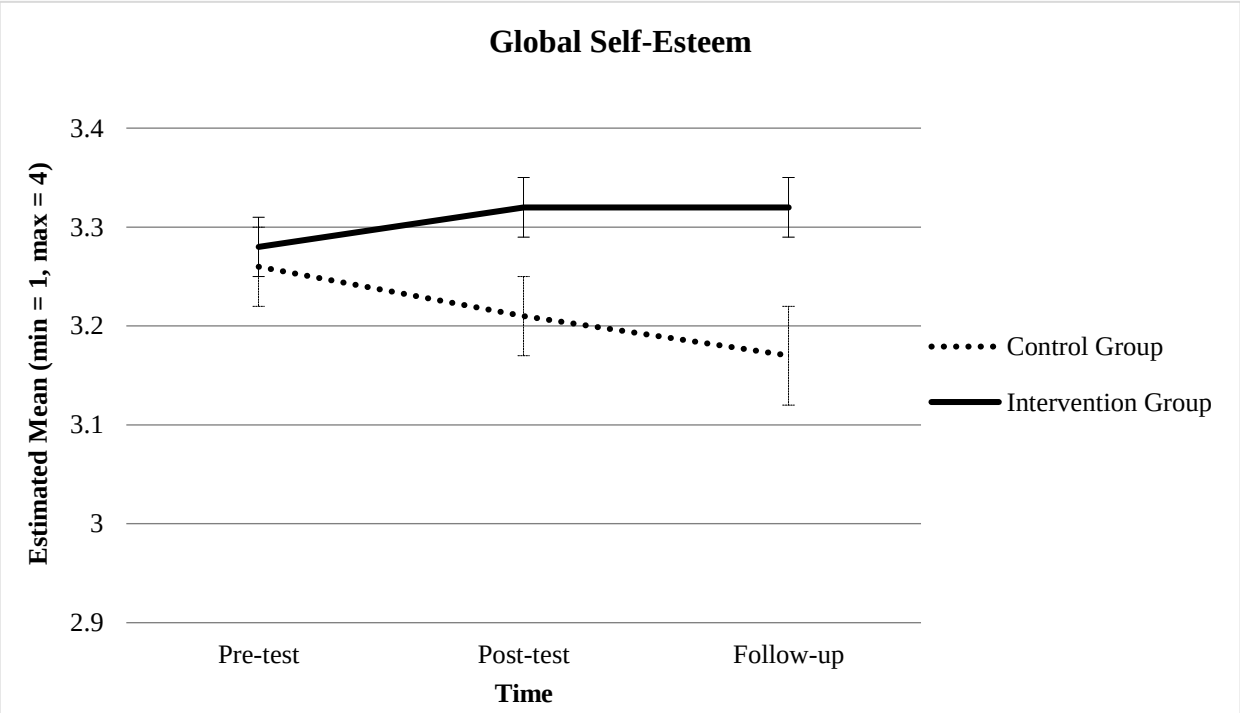

Figure 4. Means of global self-esteem for the intervention and control group. Error bars represent standard error of the means.

Tables

Table 1

Content and Procedures of the Teacher Training

Session	Content	Procedure
1	Introduction to the subject self-concept promotion in PE; Theory about structure and sources of self-concept in childhood and adolescence.	1. Introduction with a practical example lesson (focus on ball games and acrobatics) 2. Discussion of experiences made during the example lesson 3. Presentation about the structure and sources of self-concept 4. Discussion of participants experiences with regard to self-concept promotion in PE
2	Theory about self-concept promotion with physical activity and exercise; Theory about teaching styles to enhance schoolchildren's sense of competence.	1. Review of the first session and discussion of first experiences 2. Presentation about teaching styles proposed to promote positive self-concept development (e.g. reflexive teaching style, individual teacher frame of reference) 3. Transfer into practice with an example lesson (focus on dance)
3	Theory about individual oriented feedback with transfer into practice; Planning lessons aimed to promote self-concept.	1. Review of the past session and discussion of participants experiences 2. Presentation about individual oriented feedback in PE 3. Transfer into practice with an example (focus on coordination circuit) 4. Preparation and discussion of participants own PE lessons
4	Elaborate and develop further lessons with a focus on reflexive teaching and individualization.	1. Review of the past session and discussion of participants experiences 2. Conduction of two short practical examples (focus on endurance and game development) 3. Preparation, elaboration and discussion of participants lessons
5	Exchange of teaching materials between the participants; Discussion about factors related to a successful long-term implementation.	1. Review of participants experiences 2. Exchange of teaching materials 3. Practical examples (focus on fighting games; participants lessons) 4. Discussion about difficulties and barriers with regard to sustainable implementation

Note. Every session lasted 3 hours (15 hours in total).

Table 2

Descriptive Statistics of Intervention and Control Groups

	Control Group (*n* = 115)					**Intervention Group** (*n* = 200)				
	Pre-test	Post-test	Follow-up	Effect Sizes		Pre-test	Post-test	Follow-up	Effect Sizes	
	M (SD)	*M (SD)*	*M (SD)*	$d_{T1\rightarrow T2}$	$d_{T1\rightarrow T3}$	*M (SD)*	*M (SD)*	*M (SD)*	$d_{T1\rightarrow T2}$	$d_{T1\rightarrow T3}$
Teaching Style										
Reflexive Teaching Style	2.20 (0.63)	2.09 (0.66)	2.05 (0.65)	-0.17	-0.23	2.32 (0.68)	2.38 (0.69)	2.45 (0.62)	0.09	0.20[a]
Individualized TFR	3.12 (0.64)	3.10 (0.64)	3.04 (0.77)	-0.03	-0.11	3.38 (0.66)	3.27 (0.76)	3.30 (0.70)	-0.16	-0.12
Self-Concept										
Perceived Sports Competence	3.16 (0.65)	3.09 (0.59)	2.98 (0.59)	-0.11	-0.29[a]	3.09 (0.60)	3.08 (0.52)	3.05 (0.58)	-0.02	-0.07
Global Self-Esteem	3.26 (0.46)	3.21 (0.49)	3.17 (0.51)	-0.11	-0.18	3.28 (0.43)	3.31 (0.38)	3.32 (0.39)	0.07	0.10

Note. All scales range from 1 to 4. Effect sizes were estimated using Cohen's *d*. $d_{T1\rightarrow T2}$ = effect size with respect to the difference between pre- and post-test; $d_{T1\rightarrow T3}$ = effect size with respect to the difference between pre-test and follow-up.

[a] The superscript denotes effect sizes the 95% confidence limits of which do not include 0.