



Self-Efficacy in Early Childhood Education and Care: What Predicts Patterns of Stability and Change in Educator Self-Efficacy?

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Self-efficacy is an important predictor of people's behaviour and wellbeing. In this longitudinal study we investigated patterns of stability and change in early childhood educator self-efficacy (ESE) in child-centred educational practice and its predictors. Early childhood educators completed a questionnaire twice. Latent profile analysis yielded four profiles: decrease profile (21.2%), increase profile (25.0%), low profile (9.6%), and high profile (44.2%). Profiles were used as the outcome of a multinomial logistic regression analysis. The analyses showed that educators' experience, number of hours worked per week, and institution are significant predictors for profile membership: educators with less professional experience and fewer working hours per week have a higher probability of being in the low profile. Family-based educators have a higher probability of being in the decrease profile than centre-based educators. The lack of opportunities to increase self-efficacy available to less experienced, part-time educators and family-based working educators are discussed in frame of Bandura's (1997) sources of self-efficacy. Practical interventions such as coaching and tandem building are proposed to strengthen ESE.

Keywords: self-efficacy, change, teacher, early childhood education and care, child-centeredness, professionalisation and professional development, latent profile analysis

SELF-EFFICACY IN EARLY CHILDHOOD EDUCATION AND CARE

Work-related self-efficacy is considered an important predictor of successful professional practice (e.g., Zee and Koomen, 2016). However, there is a significant lack of knowledge about the self-efficacy of early childhood educators. Self-efficacy has also been defined as an aspirational outcome for continuing education (e.g., von Suchodoletz et al., 2018), but there are few longitudinal studies of changes in self-efficacy and its predictors. We therefore focused on this particular field and attempted to shed light on stability and change in self-efficacy in early childhood education and care (ECEC).

The theory of self-efficacy is based on Bandura's (1997) social-cognitive theory, which describes self-efficacy as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Bandura (1997) proposes four sources of self-efficacy expectations: mastery experience, vicarious experience, verbal persuasion, and physiological and emotional arousal. Mastery experience is given as the most influential source of self-efficacy. Mastery experience provides the most authentic information about the own capabilities to succeed. Vicarious experience means learning through the experiences of others (seeing, or talking, and reading about). The third source, verbal persuasion, means feedback from significant others. Physiological and emotional arousal, through one's own perception of physiological, and emotional states, also seem to be relevant. But the power of all sources depends on the individual judgement of the experience. According to Bandura (1997), behaviour is influenced by self-efficacy. Self-efficacy beliefs are the basis for the choice of and persistence in a certain action. They also influence one's own perception, actions and emotions. Numerous studies support the assumption of the importance of self-efficacy on human achievement in many areas like sports, health business, or education (Bandura, 1997).

Bandura's (1997) theory generally relates to self-efficacy, whereas Tschannen-Moran et al. (1998) relate this idea specifically to work-related self-efficacy for school teachers: "Teacher efficacy is the teacher's belief in his or her capability to organize and execute the courses of action required to successfully accomplish a specific teaching task in a particular context." (p. 233).

Since Bandura published his ideas, there has been significant research into the impact of teacher self-efficacy on different levels of outcomes. Zee and Koomen. (2016) developed a synthesis of the research on teacher self-efficacy outcomes, showing that teachers with higher self-efficacy, and particularly teachers with more experience, tend to use more proactive, student-centred approaches. Teacher self-efficacy affects more than pedagogical practice and child development; we can presume that it also has an impact on teachers' own wellbeing. For example, different studies show effects on burnout, stress and coping, and job satisfaction (e.g., Caprara et al., 2006; Klassen and Chiu, 2010; Aloe et al., 2014). The results in this area seems to be consistent. Zee and Koomen's (2016) synthesis showed a robust protective effect of high teacher self-efficacy on stress and overall burnout, as well as greater sense of personal accomplishment and job satisfaction, irrespective of experience or educational setting.

Previous studies in the educational field use different measurements of teacher self-efficacy. But all measurement tools refer to the school context even if they are used in context of ECEC. Tschannen-Moran et al. (1998) and Schmitz and Schwarzer (2000), however, state the importance of integrating key context factors of the specific teaching area when evaluating teachers' work-related self-efficacy. In ECEC, a primary indicator of high interaction quality is child-centredness, e.g., taking children's perspectives into consideration, or giving high-quality feedback in response to what children do or say (La Paro et al., 2012). Consequently, it represents a key factor in ECEC. We therefore define work-related self-efficacy in ECEC (educator

self-efficacy: "ESE") as the extent to which ECEC educators feel able to engage in child-centred educational practice.

The study by Perren et al. (2017) showed that associations between educational knowledge and child-centred educational practice are mediated by early childhood ESE.

To understand both stability and change in early childhood ESE, we conducted a longitudinal study in ECEC settings. It is one of the first studies to use this specific approach to capture early childhood ESE.

Change in Self-Efficacy

Bandura (1977) asserts that strong self-efficacy expectations develop through repeated, significant success, and are relatively resistant even to later failures. The power of self-efficacy beliefs lies in their circularity. Low self-efficacy leads to less effort and lower persistence and therefore lower outcomes, which in turn lead to lower self-efficacy beliefs. The opposite (high self-efficacy leading to more effort and higher outcomes) is also true (Tschannen-Moran et al., 1998). However, some researchers contradict this. Other reports, mostly of qualitative case studies, indicate the power of doubt in self-efficacy to encourage even more effort and persistence to achieve a given goal (Wheatley, 2002; Rushton, 2003; Atay, 2007; Wyatt, 2013).

Moreover, high/low self-efficacy beliefs have a self-affirming effect. New experiences are integrated into existing ones: if they fit, they strengthen existing beliefs, while if they do not fit they will be minimalised, discounted or forgotten (Bandura, 1997). Labone (2004) describes these selection processes in more detail.

Much research has therefore focused on pre-service and the early years of teaching, since this is the time during which teacher self-efficacy is formed and is most susceptible to change. Several studies have reported an increase during pre-service (Klassen and Durksen, 2014; Dicke et al., 2015; George et al., 2018), but also a decrease in the first year of teaching (Woolfolk Hoy and Spero, 2005). Positive experiences and competent support were singled out as predictors of increasing self-efficacy during pre-service (Rushton, 2003; Atay, 2007). Nevertheless there are also some studies showing change in teacher self-efficacy even after the first years of teaching. Pas et al. (2012), analysing data from 600 elementary school teachers over 3 years, showed a significant increase in teacher self-efficacy. Teachers' own preparedness ratings were strong predictors of the change in teacher self-efficacy. Teachers with higher level of preparedness have higher teacher self-efficacy at time 1 but show less growth in teacher self-efficacy. Presumably this can be traced back to some ceiling effects. Klassen and Chiu (2010) analysed the change in teacher self-efficacy over time in more detail, showing a non-linear change in teachers' experience over their career, with a peak at mid-career and a decrease afterward. The only longitudinal study of ECEC also used a school-related scale, the Teacher Sense of Efficacy Scale (von Suchodoletz et al., 2018), reporting change in preschool teacher self-efficacy over time, independently of the starting point. This study also showed that a coaching intervention produces increases in teacher self-efficacy. Holzberger et al. (2013) analysed the change in teacher self-efficacy over one academic year, using data from 155 secondary maths teachers. Cross-lagged models showed

that teacher self-efficacy changed over the school year and was affected by instructional quality. The implementation of new curricula or programmes is also associated with a (temporary) decrease in teacher self-efficacy (Ross et al., 1997; Mulholland and Wallace, 2001; Wyatt, 2013). Lazarides et al. (2020) highlighted the contextual dependency of teacher self-efficacy. Teacher self-efficacy seems to fluctuate, depending on resources and experiences in a specific setting or task.

For ECEC we can only refer to results from school setting or studies using a school setting-related assessment of teacher self-efficacy. Nevertheless, we expect similarities in the stability or change of self-efficacy and their predictors between ECEC educators and teachers in school settings.

More than in school settings, in ECEC every day is different, and changes in conditions (e.g., child group composition, team members) are normal. Educators are faced with a lot of different challenging situations and need to reflect their own ability and their ESE again and again. Therefore, we hypothesise a high level of vulnerability of early childhood ESE, even for educators in later stages of their career. Klassen and Durksen (2014) have shown this for pre-service teachers, whose self-efficacy varied in a weekly measurement.

Taken together, we can conclude that both may be true: some early childhood educators will be stable in their self-efficacy, while some change will be observed for others.

Personal and Contextual Effects on Self-Efficacy

We expect that changes in self-efficacy may be observed, even later in people's professional pathways. The question therefore arises as to what predicts these changes? Since longitudinal studies on self-efficacy in ECEC are lacking, we need to take a look at cross-sectional studies of teacher self-efficacy.

Different personal characteristics are expected to affect teacher self-efficacy. Several studies have addressed teachers' years of experience, but the results are inconsistent. While Durksen et al. (2017), Bullock et al. (2015), Kim and Kim (2010), and Wolters and Daugherty (2007), for example, found some associations between teacher self-efficacy and experience, Guo et al. (2011) and von Suchodoletz et al. (2018) did not report any associations between these two variables. Most of them reported on cross-sectional data but, e.g., von Suchodoletz et al. (2018) used longitudinal data. As outlined above, professional experience might be non-linearly associated with self-efficacy (Klassen and Chiu, 2010).

Like teachers' experience, their length of training and level of education show inconsistent results over different studies (Tschannen-Moran and Johnson, 2011; Pas et al., 2012; von Suchodoletz et al., 2018).

Teachers' job satisfaction may be another personal predictor of their self-efficacy. As reported above, job satisfaction is generally treated as an outcome of teacher self-efficacy, but the direction of the effect is not obvious. Several case studies showed the importance of a positive environment (e.g., positive relationship with mentor, possibility to try out) to self-efficacy development (Klassen and Durksen, 2014; Bautista and Boone, 2015).

Contextual effects as well as personal ones might be relevant in explaining interindividual differences and changes in self-efficacy: Bandura (1977) and Tschannen-Moran et al. (1998) define self-efficacy as being contextually dependent. The same person may believe in his or her efficacy in situations with two children while mealtimes, but may doubt his or her self-efficacy beliefs in free choice with several children. Regarding the context of ECEC, Perren et al. (2017) showed higher early childhood ESE in centre-based day care than in family-based settings or in playgroups.

Many different predictors are potentially relevant to self-efficacy. Collie et al. (2012), for instance, examined teachers' perceptions of school climate and beliefs about the social-emotional learning of students, and its effects on teacher self-efficacy. They found a positive effect of perceived student behaviour and motivation on teacher self-efficacy. Another study reported a reciprocal relationship between the collective teacher self-efficacy of the team and students' achievement (Ross et al., 2004).

In conclusion, the results for most of the personal factors are inconsistent, while contextual factors seem to be relevant for teacher self-efficacy. A similar result can be expected for early childhood educators' self-efficacy.

RESEARCH AIMS

This study aimed to gain a deeper understanding of early childhood ESE. We assessed intraindividual changes of early childhood ESE over a time span of approximately two and a half years. We investigated patterns of change or stability of self-efficacy over time by estimating latent profiles. Based on theoretical assumptions, like the stability of self-efficacy reported by Bandura (1977), and the change patterns shown in previous research (e.g., Klassen and Chiu, 2010; Guo et al., 2011; von Suchodoletz et al., 2018), we can expect patterns of stability and change. Therefore, we hypothesise that we can specify different latent profiles, some indicating change of self-efficacy and others indicating stability of self-efficacy.

We also examine whether personal characteristics such as educators' years of experience and working hours per week are associated with latent profile membership of change in early childhood ESE. Furthermore, we examined whether contextual variables such as the institution, the environmental climate, or some general change in working conditions (e.g., the function, the institution, or processes of change at the management level) are associated with participants' latent profile membership. Due to the exploratory nature of our study no specific directional hypotheses were formulated.

MATERIALS AND METHODS

Procedure

To address our research aims, we conducted an online survey in a sample of educators working in different ECEC settings in

Switzerland. Participants from three (originally cross-sectional) studies were asked to participate in a follow-up assessment.

Assessment at timepoint 1: The first survey of these three studies took place in 2013–2015.

For study 1, we recruited in 2013 participants through professional networks of ECEC in the German-speaking part of Switzerland (Perren et al., 2017). Members of the networks received an invitation to participate and to spread the link to colleagues. Participation was voluntary and gift certificates (30 × € 30) were raffled. This recruitment strategy produced a convenience sample (T1: $N = 265$).

In study 2, a partly random sample of 119 day care groups were recruited in 2015 to participate in an observational study of day care quality (Reyhing et al., 2019). 240 educators in these day care groups also completed an online questionnaire.

In study 3, we collected additional data in the French-speaking part of Switzerland in 2015, using a similar recruitment strategy to study 1 (T1: $N = 166$). For this survey the questionnaire was translated into French.

Assessment at timepoint 2: In 2017, participants in all three studies who gave an e-mail address at timepoint 1 ($N = 548$) were then sent a second invitation to participate in the online survey again (timepoint 2). The average period between timepoints was 2.5 years ($SD = 0.84$). Again, participation was voluntary and gift certificates (10 × € 50) were raffled.

Participants provided information on their educational settings, professional background and job satisfaction, and completed a questionnaire on their professional attitudes, early childhood ESE, and educational practice (Perren et al., 2017). The sections of the core questionnaire were presented in a random order to prevent systematic and selective patterns of partial completion, and sequence or fatigue effects. This paper uses data on early childhood ESE. 197 persons responded to the survey invitation at timepoint 2 (T2). Data were included if information about professional background was almost complete and the majority of the items in the early childhood ESE scale had been answered (final $N = 156$).

Sample

One hundred and fifty-sixth educators of 0- to 4-year-old children from different Swiss ECEC settings (97% females, age at T2: $M = 37.73$, $SD = 12.00$) are included in this analysis. A total of 42.9% participated originally in study 1, 36.5% in study 2, and 20.5% in study 3. We tested potential differences between the three studies at timepoint 1 (T1) with a Generalized Linear Model (GZLM). Systematic differences in early childhood ESE were observed between the three studies (mean early childhood ESE study 1 $M = 4.26$, $SD = 0.05$ and study 2 $M = 4.39$, $SD = 0.05$, $T(122) = -1.83$, and $p = 0.07$; study 1 $M = 4.26$, $SD = 0.05$ and study 3 $M = 4.58$, $SD = 0.07$, $T(97) = -3.82$, and $p < 0.001$; study 2 $M = 4.39$, $SD = 0.05$ and study 3 $M = 4.58$, $SD = 0.07$, $T(87) = -2.22$, and $p < 0.05$). The three studies at T1 took place one after another. Due to the linear dependency between T1 time and the time interval between T1 and T2, we cannot control for both variables. Therefore, we decided to control for time interval between T1 and T2 in our main analyses.

Most participants work in a centre-based setting (63.5%), 17.9% in family-based day care, and 18.6% lead educational playgroups. They work on average of 28.16 hours per week in professional childcare ($SD = 14.02$). Many of the participants (37.2%) have completed professional education, 27.6% have some basic training for family-based day care or playgroups, 23.1% have a degree such as a Bachelor's or Master's, and 8.3% were still in education while participating (T2); 3.8% did not answer this item. Participants have 11.75 years of experience in ECEC on average ($SD = 9.51$).

In German-speaking Switzerland, ECEC for children aged under 4 years takes place in different types of care settings: centre-based daycare, family-based daycare, and educational playgroups (Perren et al., 2016). At 4 years old, most children will transition to mandatory kindergarten, which is a well-established part of the Swiss school system with structures and a professional level of teachers that parallels the school system. In contrast, ECEC lacks such clear structures, and caregivers and educators have heterogeneous professional levels. More details about ECEC in Switzerland are available in Perren et al. (2016).

Attrition Analysis

A total of 548 persons received a second e-mail but 392 did not answer the questionnaire again or answered it only incompletely. We used *t*-Tests to analyse whether there are systematic differences between the study and the drop-out sample. None of the tested differences at timepoint 1 were significant: early childhood ESE (drop-out sample: $M = 4.33$, $SD = 0.46$; study sample: $M = 4.37$, $SD = 0.41$; $T(513) = 1.14$; $p = 0.25$), the experience of participants (drop-out sample: $M = 10.51$, $SD = 9.31$; study sample: $M = 11.75$, $SD = 9.51$; $T(521) = 1.39$; $p = 0.17$), the working hours per week (drop-out sample: $M = 28.94$, $SD = 14.14$; study sample: $M = 28.07$, $SD = 14.02$; $T(515) = -6.40$; $p = 0.52$) or their job satisfaction (drop-out sample: $M = 4.30$, $SD = 0.62$; study sample: $M = 4.38$, $SD = 0.52$; $T(505) = 1.42$; $p = 0.16$).

Measurement

Early Childhood Education and Care Self-Efficacy Beliefs

Early childhood ESE was evaluated using selected scales from a questionnaire by Perren et al. (2017), which assesses ESE, attitudes and educational practice. For this study we used three subscales that refer to a child-centred educational approach: ensuring child participation (CP), supporting children as active learners (AL), and providing a supportive learning environment (LE). In line with Schmitz and Schwarzer (2000), who highlighted the importance of implementing some difficulty level into items of self-efficacy measurement, every item asked for a specific task in a difficult situation. Each subscale consists of three items [e.g., “I can be interested in children's opinions and views and consider them, even if I'm under time pressure” (CP); “I am able to support children in their autonomous exploration of the environment, even when children are anxious” (AL); “I can structure the learning environment in such a way that all children in the group find suitable challenges, even when their needs are very different” (LE)]. Participants indicate their agreement using

responses ranking from 1 = totally disagree to 5 = totally agree. Higher ratings indicate greater self-efficacy. The mean scale score of the three subscales are used as the construct “Early childhood educator self-efficacy” (ESE). The reliability of the ESE scale in this study was $\alpha = 0.79$ for timepoint 1 and $\alpha = 0.73$ for timepoint 2. A calculated confirmatory factor analysis for timepoint 1 and timepoint 2 showed scalar measurement invariance. Neither equal factor loadings [$\Delta\chi^2(8) = 6.07, p = 0.64$] nor the assumption of equal intercepts [$\Delta\chi^2(8) = 9.16, p = 0.33$] brought about significant worsening. We therefore favour the more restricted model (scalar measurement invariance).

Job Satisfaction

The participants’ overall job satisfaction was assessed using the job satisfaction scale developed by Enzmann and Kleiber (1989). This scale consists of six items (e.g., “I like to stay at work”). Like the self-efficacy scale, participants’ agreement was assessed using responses ranking from 1 = totally disagree to 5 = totally agree. Higher ratings indicate greater job satisfaction. Reverse coded items were inverted. To analyse this, we used mean scale scores to calculate a difference value between timepoints (T2-T1), which represents the change in job satisfaction. The job satisfaction scale shows reliability of Cronbach’s alpha = 0.74 for timepoint 1 and Cronbach’s alpha = 0.80 for timepoint 2.

Change in Working Conditions

We asked participants about changes in their working conditions between timepoints. We used the individual date stamp of their first participation in the online questionnaire to help them remember the time in between. We asked about changes in leadership or structure, changes of job, and any other meaningful changes in their working conditions. Since group sizes of the different change types were small, we used this variable binary (1 = change; 0 = no change).

Analytic Method

The analyses were conducted using R and SPSS 25. First, we ran a latent profile analysis with ESE scales at timepoints 1 and 2 in R (tidyLPA; Rosenberg et al., 2019). We used single imputation for missing values and scaled values of ESE at T1 and T2. Masyn (2013) describes four different model specifications and recommends using the one with the best fitting solution. We used the “class-invariant, unrestricted” LPA model, proposed by Masyn (2013) because it fit our data best [Akaike’s information criterion (AIC), Bayesian information criterion (BIC)]. In this model, variances and covariances were set as equal across profiles. We started with a nine-profiles solution, theoretically based on nine possible ways of change (low to low, low to middle, low to high, middle to low, middle to middle, middle to high, high to low, high to middle, and high to high), and ending with an optimum of four profiles (decrease profile, increase profile, low profile, and high profile). The choice of the optimum profile solution is based on theoretical and methodical considerations. We used Akaike’s information criterion (AIC; lower values are preferable), Bayesian information criterion (BIC; lower values are preferable), and entropy (range = 0–1, higher values are preferable). Derived

from these criteria, a two- (AIC = 852.31; BIC = 876.71; and entropy = 0.74) or four-profile solution was taken into consideration. Based on theoretical considerations, we decided to analyse the four-profile solution (AIC = 850.08; BIC = 892.78; and entropy = 0.71).

To compare these profiles, we conducted univariate comparisons with a GZLM-analysis as well as multinomial logistic regression analysis. For univariate analysis the profiles were used as predictor and linear variables as outcome. We ran a Wald χ^2 test for linear and chi-square tests for category variables. To compare all profiles with one another, we calculated three multinomial logistic regression models with different reference categories: one with the decrease profile as reference category for the dependent variable, one with the increase profile as reference, and one with the low profile as reference as well. Educators’ professional experience, working hours per week, change in job satisfaction, change in working conditions, and institutional setting were added as predictors. We controlled for time interval between timepoint 1 and timepoint 2. To test the model fit, all predictor variables were added separately to the model. Pseudo R^2 were compared. We also examined the -2 log-likelihood, for which lower values indicate a better model fit.

Since the job satisfaction scale lacked data, the multinomial logistic regression analysis was carried out using only $N = 126$ participants. The latent profile analysis was calculated using the full dataset ($N = 156$).

RESULTS

Pearson correlation of ESE between timepoint 1 and timepoint 2 is $r = 0.41$, indicating moderate rank order stability. The mean score of ESE is very similar at timepoint 1 ($M = 4.37, SD = 0.41$) and timepoint 2 ($M = 4.38, SD = 0.39$; no significant mean change); both scores are at a mid to high level of ESE. There was a minimal decrease in the mean score regarding job satisfaction at both timepoints (T1: $M = 4.38, SD = 0.52$; T2: $M = 4.29, SD = 0.66$); rank order stability is $r = 0.56$. The change in job satisfaction is on average $M = -0.14 (SD = 0.57)$. Moreover, there are two almost equal groups of participants with ($N = 81$) or without ($N = 75$) any change in their working conditions.

Table 1 and **Figure 1** presents the results of the latent profile analysis, which yielded four different profiles of stability and change of ESE. We identified decrease profile (21.2%), increase profile (25.0%), low profile (9.6%), and high profile (44.2%). Univariate analysis showed differences between the profiles regarding job satisfaction [T1: Wald $\chi^2(154) = 10.88, p < 0.05$; T2: Wald $\chi^2(128) = 9.89, p < 0.05$]. The highest job satisfaction is found for the high profile for both timepoints, with significant differences to the low profile at timepoint 1 [$T(82) = 2.79; p < 0.05$; and $d = 0.62$] and timepoint 2 [$T(66) = 2.92; p < 0.05$; and $d = 0.72$]. There are no other significant differences between the profiles.

In a next step these profiles were used as dependent variables in multinomial logistic regression analysis. The model fit statistics are moderate: the -2 log-likelihood is relatively high, with a score of 298.79 and $\chi^2(21) = 27.19, p = 0.17$. However, the pseudo R^2

TABLE 1 | Results of latent profile and univariate analyses ($N = 128-156$).

	Decrease profile ($N = 33$)			Increase profile ($N = 39$)			Low profile ($N = 15$)			High profile ($N = 69$)			Wald χ^2
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	
T1 ESE ^a (raw scores)	33	0.38 (4.53)	0.59 (0.24)	39	-1.05 (3.94)	0.47 (0.19)	15	-1.43 (3.79)	0.63 (0.26)	69	0.72 (4.67)	0.48 (0.20)	
T2 ESE ^a (raw scores)	33	-0.92 (4.03)	0.52 (0.20)	39	0.19 (4.46)	0.66 (0.26)	15	-1.72 (3.72)	0.47 (0.18)	69	0.71 (4.66)	0.51 (0.20)	
T1 job satisfaction	33	4.38	0.43	37	4.26	0.52	15	4.11 ^d	0.49	69	4.51 ^d	0.54	10.88*
T2 job satisfaction	28	4.20	0.69	32	4.23	0.67	15	3.93 ^e	0.66	53	4.47 ^e	0.60	9.89*
Educator's experience	33	10.39	10.00	39	11.24	8.01	15	7.67	5.61	69	13.58	10.42	6.40
Working hours/week	33	27.50	13.88	39	26.97	15.10	15	22.93	12.90	69	30.28	13.56	4.15
Change in job satisfaction	28	-0.19	0.59	30	-0.06	0.72	15	-0.18	0.53	53	-0.14	0.47	0.99
Institution ^z	33			39			15			69			
Centre-based	20			20			9			50			
Family-based	8			9			3			8			
Playgroup	5			10			3			11			
Change in working conditions ^z	33			39			15			69			
Change	20			20			9			32			
No change	13			19			6			37			
Time interval T1 T2	33	2.31	0.80	39	2.69	0.84	15	2.54	0.88	69	2.35	0.82	5.42

* $p < 0.05$; ^a z -standardised (within each timepoint). Group differences: ^{d,e} $p < 0.05$ and; ^zchi square test shows no significant differences.

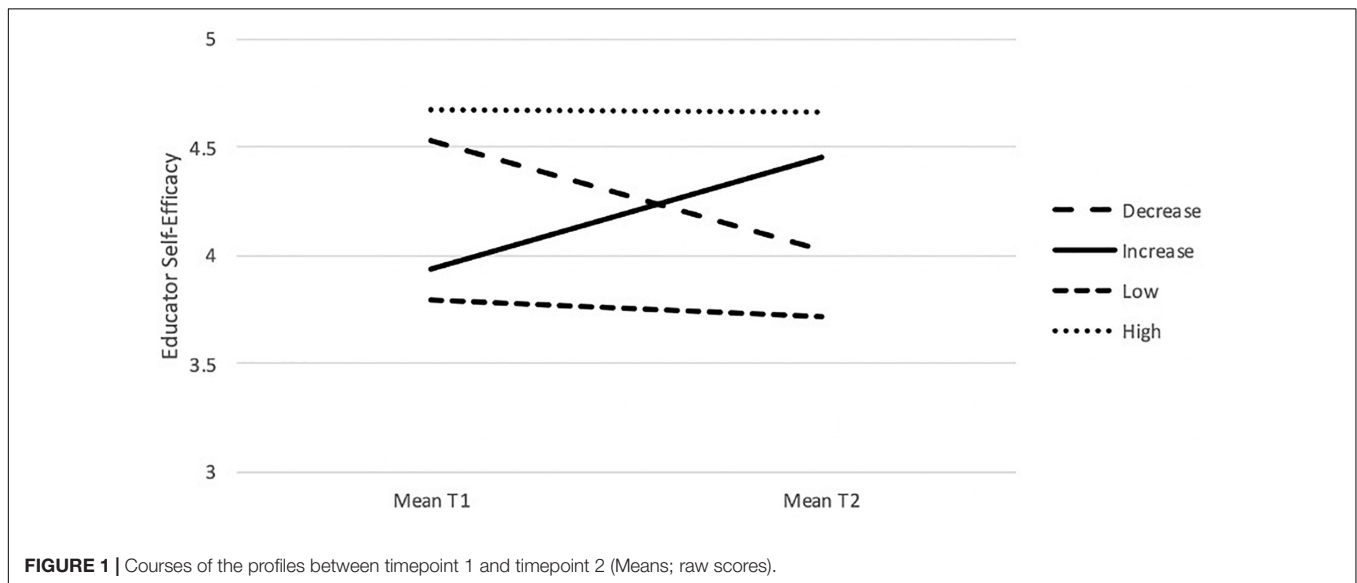


FIGURE 1 | Courses of the profiles between timepoint 1 and timepoint 2 (Means; raw scores).

favours the full model instead of the models with fewer predictors (full model: Nagelkerke $R^2 = 0.21$).

The results table (Table 2) shows the multinomial regression analysis with the low profile as reference category. Except for one, all significant differences are between the low profile and the other profiles.

There is a significant difference between the high and the low profile in educators' experience [$b = 0.13, p < 0.05$, and $OR = 1.14$ (95% $CI:1.03, 1.26$)] and working hours per week [$b = 0.06, p < 0.10, OR = 1.06$ (95% $CI:1.00, 1.12$)]. Between the increase and the low profile, the same predictors show differences: educators' experience [$b = 0.09, p < 0.10, OR = 1.10$ (95% $CI:0.99, 1.21$)] and working hours per week [$b = 0.05, p < 0.10, OR = 1.06$ (95% $CI:0.99, 1.12$)]. Between the decrease and the

low profiles only educators' experience [$b = 0.10, p < 0.10, OR = 1.10$ (95% $CI:0.99, 1.22$)] had a significant effect on profile membership.

Odds ratios can be interpreted as the effect of a one-unit change in the predictor variable on the probability of being in profile A instead of profile B, the reference profile (low profile). Values lower than 1 indicate a lower likelihood of remaining in profile A. Values higher than 1 indicate a higher likelihood of remaining in profile A.

The results show that educators with more experience are more likely to be in the high, the increase or the decrease profile than in the low profile. Moreover, educators with more working hours per week are more likely to be in the high or the increase profile than in the low profile.

TABLE 2 | Results of multinomial logistic regression analysis ($N = 126$).

Profiles		B	SD	Wald	sig.	Exp(B)	95% Conf-interval Exp (B)	
							Lower	Upper
Increase	Constant term	-1.46	1.75	0.70	0.40			
	Educator's experience	0.09	0.05	3.15	0.08	1.10	0.99	1.21
	Working hours/week	0.05	0.03	2.93	0.09	1.06	0.99	1.12
	Change in job satisfaction	0.22	0.62	0.13	0.72	1.25	0.37	4.20
	Change in working conditions	-0.51	0.76	0.45	0.50	0.60	0.14	2.66
	Institution = playgroup ^b	1.82	1.26	2.10	0.15	6.18	0.53	72.53
	Institution = family-based ^b	0.79	1.05	0.57	0.45	2.21	0.28	17.18
Decrease	Time interval T1-T2	-0.15	0.56	0.08	0.78	0.86	0.29	2.56
	Constant term	0.36	1.75	0.04	0.84			
	Educator's experience	0.10	0.05	3.36	0.07	1.10	0.99	1.22
	Working hours/week	0.03	0.03	1.14	0.29	1.03	0.97	1.10
	Change in job satisfaction	-0.33	0.59	0.30	0.58	0.72	0.23	2.31
	Change in working conditions	-0.07	0.76	0.01	0.93	0.94	0.21	4.18
	Institution = playgroup ^b	1.68	1.31	1.63	0.20	5.34	0.41	69.96
High	Institution = family-based ^b	1.39	1.04	1.79	0.18	4.03	0.52	31.08
	Time interval T1-T2	-0.87	0.58	2.23	0.14	0.42	0.13	1.31
	Constant term	-0.75	1.61	0.22	0.64			
	Educator's experience	0.13	0.05	6.79	0.01	1.14	1.03	1.26
	Working hours/week	0.06	0.03	3.74	0.05	1.06	1.00	1.12
	Change in job satisfaction	-0.19	0.56	0.12	0.73	0.82	0.27	2.48
	Change in working conditions	-0.74	0.72	1.03	0.31	0.48	0.12	1.98
	Institution = playgroup ^b	0.94	1.20	0.62	0.43	2.57	0.25	26.76
	Institution = family-based ^b	-0.18	1.02	0.03	0.86	0.83	0.11	6.16
	Time interval T1-T2	-0.26	0.51	0.26	0.61	0.77	0.28	2.10

^aReference = low profile; ^bReference = centre-based; Significant values are in bold.

The only difference between other profiles than the low profile was a difference between the decrease and the high profile for educators' institution [family-based; $b = 1.58, p < 0.05, OR = 4.84$ (95% CI:1.07, 21.82)]. Educators who work in family-based settings have a higher probability of being in the decrease profile than in the high profile than educators in centre-based institutions.

DISCUSSION

This study investigated how early childhood ESE changes or remains stable over time. It is the first longitudinal study to focus on early childhood ESE beliefs using a specific, early childhood-related measurement. ESE in relation to child-centred educational practice showed different patterns of change or stability over time. Four different profiles were identified. Two of them represent change in ESE (decrease profile and increase profile) and two represent stability in ESE (low profile and high profile). Fortunately, the high profile is the one occupied by most educators, and the increase profile the second largest. From the school context and some research in ECEC, we know that high teacher self-efficacy is important for high quality practice (Zee and Koomen, 2016). Therefore, it is reassuring to see most educators with high or increasing ESE.

Still, there is a considerable difference between the low profile and all other profiles. Educators with low ESE seems to be those with less experience and fewer working hours per week. The more experience and the more hours they work per week, the higher the probability that they will be in one of the other profiles. This is true for the high and the increase profile but also for the decrease profile.

The low profile shows lowest ESE values at timepoint 1 and timepoint 2. It seems that educators with less experience and fewer working hours per week are more likely to have lower ESE, which does not change over a timespan of approximately 2.5 years. Moreover, these educators also show lowest job satisfaction at both measurement points. Educators with lower working hours per week may not have enough opportunity for mastery or vicarious experiences to strengthen their ESE. Maybe they had experience of previous failure, which lead to lower ESE. They are also less experienced and cannot look back on a long career containing a lot of mastery experiences, which would keep ESE high even through a period of less new positive experiences. This is also in line with previous studies showing an increase in teacher self-efficacy with increasing experience (Kim and Kim, 2010; Klassen and Chiu, 2010; Bullock et al., 2015; Durksen et al., 2017; George et al., 2018). Their lower job satisfaction can be a reason or an outcome of the low ESE. Klassen and Chiu (2010) showed some relations between teacher self-efficacy and

job satisfaction as well. Dissatisfaction with the job can lead to lower commitment and lower work effort which in turn leads to lower success and therefore probably to lower ESE. Low ESE also can lead to lower effort and persistence and therefore lower success which might result in lower job satisfaction. Therefore low job satisfaction and low ESE can be reciprocal and may lead to a downward spiral.

According to our hypothesis, educators' experience and working hours per week were predictive for profile membership. In addition, we expected the different educational settings in which educators work to be reflected in different profile memberships. Perren et al. (2017) showed such a difference in their cross-sectional study. Educators in family-based settings reported lower ESE than those in centre-based daycare. Our results show that educators who work in family-based settings have a higher likelihood of decreasing ESE than educators in centres. One possible explanation is the lack of collaboration with other educators and leadership in family-based settings. Atay (2007) reported effects of vicarious experience for teachers with positive relationships and satisfaction with co-teachers. Labone (2004) also highlights the importance of similarities and identification with others in using vicarious experience to build stronger self-efficacy beliefs. Moreover there is a hardly any opportunity for social persuasion like positive feedback or orientation. These opportunities are lacking in a family-based setting.

Change in job satisfaction was another expected predictor of profile membership, yet multinomial logistic regression analysis showed no indication of this. But univariate analysis indicated some differences between the profiles for each timepoint. Educators in the high profile showed the highest job satisfaction at both timepoints. Previous studies also found cross-sectional positive relations between self-efficacy and job-satisfaction (Caprara et al., 2006; Klassen and Chiu, 2010). Educators with high self-efficacy are more satisfied with their job than those with low ESE. It is therefore surprising not to find any evidence for a relationship between changes in job satisfaction and ESE, although positive and negative environments were shown to be relevant for increasing or decreasing self-efficacy (Atay, 2007; Klassen and Durksen, 2014). The change in both seems not to run along parallel lines.

Change in working conditions was not associated with profile membership. This can be explained by methodological limitations: we only asked for change *per se*, and not whether this change was experienced as positive or negative. As Labone (2004) notes, change in self-efficacy depends on the individual selection, attention to and use of different self-efficacy information. Perhaps only individual perception of a change is relevant for ESE change or stability, something which needs to be examined in further research.

Strengths, Limitations and Further Research

We used a specified assessment of early childhood ESE. This new assessment enables us to look in a more detailed and

specific way at early childhood ESE. In line with the requirements of Schmitz and Schwarzer (2000) and Tschannen-Moran et al. (1998), we integrated key context factors of child-centredness in ECEC to evaluate ESE. This can be seen as an important development in self-efficacy research in ECEC. Nevertheless it is still a novel assessment tool and needs to be examined further. Especially one item needs to be developed further: It displays not the typical self-efficacy statement like "I can" or "I am able to" (see Perren et al., 2017, p. 145). Therefore a little caution with this scale is indicated.

Our analysis focused on stability and change in early childhood ESE. There is a limited number of longitudinal studies on self-efficacy after the first years in service, especially for ECEC. Our results show that change in ESE continues beyond the first years as well. For a better understanding of the different courses, further research on educators' whole career and a detailed examination of determinants of change is needed. Our study is limited in its assessment of institutional change. We did not assess institutional change in a precise way, and are therefore unable to differentiate between positively and negatively experienced change in working conditions. Moreover, we did not assess children's characteristics as a potential predictor. As a contextual variable child behaviour was shown to influence teachers self-efficacy in other studies (Guo et al., 2011; von Suchodoletz et al., 2018).

In this study, we have a high attrition rate, many of the educators of the first measurement point did not participate in the second survey. This high drop-out rate might partly reflect the high attrition rate in this professional field. We have not found significant differences between the drop-out sample and the study sample, but it remains unknown how educators in the drop-out sample developed over the time. Low or decreasing ESE might be more frequent. The small sample size also produces small profile sizes; even more exciting are the significant differences between the profile with the lowest membership (low profile) and the other profiles.

Moreover, we used latent profile analysis to identify profile membership, which is a current analytic approach with advantages over classic non-latent cluster methods. Latent profile analysis uses profile membership as an unobserved categorical variable. Its values indicate the probability of membership of certain profiles (Spurk et al., 2020).

In conclusion, we see the specific assessment of ESE as a promising approach to illuminate early childhood ESE. Further research using this specific assessment will lead to a more comprehensive understanding of ESE in ECEC.

Practical Implications

In the light of the growing professionalisation of educators, our results indicate a need to focus in the future on educators with less experience and fewer working hours per week. Because of the influence on individual wellbeing and quality in childcare, it is worthwhile to invest in strengthening ESE (Klassen and Tze, 2014; Zee and Koomen, 2016). The findings

suggest that less experienced educators with fewer working hours per week struggle to have confidence in their self-efficacy and are unable to increase it over time. Coaching interventions could be a promising approach to address ESE through verbal persuasion and reflection on their own actions (Labone, 2004; von Suchodoletz et al., 2018). Building tandems of educators could be another way of supporting verbal persuasion and reflection, and pre-service supervisors are important sources of feedback. Moreover, supervisors support educators' reflection processes on their own practice (Atay, 2007). After finalisation of pre-service education, there is often a lack of opportunity for further regular exchange and peer feedback. Our results indicate the need for this beyond the first years, an opportunity that should be offered to part-time educators as well. Labone (2004) has highlighted the effect of positive feedback in relation to one's own goals. The importance of collaboration for teachers' professional learning was also shown by Durksen et al. (2017). To counteract the lack of opportunity for vicarious experience and verbal persuasion in family-based ECEC, educators could build tandems here as well. Even if they are not working in the same place, they could peer-reflect on their practice once a week.

Taken together, this insight into ESE in ECEC shows the changeability of self-efficacy over a short time span of approximately 2.5 years. It makes an important contribution to research in early childhood education and care and the professional development of educators in this field.

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DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

YR and SP contributed conception and design of the study. YR analysed the data and wrote the first draft of the manuscript. SP revised the manuscript. Both authors read and approved the submitted version.

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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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