Adv Educ Res Eval, 2021, 2(2): 166-176
DOI: 10.25082/AERE.2021.02.003

RESEARCH ARTICLE

Teachers' self-efficacy: Associations with teacher and student characteristics and effects of the anger management intervention, the Mini-Diamond

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Received: May 11, 2021;
Accepted: July 12, 2021;
Published: July 16, 2021.

Citation: Niclasen J, Amholt TT, Carter R, *et al*. Teachers' self-efficacy: Associations with teacher and student characteristics and effects of the anger management intervention, the Mini-Diamond. *Adv Educ Res Eval*, 2021, **2**(2): 166-176.
https://doi.org/10.25082/AERE.2021.02.003

Abstract: Teacher self-efficacy (TSE) is the term used for teachers' beliefs about their capacity to positively influence students' learning and social environment. How TSE influences incidences of teacher burnout and student academic achievement has been the focus of previous research. Studies investigating the associations between TSE and socio-demographic characteristics are sparse, and little is known about the possible effects of school-based interventions on TSE. In order to address these areas of research, the aims of this study were twofold. First, the study examined associations between TSE and a) teachers' socio-demographic characteristics, and b) student's school-related well-being. Secondly, we investigated the effect of a school-based anger-management intervention, the Mini-Diamond, on TSE. Students from grades 0 to 2 and their teachers, from all schools in two Danish municipalities, participated in the study. Teachers completed two questionnaires, including the Danish version of the Teacher Self-Efficacy Scale and a questionnaire on socio-demographic characteristics. All students filled out a school well-being questionnaire. The questionnaires were completed prior to and after the intervention. Positive associations were found between TSE and teachers' age, showing that the older the teacher, the higher the TSE. Furthermore, positive associations between TSE and years of experience, as well as TSE and students' school connectedness, were found. No effects were found of the school intervention on TSE.

Keywords: teaching, school interventions, school well-being, Mini-Diamond intervention, Bandura teacher self-efficacy scale

1 Introduction

Self-efficacy is defined as people's perception of their ability to carry out a particular course of action successfully [1, 2]. In educational research, teachers' self-efficacy (TSE) is the term used to describe a teachers' beliefs in their capacity to influence their students' learning [3, 4]. The term TSE was introduced by Bandura and has been validated in many studies. TSE has been used to investigate associations with a range of factors, which illustrate its importance in school settings, including student well-being [5, 6], teacher well-being [5, 7], academic achievement [8–11], and teacher competence [12]. Findings related to links between TSE and academic achievement are inconsistent. Mahler and colleagues (2018) found no link between TSE and student performance, Zee and colleagues (2018) had inconsistent results linking the two factors, while Gulistan and colleagues (2017) reported a strong correlation between TSE and academic achievement [9–11].

Studies have shown that TSE has been positively associated with many important educational outcomes including teachers' persistence, enthusiasm, commitment, and instructional behavior [5, 6, 12], as well as student outcomes such as achievement, motivation, and self-efficacy beliefs. It would seem that TSE not only influences the teachers' own job performance, but also influences student-related factors [4].

1.1 Teacher-related factors

Concerning teacher-related outcomes, studies have shown that TSE is positively associated with the commitment and satisfaction of the teachers towards their own work, and negatively correlated with job-related stress and burnout [5, 6, 13]. Other studies have focused on the impact of years of teaching experience on TSE. For example, Wolters & Daugherty (2007) reported that teachers

with more teaching experience were more likely to believe in their own abilities to accomplish critical instructional tasks, such as classroom management [14]. Similarly, Klassen & Chiu (2010) examined a large sample of teachers, looking at their years of teaching experience in relation to their self-efficacy, and reported that years of teaching experience were positively correlated with teachers' self-efficacy, rising through the early and middle years of their teaching careers, and then dropping off in later years [13]. This indicates that years of teaching experience have a positive role in influencing teachers' self-efficacy.

Besides years of teaching experience, other studies have focused on the association between TSE and socio-demographic characteristics such as age, gender and ethnicity [13, 15]. Greenwood et al. (1990) investigated associations between gender, age, and race, and found that those teachers, who believe they can motivate students to achieve, were more likely to be female [16]. No effects were reported for age and ethnicity. Okech (2004) explored the relation between emotional intelligence and TSE, and years of teaching experience, age, gender and race in an American setting [17]. A markedly significant relationship was observed between emotional intelligence and TSE, but the study failed to support the hypothesized relationships with the remaining factors.

In a large-scale synthesis of 40 years of research, Zee and Koomen (2016) concluded that TSE shows positive links with patterns of teacher behavior and practices related to the quality of teaching, and factors underlying teachers' psychological well-being, including personal accomplishment, job satisfaction, and commitment. They also reported on negative correlations with factors that cause burnout [18].

To sum up, there are several studies which report on positive correlations between various positive factors, however this evidence is unconvincing for socio-demographic characteristics.

1.2 Student-related factors

Besides studies focusing on associations between TSE and a range of teacher-related outcomes, other studies have focused on TSE and student-related outcomes, including students' academic performance and well-being [19, 20]. Some studies have indicated that high levels of self-efficacy in teachers are associated with students obtaining higher academic achievement [21–23]. Other studies have found that teachers with higher self-efficacy are more likely to have positive relations with their students, and to create a harmonious class environment thus positively influencing several student outcomes such as academic performance and peer relations [23, 24]. Consequently, teachers with higher self-efficacy tend to have students that are more likely to have positive feelings toward their school, such as feeling secure at school, and less likely to demonstrate problematic behaviors, such as bullying. Indeed, when encountering situations involving students' bullying, teachers with high self-efficacy are more likely to intervene positively [25]. As such, there is a firm research base that points to there being positive links between TSE and students' academic achievement [18].

1.3 Aims of the current study

Considering the studies and current knowledge described above, it would seem that TSE is not only positively associated with teacher-related factors but also with student-related outcomes, including well-being and academic achievement. The association with socio-demographic characteristics, however, seems less evident, and it is not clear whether socio-demographic characteristics influence TSE. How involving the teacher in training school-based interventions affects their TSE, is an aspect of schooling that has only had sporadic and limited investigation. It is likely that teachers who are trained in school-based interventions would feel more secure in their teacher and guiding role with students. Would it be possible to enhance TSE via training in a specific school-based intervention? There is the possibility that such training could impact positively on both student-related outcomes and TSE.

In order to investigate these possibilities, this study was carried out in a Danish school context and the aims were twofold. The first aim was to examine the association between teachers' self-efficacy and a) teachers' socio-demographic characteristics, and b) student's school-related well-being. The second aim was to investigate the effect of a school-based anger-management intervention, the Mini-Diamond, on teachers' self-efficacy.

2 Methods

2.1 Participants

Students from grades 0 to 2 (approximately 6 to 8 years old) and their teachers, from all schools in two municipalities (Rødovre and Herlev), both suburbs of the greater Copenhagen area in Denmark,

participated in the study. The two municipalities are both located closely to Copenhagen and were similar in size and socio-demographic characteristics and were thus considered comparable.

Number of inhabitants (2018) in Rødovre was 41.119, while in Herlev it was 28.572. Rødovre covers 12,2 km2 and Herlev is a little smaller, covering 12 km2. The inhabitants have a budgeted tax base (2018) of 193,474 DKK (approx. 26,000 euros) per inhabitant in Rødovre and 192,663 DKK (approx. 25,900 euros) per inhabitant in Herlev, which is very similar, illustrated by lying 26th and 24th respectively relative to the other 90 municipalities. Average Income (2016) for those inhabitants who are employed, was 321,817 DKK (approx. 43,000 euros) (28th highest municipality) in Rødovre, and 327,024 DKK (approx. 44,000 euros) (26th highest municipality) in Herlev. Once again, this shows a marked similarity between the two municipalities.

At baseline, a total of 70 teachers from six schools and 20 classes, consisting of 889 students in Rødovre municipality, received the Mini-Diamond intervention [28]. In Herlev municipality a total of 30 teachers from three schools, and 19 classes, comprising 830 students, participated in the study without receiving the intervention, *i.e.*, they functioned as the control group in this study. After completion of the intervention, a total of 17 teachers (dropout rate 75.7%) from Rødovre municipality and 14 teachers (dropout rate 53.3%) from Herlev municipality had remained in the study. The entire study was initiated at the beginning of the school year in August 2016 and was finalized at the end of that school year in June 2017. Data for the present part of the study was collected between August and December 2016. At baseline, the age of the teachers ranged from 25 to 62 years (M = 42.41, SD = 10.02), while their teaching experiences ranged from 0 to 39 years (M = 12.86, SD = 8.88).

2.2 Instrumentation

2.2.1 The teacher self-efficacy scale

Teachers from both Rødovre and Herlev Municipalities completed two questionnaires, including the Danish version of the Teacher Self-Efficacy Scale (TSES) [26] and a questionnaire regarding the socio-demographic characteristics of these participants.

A short questionnaire about socio-demographic characteristics included questions about their age, gender, educational attainment (teacher or teaching assistant), years of teaching experience, and their self-efficacy about management in the classroom. This questionnaire was applied in order to investigate the first aim looking into the effect of socio-demographic characteristics. The other questionnaire, the TSES, is internationally developed and standardized, and consists of 28 items [26]. Teacher self-efficacy scale was originally developed to measure teacher beliefs and the degree to which teachers thinks they can be effective in their school activities [26]. School activities include situations such as teaching, involving parents, creating positive school climate, involving parents, and making decisions.

The 28 items included in the TSES questionnaire load onto six dimensions: efficacy to influence decision-making (3 items), instructional self-efficacy (8 items), disciplinary self-efficacy (3 items), efficacy to enlist parental involvement (3 items), efficacy to enlist community involvement (3 items), and efficacy to create positive school climate (8 items).

Efficacy to influence decision-making assesses teachers' self-perceived power in influencing decisions made at their school and includes items such as, "How much can you influence the decisions that are made in the school?". *Instructional self-efficacy* assesses teachers' self-perceived teaching abilities, with items such as, "How much can you do to motivate students who show low interest in schoolwork?". *Disciplinary self-efficacy* assesses teachers' self-perceived ability to keep discipline in the class, such as, "How much can you do to get children to follow classroom rules?". *Efficacy to enlist parental involvement* assesses teachers' self-perceived ability to involve parents in the school and school activities, including the following example, "How much can you do to get parents to become involved in school activities?". *Efficacy to enlist community involvement* assesses teachers' self-perceived ability to get communities involved in their schools and includes items such as, "How much can you do to get community groups involved in working with the school?". *Efficacy to create positive school climate* assesses teachers' self-perceived ability to create a positive school environment, e.g., "How much can you do to make students enjoy coming to school?".

All items were rated on a scale ranging from 0-100; from "cannot do at all" (0), to "can do moderately" (50), to "highly certain can do" (100). Apart from the individual scales, a "total teacher self-efficacy scale" was obtained by summing the scores of the individual scales. Reliability in terms of Cronbach's Alpha (α) was calculated for the individual subscales and for the total teacher self-efficacy scale. The values of α ranged from 0.60 to 0.91.

2.2.2 Student well-being questionnaire

Students responded to a well-being questionnaire from an online platform, skolesundhed.dk (now known as BørnUngeLiv) [27, 28]. Skolesundhed.dk is an online web portal developed in 2007.

Skolesundhed.dk aimed to provide Danish municipalities with a data platform or tool that could be used in working with school-aged children and their families and is used for distribution of questionnaires as well as communicating with parents [29]. Skolesundhed.dk provides a tool to work in a structured way regarding students physical, mental, and social health. Skolesundhed.dk is owned by the participating municipalities and developed in a collaboration between municipalities and the Danish Committee for Health Education [30]. When the individual municipalities work in a clinical or practical setting with skolesundhed.dk, they can choose between a list of modules and only include exactly those questions of relevance to them, thus making the platform as easy and useful as possible.

For the present research project, questions related to school well-being were identified. The questions were identified because they were hypothesized to be outcome measures associated with TSE and/or the Mini-Diamond intervention. In order to identify a factor structure for the included questions, a Confirmatory Factor Analysis (CFA) was carried out in R [31]. The results of the CFA revealed that the items could be subdivided into three factors, *i.e.*, School Connectedness, Learning Efficacy, and Bullying (model fits $SRMR = 0.037$, $RMSEA = 0.044$). For further details see Liu et al. (2021) [28]. A total of 13 items assessed School Connectedness and included items such as, "Do you have good friends at your school?", "Do you feel secure at school", and "Is there an adult you can ask for help if you need it?". A total of five items assessed Learning Efficacy and included items such as, "Do you feel like learning something at school?", "Do you have peace and quiet at school?", and "Are you included in deciding what you do in your lessons?". Finally, four items tapped into Bullying and included items such as, "Are you teased by someone from another class to the point where you get upset?" and "Have you participated in teasing someone, to the point where they got upset?".

Students responded to each item on a 3-point Likert-like scale, including 0 (*no*), 1 (*sometimes*), and 2 (*yes*). Student questionnaires were adapted in layout to the age group by making illustrations with smileys. Higher scores on the first two scales were considered positive and indicated a better connection with school, and a higher perceived Learning Efficacy. For the factor items related to Bullying, the scale was considered positive when the score was low, which indicated less perceived bullying related behaviors by the students.

In both municipalities, the participating students filled out the same questionnaires 1 week prior to the beginning of the intervention (Time 1), and 1 week after the end of the intervention (Time 2). In Rødovre municipality a total of 889 students filled out the questionnaire at Time 1, and a total of 980 students filled out the same questionnaire at Time 2. In Herlev, 830 students filled out the same questionnaires at Time 1, and 717 students filled out the questionnaires at Time 2.

2.2.3 A School based anger management intervention, the Mini-Diamond

The Mini-Diamond intervention is presented in a manual and consists of eight modules of 1.5 hours duration each (*i.e.*, two school lessons per module) [32]. Each module focuses on different aspects of anger management, including bodily reactions, actions, thoughts and feelings, as well as interactions between them. All exercises include a focus on self-regulation, mentalization and reflection [32].

The individual modules alternate between different forms of learning, including exercises and activities. Ultimately, the Mini-Diamond aims to teach students the skills of managing their anger, which is a key factor contributing to negative and aggressive behavior [33–35].

Local instructors implemented the Mini-Diamond within each class in each school [21]. These instructors had all completed a 2-day course on the implementation of this intervention. At the course, the instructors were introduced to the theoretical basis of the intervention and were taken through the individual exercises, as specified in the manual. The 2-day course focused on theoretical as well as practical tools to handle and help children with anger and other related reactions. The course provided the instructors with education to lead the 8-week course for school classes. At each school, a number of instructors, typically teachers or teaching assistants, were responsible for implementing the Mini-Diamond. In some classes the instructors of the Mini-Diamond intervention are also the main teacher or teaching assistant of that particular class, whereas in other classes they are not.

2.3 Data analysis

Concerning the first aim, *i.e.*, examining associations between TSE and teachers' socio-demographic characteristics, Pearson correlations were used to examine associations between TSE on the one hand, and teachers' age, years of teaching experience and student well-being on the other. Independent sample *t*-tests were used to compare whether teachers' gender (male or female) and place of teaching (*i.e.*, Rødovre or Herlev municipalities) had an impact on the TSE scores.

Concerning the second aim, *i.e.*, the effect of the Mini-Diamond intervention on TSE, teachers' self-efficacy was measured prior to and after the intervention, and subsequently analyzed using multilevel modeling. To eliminate the potential effects of initial differences in TSE between Rødovre and Herlev municipalities, TSE scores of each municipality assessed at baseline were controlled for in the multilevel models.

All analyses were performed both on the individual dimensions of the TSE scale, but also on the overall sum of the teachers' self-efficacy scale. All analyses were carried out through the nlme package in R [31]. Statistical assumptions (absence of outliers, normality of variables, linearity, and homoscedasticity) were checked.

3 Results

3.1 Association between teachers' self-efficacy and a) teachers' socio-demographic characteristics, and b) student's school related well-being

The total TSES score were positively correlated with both teachers' age and years of teaching experience (r = 0.23 and 0.36, respectively). Regarding *teachers' age,* positive correlations were found between the three individual scales: instructional self-efficacy, disciplinary self-efficacy, and efficacy to create a positive school climate. These correlations ranged from r = 0.15 to 0.21. For *years of teaching experience*, positive correlations for five of the six teachers' self-efficacy subscales (excluding efficacy to influence decision-making) were found. These ranged from r = 0.14 to 0.27). *Place of teaching* (*i.e.*, municipality of employment) was not associated with either the total TSES (t = -0.40, p = 0.693), nor with any of the individual teacher self-efficacy scales ($-0.78 \leq t \leq 1.8$, all $p > 0.05$).

Table 1 Results of t-tests for the associations of place of teaching and gender on teacher self-efficacy

	t	df	Sig (2-tailed)	Mean difference	Std. error	95% confidence interval	
						Lower	Upper
Place of teaching							
TSES	-0.4	42.44	0.693	-0.86	2.18	-5.27	3.54
Influence	0.58	70.03	0.562	1.92	3.3	-4.66	8.52
Instruction	-0.12	47.15	0.906	-0.31	2.65	-5.66	5.03
Disciplinary	0.23	47.47	0.817	0.71	3.07	-5.47	6.9
Enlist parents	-1.36	59.52	0.178	-3.75	2.75	-9.26	1.76
Enlist community	-1.82	56.65	0.073	-8.83	4.84	-18.54	0.86
Create positive climate	-0.18	47.53	0.86	-0.43	2.43	-5.32	4.46
Gender							
TSES	-0.53	39.56	0.602	-0.99	1.88	-4.8	2.82
Influence	2.42	38.73	0.02	8.58	3.55	1.39	15.77
Instruction	0.51	32.01	0.612	1.38	2.7	-4.13	6.9
Disciplinary	0.76	43.45	0.455	2.01	2.67	-3.37	7.4
Enlist parents	-1.3	28.07	0.205	-4.42	3.4	-11.39	2.55
Enlist community	-2.19	32.35	0.036	-11.79	5.39	-22.78	-0.8

Regarding *teachers' gender,* no significant difference was found with their total TSES (t = 0.52, p = 0.602), but significant differences were observed for some of the individual TSES scales. Specifically, compared to female teachers, male teachers scored higher on their self-efficacy for influencing decision-making (t = 2.42, p = 0.020), but lower on efficacy to enlist community involvement (t = -2.19, p = 0.036). No differences were observed for the remaining TSES subscales ($-2.19 \leq t \leq 0.51$, all $p > 0.05$). T-test results can be found in Table 1.

The association between teachers' self-efficacy and student's school-related well-being was investigated using three independent scales, *i.e.*, Student School Connectedness, Student Learning Efficacy, and Bullying. Teachers' self-efficacy was significantly and positively correlated with Student School Connectedness (r = 0.12), but not with their Learning Efficacy and Bullying ($-0.06 \leq r \leq 0.07$).

3.2 Effect of the Mini-Diamond intervention on teachers' self efficacy

Secondly, whether the Mini-Diamond intervention affected teachers' total TSES, and if so, then how were they affected, was investigated in the two municipalities of Rødovre (intervention municipality) and Herlev (control municipality). The results showed no difference in the total TSES between the two municipalities, b = -4.88, t (2) = -1.23, p = 0.34, indicating that the intervention

did not affect total TSES scores. The effects of the intervention on the six individual scales were investigated. No significant effects of the intervention were found on teachers' efficacy to influence decision-making (b = -5.52, t (2) = -1.29, p = 0.33), instructional self-efficacy (b = -16.35, t (2) = -1.14, p = .37), disciplinary self-efficacy (b = -1.95, t (2) = -0.35, p = 0.76), efficacy to enlist parental involvement (b = -3.33, t (2) = -0.85, p = 0.48), efficacy to enlist community involvement (b = -2.25, t (7) = -0.25, p = 0.83), and efficacy to create a positive school climate (b = -9.13, t (2) = -1.32, p = 0.32). In sum, these results suggest that the intervention exerted no influence on any of the included dimensions of TSE, when comparing teacher self-efficacy scores before and after the intervention.

4 Discussion

The first aim of the current study was to examine the association between 1) TSE and teachers' socio-demographic characteristics, and 2) student's school-related well-being. The second aim was to investigate the effect of a school-based anger-management intervention, the Mini-Diamond, on TSE. Aligned with other studies, positive correlations were observed between TSE and teachers' age and years of teaching experience, with the largest correlation between TSE and teachers' years of experience. Positive gender specific correlations were also observed, where male teachers reported higher self-efficacy in influencing decision-making, whereas female teachers reported more efficacy in enlisting community involvement. When it came to student-related factors, a positive correlation between TSE and Student School Connectedness was observed. No significant effects of the Mini-Diamond intervention on TSE were observed.

4.1 Teacher-related outcomes

Aligned with other studies, positive correlations between TSE and teachers' age and years of teaching experience were found, with the largest correlation being between TSE and teachers' years of experience [13,14,16,17,36]. Wolters & Daugherty (2007) reported that teachers with more teaching experience were more likely to believe in their own abilities related to class management [14]. Similarly, Klassen & Chiu (2010) reported, that years of teaching experience were positively correlated with TSE early on and mid-career [13]. It thus seems that there is evidence that years of teaching experience, maybe in particular in the early years of a teacher's career, is associated with TSE.

Studies show that teachers typically show more insecurity in the early years of their career [37]. In the first years of their teaching career, teachers typically hesitate to share doubt and questions or ask for supervision [38]. Later in their career not only does their teaching experience increase, but they also get better at delivering knowledge, helping students who have learning difficulties, communicating effectively with parents, cooperating efficiently with other teachers, and building a harmonious classroom environment [38–40]. Their learning curve and courage had the steepest increase at the beginning of their career. As a result, length of experience has an important effect on teachers' ability to deliver knowledge, classroom management and increasing academic achievement [15,41].

A significant, but smaller association between the age of the teacher and TSE was found. Previous studies concerned with TSE have not found this. For example, Greenwood et al. (1990) and Okech (2004) investigated this but failed to find a significant association between TSE and teacher's age [16,17]. Perceived self-efficacy is concerned with people's beliefs in their ability to influence events that affect their lives [42]. This belief is a core element of human motivation, performance accomplishments, and emotional well-being. Whatever other factors may serve as guides and motivators; they are rooted in the belief that one can make a difference by one's actions [42]. It is possible that self-efficacy may increase with age, irrespective of years of teaching experience. Another possibility is that the two factors, *i.e.*, years of teaching experience and age, are closely correlated. This could mean that the correlation found between TSE and age is actually a correlation between TSE and experience. The age ranges in the other studies were generally not reported, but in the present study the ages of the teachers ranged from 25 to 62 years of age, whereas their years of teaching experience ranged from 0 to 39 years. As a result of the data for this part of the study being cross-sectional and correlational in nature, the two factors and the positive correlation may well reflect years of teaching experience.

4.2 Student-related outcomes

Positive correlations were found between TSE and age, as well as years of teaching experience. These correlations may also have implications for the health of the students, such as increased well-being and better academic achievement [19,20]. In this study, the associations between TSE and student well-being were investigated, and a significant correlation with school connectedness

was found. This finding echoes prior findings, which suggest positive correlations with students' academic adjustment [18, 23–25]. For example, teachers with higher self-efficacy have more positive relations with their students and are better at creating a harmonious class environment [23, 24]. Students are, in turn, more likely to have more positive feelings toward their school, such as feeling secure at school, and less likely to demonstrate problematic behaviors, such as bullying [25, 43].

Ideally, we would have preferred to have the questionnaire use a 5-point Likert scale, but this couldn't be changed. The questionnaires are part of an ongoing, national data collection project, rather than being the domain of our research group, and it was not in our power to restructure the questionnaire.

Although the nature of the data in the current study was cross-sectional, the causality remains unknown. However, the finding that students feel more connected to their school if their teachers score higher on TSE, is an interesting clinical finding. If, for example, there are classes with very disruptive students and other challenges, it is important to consider which teachers are assigned to these classes. In addition to TSE, the teacher's socio-demographic characteristics, such as age and years of teaching experience, need to be considered as they will impact on the connection the students feel towards the school and potentially on their academic achievement [21–23].

4.3 Gender differences

An interesting finding of this study is that male and female teachers differ in their perceived self-efficacy regarding influencing decision-making and enlisting community involvement. Positive correlations were seen for male teachers who reported higher self-efficacy in influencing decision-making, whereas female teachers reported more efficacy enlisting community involvement. There seem to be no previous studies reporting similar results [15, 17], which may indicate that this finding may be by chance. However, literature investigating gender differences within dominance and communication in general indicate that the findings of these studies are well aligned with the present study [44]. More specifically, males tend to be more powerful, dominant, and assertive, whereas females are more empathic, communicative, and cooperative [43–45]. This may explain why male teachers are more likely to exert influence in decision-making within their school setting. In comparison, female teachers tend to be more empathic, communicative, and cooperative, and these skills are appreciated when convincing external partners to be involved in school activities. This finding could be the subject of further research into gender differences in teaching and teacher's education regarding TSE and interventions.

4.4 The effect of the Mini-Diamond intervention

Regarding the impact of the Mini-Diamond intervention, results showed no influence on the teachers' self-efficacy. The aim of the Mini-Diamond intervention is to equip children with specific anger management skills. Prior to beginning the intervention, it was hypothesized that, although the Mini-Diamond intervention was not directly targeted at teachers' self-efficacy, it was likely that equipping students with anger management skills could have an indirect, positive effect on TSE. However, this indirect effect was not obtained, indicating no influence of the student intervention on TSE. One explanation may be that the Mini-Diamond intervention was not effective at improving children's skills to manage their anger and other negative emotions, and ultimately failed to improve students' well-being and in turn TSE [28]. Another reason might be that the Mini-Diamond intervention did not directly target the teachers and thus could not be expected to impact on TSE. As such, interventions directly targeted at teachers, especially those focusing specifically on TSE, might be more effective at improving teachers' self-efficacy [7, 46]. For instance, mindfulness [47] and instructional training [48] have been shown to be effective in terms of improving TSE. Further research could advantageously examine whether, and to what extent interventions that indirectly target TSE, can have a positive impact on this factor.

4.5 Limitations

A high dropout rate was experienced among the participating teachers during the Mini-Diamond intervention. This significant dropout from the current study makes it hard to reach a solid conclusion on the effect of the Mini-Diamond intervention. A lack of power may be the reason that a potential effect on TSE of the intervention was not observed.

There were many possible factors contributing to the teachers dropping out, but one likely explanation is that the intervention was voluntary, and unscheduled. The teachers had to fit the sessions into their curriculum as an additional task and therefore needed to poach time from other subjects. This extra workload proved too much for some of the teachers. This extra workload would be especially problematic in classes already experiencing high levels of disruptive behavior. Another contributing factor could be the state of the schools in the municipality in general. As reported in the

participants section above, there are only 28.4% of students who experience thriving in the school environment, and there is negative teacher effect. Both factors would likely impact negatively on the teachers, social climate of the classroom and the individual students [5, 36].

Another factor which was attributed to the teachers' dropout rate, was those questionnaires which were physically lost in the mail to and from the schools.

The dropout rate could be the result of complications in the implementation of the intervention or problems with the training of the instructors who implemented the intervention. This could be related to factors such as instruction, demands on time, or prioritization difficulties. It is important to emphasize that these dropout rates did not influence the findings related to teacher and student characteristics, as only baseline data was applied for this part of the study.

The data in this study was mostly cross-sectional, and thus the causality remains unknown. More studies are needed within this field, in order to investigate the specific causalities between the different factors. An attempt was made to find causality in the current study, by including data from the Mini-Diamond intervention, although no significant results were found.

5 Conclusions

This study examined the factors influencing TSE from three aspects: teachers' socio-demographic characteristics, students' well-being, and the effect of the Mini-Diamond intervention. The study investigated whether an anger management program run in schools, which was implemented by the class teachers, effected those teachers' TSE. The intervention was carried out in a Danish municipality, with another municipality, which was roughly equivalent in socio-demographic characteristics, was used as the control group. Outcome measures included different aspects of child- and parent-rated student well-being, including factors such as the child's school connectedness, learning, self-efficacy, and experiences of bullying.

Overall, the results showed that TSE was positively associated with the teachers' ages and length of teaching experience, and with the students' feelings of connectedness towards their school. Furthermore, results showed gender differences, where male teachers reported higher self-efficacy in influencing decision-making, whereas female teachers reported more efficacy in enlisting community involvement. The association between TSE and student well-being was investigated, and a significant correlation was found to school connectedness. No effect of the anger management intervention, the Mini-Diamond, was found on TSE, suggesting that this form of intervention does not exert influence on TSE. The study concludes that further research is needed within this field, in order to investigate the specific causalities between the different factors influencing TSE.

6 Implications for school health

Positive correlations were observed between TSE, the teacher's age and with years of teaching experience, with teachers' ages and their years of teaching experience contributing positively to TSE. In addition, a positive correlation was found between TSE and Student School Connectedness. Although the causality of these factors currently remains unknown, TSE most likely contributes positively to student well-being and academic achievement, as hypothesized in other studies on the subject [10, 12, 13, 16]. As a result, teacher socio-demographic characteristics should most likely be a consideration when teacher resources are allocated to individual classes, in particular classes with high levels of disruptive behavior. Teachers with many years of teaching experience being allocated to these classes may have a positive effect on student well-being. This could positively influence the classroom environment and student-related outcomes. The findings of this study should be considered when allocating teachers to classes.

Human subject approval statement

All procedures performed in studies where human participants were involved, were in accordance with the ethical standards of the institutional research committee, and with the 1964 Helsinki declaration, as well as any later amendments or comparable ethical standards.

Acknowledgements

This work was supported by TrygFonden under grant numbers 114629 and 121941.

Conflict of interest

All authors declare no conflict of interest.

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