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Running Head: PE efficacy development in pre-service teachers

Exploration of the longitudinal development of PE teacher efficacy: understanding the key influences impacting pre-service teachers

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### Abstract

**Purpose:** To investigate the longitudinal development of physical education (PE) teacher efficacy (TE) of pre-service teachers. **Method:** Participants included 287 pre-service teachers from six UK higher education institutions. Data were collected over three years using an online questionnaire that included a validated PE teaching efficacy scale with the same pre-service teachers. Primary analysis included a one-way ANOVA to examine variances across institutions, gender, and time followed by four multilevel linear regression models using MLwiN. **Results:** No significant mean score differences were found in PE TE between entry point and programme completion  $F(5,282) = 1.29, p = .268$ ;  $F(5,283) = 0.66, p = .65$ . Yet, significant differences in PE TE concerning gender, teaching, coaching, and voluntary experiences were found at the intra level ( $p < .01$ ). **Discussion:** The professionalisation phase did not lead to significant advancements in PE TE. Findings support the necessity of a PE efficacy development model during professionalisation.

*Keywords:* Physical education teacher education (PETE), Assessment, Continuous professional development, Teacher efficacy.

## 56 **Introduction**

57 The greatest influence on pupils' academic attainment is often attributed to teachers' beliefs and  
58 their commitment to creating high-quality learning experiences (Burgess, 2019; Donohoo &  
59 Katz, 2017; Hattie, 2023). Teacher Efficacy is recognised internationally as being the key term  
60 used to describe a teacher's judgment of their capabilities to foster these conducive learning  
61 environments (Skaalvik & Skaalvik, 2016; Woolfolk Hoy & Spero, 2005). Highly efficacious  
62 teachers demonstrate greater instructional quality, efficient classroom management strategies  
63 (Woodcock et al., 2022) and experience lower stress levels throughout their careers (Zee &  
64 Koomen, 2016). They also have greater confidence in overcoming the challenges experienced  
65 within the classroom and are more likely to persist with the development of new skills and  
66 techniques to support student learning (Bertills et al., 2018; Holzberger et al., 2013). These  
67 factors hold significant importance for teacher educators in higher education (HE), as they play a  
68 crucial role in preparing pre-service teachers for the teaching profession.

## 69 **An understanding of physical education teacher efficacy and its contribution towards** 70 **teaching and learning in physical education**

71 Physical education (PE) teacher efficacy describes a sense of confidence in relation to the  
72 contextual competencies relevant to the teaching and delivery of PE. Many scales have been  
73 developed to examine PE teacher competencies (Biddle & Goudas, 1998; Humphries et al.,  
74 2012; Martin & Kulinna, 2003; Zach et al., 2012) and have been widely used in pre-service  
75 PE studies. Two recent PE teacher efficacy scales are credited to the work of Humphries et al.  
76 (2012) and Zach et al. (2012). Humphries et al. (2012) PE teacher efficacy scale integrates the  
77 framework of the initial PE teacher standards developed by the national association for sport and  
78 PE in the United States of America. In total there were seven factors deemed to be essential skills

79 and responsibilities of the pre-service PE teacher, these ranged from subject knowledge,  
80 accommodating skill level differences, and effective use of assessment. In comparison, Zach et  
81 al.'s (2012) PE teacher efficacy scale, developed in Turkey, shared similar themes such as the  
82 importance of subject knowledge, the ability to develop skills in a range of practical settings and  
83 planning and implementing effective learning experiences but used two factors which were  
84 challenging motivational learning and effective teacher. In addition, they used existing questions  
85 from previously validated scales (Biddle & Goudas, 1998; Martin and Kulinna, 2003). There are  
86 similarities between the scales i.e., the importance of planning, supporting individual needs and  
87 having knowledge of a range of practical activities and these are likely due to the universal  
88 demands of the day job of being a highly competent PE teacher. Yet, there are differences such  
89 as the number of questions within the scales and the emphasis placed on the ability to apply  
90 technology within a PE setting and the ability to cope with limited use of space and equipment.  
91 These differences are considered to be contextual i.e., resulting from the specific requirements of  
92 the country where the scale was developed and what the collective priorities were of the invested  
93 experts and practitioners that were involved with the development of the scales (Humphries et  
94 al., 2012; Zach et al., 2012).

95 It is widely appreciated in the literature that a teacher's perception of their PE teacher  
96 efficacy is likely to influence both the method and choice of teaching and learning activities  
97 (Capel, 2016; O'Leary et al., 2020; Richards et al., 2019). This is because teachers with a higher  
98 PE teacher efficacy have a greater ability to implement a range of teaching and learning  
99 approaches in addition to having clear learning intentions and greater feelings of control  
100 compared to teachers with a lower PE teacher efficacy (Martin & Kulinna, 2003). It is these  
101 abilities that promote students' autonomy, cognitive and affective development, leading to

102 increases in student motivation and overall learning (Ross, 1994; Zimmerman, 2000). For clarity,  
103 current evidence suggests that pre-service PE teachers enter training programmes with various  
104 levels of PE teacher efficacy (Magill et al., 2023) and it is understood that the predictors of a  
105 higher PE teacher efficacy derive from the experiences gained through teaching and learning  
106 experiences in either schools or sport clubs and the influence of role models (i.e., peers, family,  
107 and school PE teachers). Thus, the development of PE teacher efficacy, during pre-service  
108 training, often presents challenges for PE educators and these originate from the quality of the  
109 prior learning experiences (Magill et al., 2023). For example, pre-service teachers<sup>1</sup> PE  
110 experiences may differ because of the value placed on participation and engagement in PE  
111 compared to skill level and performance (Lawson, 1983a). Secondly, the exposure to a range of  
112 instructional and delivery techniques along with the opportunity to observe key figures often  
113 determines a teaching, coaching or fitness orientation (Capel, 2016; Richards & Padaruth, 2017)  
114 and this can influence a teacher's perspective towards learning approaches. Finally,  
115 predetermined pedagogical beliefs increases the task for PE educators in overcoming pre-service  
116 teachers' willingness to adopt newer teaching and learning techniques. Indeed, it is these  
117 individual factors that PE educators need to explore, develop and or foster when planning to  
118 prepare pre-service teachers for a career in teaching PE. Yet, there is little evidence or  
119 knowledge of the longitudinal development of PE teacher efficacy during pre-service training.

120 In response to the above, this study explores the longitudinal development of perceived  
121 PE teacher efficacy and the key influences impacting the progression of teacher efficacy. The

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<sup>1</sup> Pre-service teacher refers to students who are completing a three-year undergraduate physical education programme before entering a post graduate certificate in education with qualified teacher status (QTS).

122 study addresses two research objectives; (1) to investigate the development of PE teacher  
123 efficacy as pre-service teachers progress through a PE programme, and (2) to determine if  
124 various subgroups exhibit any differences in the development of PE teacher efficacy.

### 125 **Theoretical Framework**

126 The teacher socialisation in PE framework (Lawson, 1983b) was used as a theoretical aid to  
127 explore the influences upon, and progression of, PE teacher efficacy. The teacher socialisation in  
128 PE framework describes the three different phases of occupational socialisation that teachers  
129 progress through en route to becoming a qualified or certified PE teacher (Capel 2016; Prior &  
130 Curtner-Smith, 2020; Richards & Padaruth, 2017). Firstly, ‘acculturation’, is known as the  
131 period of development prior to entering teacher education, where individuals gain a variety of  
132 experiences within PE and sport and observe teachers and coaches. It is understood that a  
133 students’ past experiences in PE or sport, provides confidence in teaching ability, and develops  
134 many of the required skills for a career in teaching PE (Magill et al., 2023). This is supported by  
135 the opportunities that PE and sport provide to work with young children and to observe key role  
136 models e.g., teachers or coaches (Lawson, 1983b). Secondly, ‘professionalisation’, describes the  
137 development phase where pre-service teachers progress through a teacher training programme.  
138 This phase provides opportunity to advance subject knowledge and to understand the factors  
139 influencing pre-service teachers’ choice of teaching and learning approaches (Jayantilal &  
140 O’Leary, 2020). For example, Jayantilal and O’Leary (2020) reported that experienced primary  
141 school teachers’ interpretation of games and choice of game delivery style was influenced during  
142 innovative HE programmes because of the exposure to different teaching and learning techniques  
143 i.e., teaching games for understanding (Bunker & Thorpe, 1982). Similarly, studies have  
144 explored the change in teacher-related factors during pre-service training (Fletcher et al., 2013).

145 The teacher related factors included teachers' ability to identify as teachers of PE and their  
146 perception of self-efficacy for teaching PE. Fletcher et al. (2013) reported that the  
147 professionalisation phase enables identities as PE teachers to be formed and removes anxieties  
148 about having to teach PE as experienced during childhood. However, no significant change was  
149 found to the perception of self-efficacy for teaching PE during the programme. Thus, teacher  
150 efficacy is often known to increase during the early phases of the professionalisation phase  
151 (Braksiek, 2022; Erbas et al., 2014; Zach et al., 2012) and yet decrease when teachers come to  
152 the end of their first year of teaching (Brittain, 2023; Woolfolk Hoy & Spero, 2005). These  
153 findings prompt concern as to why teacher efficacy reduces and therefore an understanding of  
154 the progression and development of PE teacher efficacy, is warranted. The final, 'organisational'  
155 phase refers to the period where teachers learn of the values and skills required within a school  
156 throughout a teaching post (Templin et al., 2017, as cited in Richards & Gaudreault, 2017). Yet,  
157 across primary and secondary schools, worldwide, teachers in general have intentions to leave  
158 the teaching profession or have left the teaching profession due to multiple factors including  
159 stress, burnout, and workload. It is these factors that are impacting teacher efficacy and student  
160 learning (Amitai & Van Houtte, 2022; Arnup & Bowles, 2016; Rasanen et al., 2020). In  
161 England, recent census figures (DfE, 2022a) have reported that 87.6% of teachers remain in post  
162 after their first year of teaching yet this reduces to 68.7% after five years with workload largely  
163 contributing to this. Whilst teaching efficacy may not be the sole contributing factor for teachers  
164 leaving the profession it is worthwhile supporting pre-service teachers, as a means of improving  
165 teacher efficacy to support teacher retention. The teacher socialisation in PE framework  
166 (Lawson, 1983) therefore provides a structure to assist with an understanding of the influences  
167 impacting the progression of PE teacher efficacy.

168

**Methods**

169 A post-positivist research paradigm, which aims to identify explanatory associations or causal  
170 relationships through quantitative approaches, was used for this study (Cohen et al, 2018). A  
171 post-positivist approach was considered an appropriate paradigm for this study as it allowed the  
172 team to interpret a range of multiple quantitative measures. This enabled a deeper understanding  
173 of the data and to critically review participant experience, perspective, and direction of data  
174 within the context of the study (Fischer, 1998).

**175 Participants and HE Recruitment Information**

176 HE institution programmes within the England (also known as university for individuals post 18)  
177 were targeted for this study. Recruitment by invitation was sent to HE institutions across  
178 Northern and Central England and a total of six institutions volunteered to participate in the  
179 study. All six participating institutions had well established PE programmes, and these sat within  
180 either the institutes school of education or school of sport science. Physical education  
181 programmes were required to meet the eligibility criteria of (1) an undergraduate programme of  
182 three to four years (2) physical education, PE and school sport or PE and sport formed part of the  
183 programme title (3) provided content relevant for a career in teaching PE and (4) integrated both  
184 practical and theoretical knowledge of PE. Five programmes enabled students to graduate with a  
185 BSc (Hons) in PE, with one providing a BA (Hons) in PE and school sport. All programmes  
186 were full time and for a duration of three years. On successful completion of each programme,  
187 graduates may apply for and complete a 12 month post graduate teacher training programme  
188 with specialism in PE to attain qualified teacher status (QTS) in either their home institution or at  
189 different institutions across the UK. All participating programmes had similar aims with four  
190 common themes prevalent across each programme (1) preparation for career in education, PE

191 and or physical activity (2) application of practical skills including school placements (3)  
192 knowledge and understanding of inclusive practice and (4) theoretically informed pedagogical  
193 principles. Graduates who decide not to enter the teaching profession are equipped with skills to  
194 support a career in either coaching, special educational needs, armed forces, or further education.  
195 A purposive sample of 287 pre-service teachers took part in an online questionnaire. The data  
196 was collected at the beginning of the students' first academic year of study (phase 1, 2019-2020)  
197  $n = 166$  (54% female  $n = 90$  and 46% male  $n = 76$ ) and using the same pre-service teachers in  
198 their final academic year (phase 2, 2021-2022)  $n = 121$  (57% female  $n = 69$  and 43% male  $n =$   
199 52). The average age of participants in phase one was 19.5 years (M) (SD = 1.98) and in phase  
200 two 21.3 years (M) (SD = 1.44), with 95% of the participants being white British. It is important  
201 to note that 45 fewer students responded to the questionnaire in phase two suggesting some may  
202 have left the programme or unable to complete the questionnaire and or exercising their right to  
203 withdraw without providing a reason. Ethical approval was gained from the lead author's  
204 institution (Ethics reference 19/SLN/013).

### 205 **Data Collection**

206 To enable the students access to the online questionnaire, the lead researcher emailed the  
207 electronic link to a staff member from the participating institutions. For most, the liaising staff  
208 member was the programme leader at each participating institution. Pre-service teachers were  
209 informed that participation was voluntary and implied consent was assumed. The questionnaire  
210 took 10 – 15 minutes to complete and consisted of two sections. Each section required pre-  
211 service teachers to respond to approximately 5 - 20 questions. Prior to the questionnaire being  
212 sent to the participants, the authors met to ensure that the questionnaire accurately addressed the

213 aims of the study, and that the questionnaire could be completed online seamlessly without any  
214 disruption. In addition, the team felt confident in using the validated PE efficacy scale, which has  
215 been used in previous studies (Magill et al., 2023; Zach et al., 2012).

### 216 *Questionnaire Section One: Previous teaching, coaching or voluntary experiences*

217 Pre-service teachers were asked to report upon their level of teaching, coaching and voluntary  
218 experiences, this is because existing research supports that these experiences influence teacher  
219 efficacy (Choi et al, 2020; Magill et al, 2023). To investigate the range of teaching, coaching and  
220 voluntary experiences, a five-point Likert scale was used for each question, and included a scale  
221 of one (no experience) to five (regular weekly experiences). Demographic data collected in this  
222 section included age, gender, ethnicity, year of study and institution.

### 223 *Questionnaire Section Two: Current perceived PE teacher efficacy*

224 PE teacher efficacy was examined using the PE teacher efficacy scale devised by Zach et al.  
225 (2012) as used in their study to investigate the changes to PE teacher efficacy in pre-service  
226 teachers. This questionnaire consisted of 22 items on an analogue response scale of one (low  
227 efficacy) to ten (high efficacy). Example items from this scale include ‘How confident are you in  
228 your ability to identify incorrect performances and provide appropriate feedback?’ and ‘How  
229 confident are you in your ability to cope with constraints (such as lack of space or equipment)?’  
230 The PE teacher efficacy scale has proven good reliability (Cohen’s kappa .83 - .99) (Zach et al.,  
231 2012) and no modifications were made to the questionnaire prior to its use. This scale was  
232 selected because of its greater reliability to the PE curriculum in England and to support the  
233 ease and time of completing the questionnaire for participants.

## 234 **Data Analysis**

### 235 *Stage One*

236 The statistical package for the social sciences (SPSS version 26) was used for the preliminary  
237 analysis. This examined the mean score values for the dependent variable (PE teacher efficacy)  
238 and the independent variables: (a) teaching, coaching, and voluntary experiences, (b) institution,  
239 (c) gender, (d) time and (e) data collection point. Data screening was performed to exclude  
240 conspicuous and incomplete responses. A one-way analysis of variance (ANOVA) was then  
241 applied to examine variances across institutions, gender, and time. The effect size was calculated  
242 using Cohen's *d* formula and using the following scale: small (0.2), medium (0.5), and large (0.8  
243 or greater) as defined by Voght and Burke Johnson (2016) effect size was interpreted.

#### 244 *Stage Two*

245 MLwiN was used to investigate the longitudinal development of PE teacher efficacy and its  
246 influencing factors through multilevel modelling. Four multilevel linear regression models were  
247 used to understand the hierarchy of the data, and both inter (examination of data across  
248 institutions) and intra (examination of data within institutions) analysis was conducted:

249 (1) Model 1 (Institutional and across institutions, and time)

250 (2) Model 2 (Institutional, across institutions, gender, and time)

251 (3) Model 3 (Institutional and across institutions, gender, teaching, coaching and voluntary  
252 experiences, and time)

253 (4) Model 4 (Institutional and across institutions, gender, teaching, coaching and voluntary  
254 experiences, time, and data collection point)

255 The fit of these models was assessed using the 2\*loglikelihood measure. The  $\chi$ -square statistic  
256 was used to evaluate the significance of the relationship and its predictive power for the  
257 dependent variable by comparing the 2\*loglikelihood values between the base model and the  
258 model that included the explanatory variables.

**259 Trustworthiness**

260 To increase the trustworthiness of the analyses, the lead researcher attended a four-day intense  
261 training course on MLWinN. In addition, the results and findings of the study was shared and  
262 deliberated with the experienced quantitative researchers and mathematicians within the team.

**263 Results****264 Participant Information**

265 Participant demographics demonstrated consistent gender representation, however females had a  
266 slightly higher proportion across the two phases (54% in phase one, 57% in phase two). Career  
267 aspirations, at phase one, found that most students (90%) expressed intentions to progress into  
268 either primary (18%), or secondary (72%) teacher training programmes with a remaining 10%  
269 reporting other. However, this decreased to 88% in phase two, attributable to a shift towards  
270 primary education (24%), and an increase in those considering alternative career paths (12%).  
271 Alternative career pathway comments included ‘further study,’ ‘coaching within a community  
272 setting,’ and ‘unsure/gap year.’ Across both phases, a large effect size ( $d = 1.84$  phase 1) was  
273 found between PE teacher efficacy and the factors of teaching, coaching, and voluntary  
274 experiences ( $d = 1.81$  phase 2). A statistically significant difference emerged between males and  
275 females concerning their extent of teaching, coaching, and voluntary experiences  $F(1,285) =$   
276  $7.92, p = .005$ ), resulting in a small effect size of  $d = 0.37$ . Females reported a higher mean score  
277 value for teaching, coaching and voluntary experiences ( $M = 2.95$ ) in comparison to males ( $M =$   
278  $2.65$ ).

**279 Phase One**

280 **Objective: (1) To investigate the development of PE teacher efficacy through a pre-service**  
281 **programme**

282 A one- way ANOVA yielded no statistical significant difference across institutions (inter level)  
283 between mean scores over time for PE teacher efficacy  $F(5,282) = 1.29, p = .27$ ) and a negative  
284 average small effect size of  $d = -0.11$  was found. These results confirm the significance of the  
285 values gained that represent the progression of PE teaching efficacy as presented in **Table 1**.  
286 Specifically, institution one had slightly lower mean values (M 6.26 and M 6.65) across the two  
287 collection points however institutes two and five scored below institute one at collection point  
288 two (M 4.36 and M5.77). Four out of the six institutions (2,3,5, & 6) observed a downward trend  
289 in mean PE teacher efficacy score by the end of the programme with two institutions observing a  
290 small increase (1 & 4) in efficacy development. No significant difference between mean scores  
291 was also found for teaching, coaching and voluntary experiences  $F(5,283) = 0.66, p= .65$ ).  
292 Similarly, a small average negative effect size  $d = -0.08$  was observed across all pairs of groups.  
293 A marginal increase in teaching, coaching and voluntary experiences was detected for students  
294 within institute one with the remaining five institutions experiencing a downward trend  
295 throughout the duration of the programme (**Table 1**).

296 **Phase Two: Objective (2) To determine if various subgroups exhibit any differences in the**  
297 **development of PE teacher efficacy.**

298 In this phase, a multilevel modelling approach was employed, to support the hierarchical nature  
299 of the data. This technique accounts for the nested structure of data, where repeated measures of  
300 PE teacher efficacy for individual students (Level 1) were nested within pre-service cohorts  
301 (Level 2), who were in turn nested within different institutions (Level 3) (Rasbash et al, 2009).  
302 To compare the differences in efficacy scores across institutions, institution 1, with its mean PE  
303 teacher efficacy score (M = 6.67) and standard error (SE = 0.26), was used as the reference group  
304 (dummy variable).

305 ***Model 1: Exploration of the long-term differences of PE teacher efficacy across institutions***

306 Model 1 analysis of the long-term development of PE teacher efficacy revealed no significant  
307 differences in the pooled sample of all institutions of TE ( $p = 0.78$ ). However, significant intra-  
308 institutional differences for TE were found ( $p < 0.01$ ) including small but statistically significant  
309 changes of TE over time ( $p < 0.001$ ). The 2\*loglikelihood for model 1 was determined to be  
310 1078.5 (**Table 2**).

311 ***Model 2: Exploration of the influence of gender on PE teacher efficacy development***

312 In model 2, the impact of gender on teaching efficacy variations at the inter level was evaluated.  
313 The mean efficacy score for females was 7.09 (SE = 0.17) and for males 6.81 (SE = 0.31). There  
314 was no significant difference in the inter-institutional mean efficacy variation for gender ( $p =$   
315 0.43). However, we did find a significant difference in the intra-institution variance among  
316 students with regards to gender ( $p < 0.01$ ). When gender was added to the model, the  
317 2\*loglikelihood outcome dropped to 1064.0, suggesting that gender might play a role in  
318 determining PE teacher efficacy. A subsequent  $\chi$ -square test confirmed a significant contribution  
319 of gender to the model ( $p < 0.01$ ), thus establishing it as a small yet significant determinant of PE  
320 teacher efficacy (**Table 3**).

321 ***Model 3 Exploration of the influence of gender, teaching, coaching and voluntary experiences***  
322 ***on PE teacher efficacy development.***

323 Model 3 assessed the difference in the long-term development of students' efficacy at the inter  
324 level, with gender and teaching, coaching, and voluntary experiences as additional factors.  
325 Efficacy variation between institutions, fixed for gender and experiences, was non-significant ( $p$   
326 = 0.40), as was the variance in PE teaching efficacy at the student level with respect to gender

327 and experiences ( $p = 0.37$ ). However, when we incorporated gender, teaching, coaching and  
328 voluntary experiences at the intra level this led to a reduced log-likelihood value of 1027.5.  
329 Further analysis using  $\chi$ -square demonstrated a significant model difference ( $p < 0.001$ ),  
330 suggesting that these factors significantly contribute to efficacy variation at the intra level (**Table**  
331 **4**). When we calculated the effect sizes between PE teacher efficacy and gender ( $d = 0.03$ ), and  
332 gender and teaching experience ( $d = 0.15$ ), they similarly revealed their small influence on  
333 teacher efficacy.

334 ***Model 4: Exploration of the influence of time collection point on PE teacher efficacy***  
335 ***development.***

336 The final model (4) investigated the change in teacher efficacy between first and final year pre-  
337 service teachers. A significant difference in teacher efficacy amongst students at the intra level  
338 was found when controlling for gender and teaching, coaching, and voluntary experiences, and  
339 time collection point ( $p < 0.001$ ). However, these results should be taken with caution as the  
340  $2 \times \log$ likelihood for model 4 (1027.3) showed marginal deviation from that observed in model 3  
341 (1027.5). Follow up  $\chi$ -square statistical analysis revealed no substantial influence of time on PE  
342 teacher efficacy observed within institutions ( $p = 0.60$ ). Therefore, the addition of the collection  
343 time point did not significantly enhance the model (**Table 5**).

344 **Discussion**

345 The purpose of the study was to investigate the longitudinal development of perceived PE  
346 teacher efficacy and to understand the key influences impacting the progression of teacher  
347 efficacy during pre-service PE training. The results indicate PE teacher efficacy mean scores  
348 were relatively high (8.04 to 6.25) in phase one and are comparable to a high mean (7.9) found in

349 Zach et al. (2012). This high level of PE teaching efficacy may reflect teaching and learning  
350 experiences gained prior to the beginning of the programme which Magill et al. (2023) identify  
351 as being a key predictor of PE teacher efficacy developed during the acculturation phase.  
352 However, the professionalisation phase, at the inter level, provided no significant advancement  
353 to the development of PE teacher efficacy as teacher efficacy mean scores ranged from 7.77 to  
354 4.36 during phase two. The factors contributing to this reduction may include the amount of  
355 teaching, coaching and voluntary experiences, and gender influences during the  
356 professionalisation phase.

### 357 **The development of PE teacher efficacy**

358 There was no significant change to the perception of PE teacher efficacy for students at the inter  
359 level even though pre-service teachers reported various baseline perceptions of efficacy on entry.  
360 Similarly, no significant difference between mean scores for teaching, coaching and voluntary  
361 experiences at the inter level was found. Yet, we did find a large effect size across both phases of  
362 the study when examining PE teacher efficacy and teaching, coaching and voluntary experiences.  
363 Thus, supporting a powerful relationship between these variables. Further analysis confirmed a  
364 significant intra-institutional difference and small but statistically significant difference in pre-  
365 service PE teacher efficacy when incorporating gender, teaching, coaching and voluntary  
366 experiences. In addition to this, we also found a small influence on PE teacher efficacy when  
367 calculating the effect sizes between PE teacher efficacy and gender, and gender, teaching,  
368 coaching and voluntary experiences. These results support that PE teacher efficacy is strongly  
369 linked to context related experiences and gender influences that require further exploration.

### 370 **Understanding the influences on the long-term development of PE teacher efficacy**

371 Pre-service teachers entered PE programmes with a perceived teacher efficacy that we suspect  
372 may have derived from the acculturation phase as identified in the PE socialisation framework  
373 (Lawson, 1983b; Magill et al., 2023). However, this assumption is based on there being no  
374 significant change to PE teacher efficacy scores on entry and at the end of a PE programme at the  
375 inter level. We acknowledge further research and exploration of this is warranted. Yet, findings  
376 do align to previous literature that similarly identifies the limited impact of the influences of  
377 professionalisation during teacher training programmes (Lawson, 1983b; Richards et al., 2019).  
378 We are also aware that current and previous empirical studies have confirmed that pre-service  
379 teachers feel less efficacious towards the end of a formal teacher training programme or  
380 certification process (Brittain, 2023; Woolfolk Hoy & Spero, 2005). One potential reason for the  
381 constrained advancement in PE teacher efficacy, as indicated in this study, might be that pre-  
382 service teachers gained a clearer understanding of the challenges and expectations associated  
383 with the teaching profession as they acquired more knowledge and skills throughout the  
384 programme (Casey & Dyson, 2009). Importantly, our findings highlight the need to understand  
385 these influences impacting the development of PE teacher efficacy further.

386       Whilst we observed no significant change to the amount of teaching, coaching and  
387 voluntary learning experiences gained at the inter level, we acknowledge that pre-service  
388 teachers contextual learning experiences varied at the intra level. These findings support the need  
389 for PE educators to adapt practice accordingly. For example, to progressively challenge pre-  
390 service teachers with fewer experiences and a lower perceived teacher efficacy to develop skills  
391 and practices. It is important to note, however, that the assessment of teaching, coaching and  
392 voluntary experiences within this study also included the external opportunities to engage in  
393 contextual learning environments. For example, participation in sport, and teaching and or

394 coaching opportunities within a school or club setting to gain additional work-related  
395 experiences. A reason for the non-significant development of teacher efficacy, during the  
396 professionalisation phase within this study, may link to the impact of COVID-19. In the UK,  
397 lockdown measures, because of the pandemic, were introduced from March 2020, at the end of  
398 the participating pre-service teachers first year of study and into their second year. This meant  
399 that during this time lectures were facilitated online and there was limited opportunity for pre-  
400 service teachers to gain work-related learning experiences (school placements) or to volunteer  
401 within a school environment (Centeio et al., 2021; O'Brien et al., 2022). In addition to this, pre-  
402 service teachers' participation in regular sport and or networking opportunities were reduced  
403 which meant that any influences from role models or guidance and support from teachers, peers,  
404 and or coaches, was limited. In support of this, we understand that COVID-19 resulted in  
405 additional workload for pre-service teachers, because of the complexities of online learning, and  
406 anxiety for pre-service teachers who were unable to complete school experience placements,  
407 resulting in a lower perceived teacher efficacy (Centeio et al., 2021; O'Brien et al., 2022).  
408 Although pre-service teachers, within this study, returned to near normal conditions during their  
409 third year (2021-2022), a substantial proportion of key learning experiences, within a school  
410 environment, had been missed. It is therefore possible that pre-service teachers may have relied  
411 upon their perceptions of teacher efficacy prior to lockdown and even in their final year of study.  
412 Further exploration of the level of contextual influences required to support efficacy  
413 development during professionalisation, is therefore required.

414 The influence of gender and teacher efficacy beliefs was also found to be non-significant at  
415 the inter level and similarly we understand this aligns with previous literature Sarfo et al. (2015).  
416 Yet, we are aware that the perception of some teaching and learning approaches, such as

417 instructional techniques and classroom management skills, can differ amongst gender and favour  
418 females (Sarfo et al., 2015). Our findings, at the intra level, support gender as a determinant of  
419 PE teacher efficacy and overall females had significant more contextual teaching, coaching and  
420 voluntary experiences. Therefore, female participants within this study may have felt more  
421 efficacious towards several teaching and learning skills, resulting from their increased number of  
422 contextual experiences. This may also support why female pre-service teachers tend to develop a  
423 teacher-centred orientation during acculturation in comparison to males (Richards et al., 2019).  
424 Nonetheless, we recognise that pre-service teacher's perception of PE teacher efficacy is varied  
425 and influenced by teaching, coaching and voluntary experiences and gender at the intra level.

426 To aid higher education institutions in developing the PE teacher efficacy of pre-service  
427 teachers, we recommend the integration of a PE teacher efficacy development model during the  
428 professionalisation phase. As suggested by Magill et al. (2023) this model could include  
429 discussions centred around prior learning experiences acquired during acculturation, the  
430 provision of personalised learning experiences (e.g., teaching, coaching and voluntary  
431 experiences that are unique to the development needs of the pre-service teacher), and  
432 complemented by reflective classroom discussions throughout. The model may lead to highly  
433 efficacious pre-service PE teachers.

#### 434 **Limitations**

435 The study has limitations that we would like to acknowledge. Firstly, final year pre-service  
436 teachers were asked to complete the questionnaire mid-way through their final year of study  
437 instead of at the end of their studies. This may have influenced pre-service teachers' perception  
438 of efficacy because there were elements of the programme yet to be delivered, albeit limited.  
439 However, the timing of the data collection was to ensure that all final year pre-service teachers

440 had access to the questionnaire. We are also aware that there is limited cultural diversity  
441 examination across the study or any depth to the investigation concerning contextual learning  
442 experiences. Our study has several strengths. The data and findings are novel to PE, as very few  
443 studies have investigated the longitudinal development of PE teacher efficacy. In addition to this,  
444 the longitudinal nature of the study and advanced analytical techniques add merit and originality  
445 to the study.

### 446 **Conclusions**

447 The results provide evidence to reinforce that acculturation phase of teacher socialisation  
448 provides a strong influence towards the perception of PE teacher efficacy. Yet, the  
449 professionalisation phase had little impact on the development of PE teacher efficacy. The  
450 reasons for this may be explained by the varied experiences gained during acculturation and, at  
451 the intra level, significant differences in the perceived PE teacher efficacy between genders and  
452 their amount of teaching, coaching and voluntary experiences.

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591 **Table 1**592 *Descriptive Statistics [Means and Standard Deviations ( $M \pm SD$ )] of PE Teacher Efficacy and*593 *Teaching/Coach Experience*

Institute Number	Collection Point	PE Teacher Efficacy		Teaching/Coaching Experience	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
1	1	6.26	0.51	2.20	0.70
	2	6.65	0.62	2.85	0.87
2	1	7.25	1.30	2.50	0.71
	2	4.36	1.57	2.33	0.00
3	1	7.32	0.42	3.05	0.82
	2	7.07	0.51	2.73	0.98
4	1	6.72	1.30	3.33	0.00
	2	7.77	1.57	2.33	0.94
5	1	7.77	0.58	3.23	0.90
	2	5.77	0.70	3.20	0.88
6	1	8.04	0.65	3.25	1.08
	2	7.76	0.79	2.75	0.71

**Table 2***Model 1: Exploration of the Long-Term Differences of PE Teacher Efficacy Across**Institutions*

	$\sigma^2$ SE	Z	P
Variance of efficacy around the mean of the institutions	[0.02(0.06)]	0.28	0.78
Institutions and variance amongst students within each institution	[1.29(0.43)]	3.02	<0 .01
Student variance over time	[2.30(0.39)]	5.89	<0.001

*Note.* \*\*  $p < 0.01$  \* $p < 0.05$

**Table 3***Model 2: Exploration of the Influence of Gender on PE Teacher Efficacy Development*

	$\sigma^2 SE$	Z	P
Variation of the mean between institutions for Gender	[0.18(0.22)]	0.80	0.43
Institutions of the mean and variance amongst students at each institution	[1.19(0.42)]	2.87	<0.01
Variations between each student and collection time points	[2.27(0.38)]	5.92	<0.001

Note. \*\*  $p < 0.01$  \* $p < 0.05$

**Table 4***Model 3: Exploration of the Influence of Gender, Teaching, Coaching and Voluntary**Experiences on PE Teacher Efficacy Development*

	$\sigma^2 SE$	Z	P
Variations of efficacy between institutions fixed with gender and teaching and coaching experiences	[0.17(0.21)]	0.83	0.40
Variance amongst teaching and gender and coaching experiences within institutions student level variation	[0.20(0.22)]	0.90	0.37
Variation of teaching efficacy among students within institutions with fixed gender and teaching and coaching experience variations between collection time points	[1.97(0.34)]	5.74	0.001

Note. \*\*  $p < 0.01$  \* $p < 0.05$

**Table 5***Model 4: Exploration of PE Teacher Efficacy Development Inclusive of Time Collection*

	Model 1		Model 2		Model 3		Model 4	
<b>Fixed Part</b>								
	$\beta$	<i>SE</i>	$\beta$	<i>SE</i>	$\beta$	<i>SE</i>	$\beta$	<i>SE</i>
Intercept (Cons)	6.97	0.14	7.09	0.17	5.38	0.41	5.42	0.42
Sex (Male)			-0.28	0.31	-0.15	0.30	-0.15	0.30
Teaching/Coaching Experience					0.59	0.12	0.59	0.12
Collection Point							-0.11	0.20
<b>Random Part</b>								
Intercept								
	$\sigma^2$	<i>SE</i>	$\sigma^2$	<i>SE</i>	$\sigma^2$	<i>SE</i>	$\sigma^2$	<i>SE</i>
Institution	0.02	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Student Level	1.29	0.43	1.19	0.42	4.60	2.39	4.78	2.41
Collection Point	2.30	0.39	2.27	0.38	1.97	0.34	1.95	0.34
Slope								
			$\sigma^2$	<i>SE</i>	$\sigma^2$	<i>SE</i>	$\sigma^2$	<i>SE</i>
Sex			0.18	0.22	0.17	0.21	0.17	0.20
Teaching/Coaching Experience					0.20	0.22	0.21	0.22
Covariances								
			$\sigma^2$	<i>SE</i>	$\sigma^2$	<i>SE</i>	$\sigma^2$	<i>SE</i>
Sex			0.00	0.00	0.00	0.00	0.00	0.00
Institution					-0.93	0.72	-0.97	0.73
<b>Model Fit</b>								
Loglikelihood 2*	1078.46		1064.02		1027.54		1027.26	
<i>P</i>			<0.01		<0.00		0.60	

Note. \*\* $p < 0.01$  \* $p < 0.05$