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2 **Emotional self-efficacy, conduct problems, and academic attainment:**
3 **Developmental cascade effects in early adolescence**

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19

20 **Abstract**

21

22 The study is amongst the first of its kind to utilise developmental cascade
23 modelling in order to examine the inter-relations between emotional self-
24 efficacy, conduct problems, and attainment in a large, nationally
25 representative sample of English adolescents ($n = 2,414$, aged 11 years).
26 Using a 3-wave, longitudinal, cross lagged-design, we tested three cascading
27 hypotheses: adjustment erosion, adjustment fortification, and academic
28 incompetence. A fourth hypothesis considered the role of shared risk.
29 Results supported small effects consistent with the cascade hypotheses, and
30 a small but significant effect was found for shared risk. Strengths and limits of
31 the study are considered alongside a discussion of the implications for these
32 findings.

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37 Keywords: emotional self-efficacy; conduct problems; attainment;

38 developmental cascade

39 **Introduction**

40

41 Developmental cascades are, “the cumulative consequences for
42 development of the many interactions and transactions occurring in
43 developing systems that result in spreading effects across different levels,
44 among domains at the same level, and across different systems or
45 generations” (Masten & Cicchetti, 2010, p.491). Drawing on ecological and
46 developmental systems theories (e.g. Bronfenbrenner, 2005; Lerner &
47 Castellino, 2002), the body of work in this area predicts that functioning in
48 different domains, levels, or systems are developmentally related. Namely,
49 successful accomplishment of developmental tasks in a given domain
50 provides a scaffold for later functioning in the same and other domains;
51 equally, failures in these tasks can trigger negative cascade effects. In this
52 paper we use a developmental cascade model to examine longitudinal inter-
53 relationships between emotional self-efficacy, behaviour problems, and
54 academic attainment in early adolescence. The model is used to test three
55 key hypotheses in the study of developmental cascades – adjustment erosion,
56 academic competence, and shared risk (Moilanen, Shaw, & Maxwell, 2010) –
57 and a fourth prediction drawing on the positive youth development perspective
58 (Lewin-Bizan, Bowers, & Lerner, 2010), which we term ‘adjustment
59 fortification’.

60

61 **Developmental cascades in adolescence**

62

63 Our focus on adolescence is driven by the fact that this period is
64 marked by major physical, psychological, behavioural, and contextual
65 changes, including the onset of puberty, the transition to secondary school,
66 and substantial neurological reorganisation (Coleman, 2011). Adolescence is
67 a captivating, critical life stage that has important repercussions for later life
68 (Hagell, Coleman & Brooks, 2013). This is particularly true of the domains of
69 functioning that we examine in the current study. For example, we know that
70 up to 50% of adult mental health problems have their first onset in
71 adolescence (Belfer, 2008). Similarly, academic competence in adolescence
72 predicts future academic success and transition to the workplace (Ek, Sovio,
73 Remes & Jarvelin, 2005). What is less known currently is the nature of inter-
74 relationships between these domains during this important period. We also
75 know relatively little about the potential role played by adolescents' emotional
76 self-efficacy in interrupting symptom-driven pathways and promoting positive
77 adjustment.

78

79 Extant research on developmental cascades typically tests one or more
80 of three key hypotheses. First, the *adjustment erosion* model predicts that
81 mental health problems lead to later academic difficulties (Moilanen et al.,
82 2010). For example, aggressive and disruptive behaviour can undermine
83 academic progress because of its effect on relationships with school staff and
84 peer acceptance. This is particularly salient in early adolescence because of
85 the increased emphasis on academic ability and reduced tolerance for
86 disruption seen in secondary education (Humphrey & Ainscow, 2006).
87 Research by Moilanen et al (2010) offers support for this hypothesis, with high

88 levels of externalising difficulties in middle childhood predicting low academic
89 competence in early adolescence. Second, the *academic incompetence*
90 model suggests that difficulties relating to academic competence can trigger
91 or exacerbate mental health problems (Moilanen et al., 2010). Youth who are
92 less academically able may experience considerable frustration and
93 disaffection that eventually manifests as aggressive and disruptive behaviour.
94 As above, this is a particularly critical consideration in adolescence given the
95 increasingly high stakes nature of academic assessments in secondary
96 education. By way of illustration, Vaillancourt, Brittain, McDougall, and Duku's
97 (2013) recent study evidenced clear cascade effects of low academic grade
98 point average on later externalising behaviour problems in the late childhood-
99 early adolescence period. Finally, the *shared risk* model stipulates that
100 cascade effects such as those outlined above are a function of other variables
101 that affect multiple domains of development more generally. For instance,
102 economic disadvantage (often categorised in education research as eligibility
103 for free school meals (Gorard, 2012)) is a well-known risk factor for lower
104 academic attainment (Department for Education, 2015) and higher social-
105 emotional difficulties (Bradley & Corwyn, 2002). This has been attributed to a
106 number of factors including a lack of ease or unwillingness to access
107 resources and associated parental beliefs and behaviours around education
108 (Davis-Kean, 2005). Also, research consistently demonstrates that being
109 identified as having special educational needs (an expansive term in education,
110 denoting particular needs or disabilities beyond a school's resource
111 capabilities) puts a child at risk of experiencing significantly worse academic
112 and psychosocial outcomes through the course of schooling (e.g. Department

113 for Education, 2013, Van Cleave & Davis, 2006). This is attributable to a
114 number of causes, including an over-representation as victims of bullying
115 (Monchy et al., 2004; Van Cleave & Davis, 2006) and poor social relationships
116 (Frostad & Pijl, 2007, Pijl et al., 2008; Valäs, 1999). These outcomes are, of
117 course, deeply inter-related (Frederickson & Furnham, 2004; Kaukiainen et al.,
118 2002). However, these factors have not been fully explored within a
119 developmental cascades framework. Deighton et al.'s (under review) recent
120 study provides some confirmatory evidence, demonstrating that pathways
121 from academic attainment to later internalising and externalising problems
122 were rendered insignificant once socio-economic and disability status was
123 taken into account in their late childhood sample, warranting further
124 investigation.

125

126 The aim of the current study was to extend understanding of
127 developmental cascade processes by addressing several gaps, limitations,
128 and inconsistencies in the existing evidence base. First, sample sizes are
129 often modest (e.g. $n = 85$ in Bornstein, Hahn, & Suwalsky, 2013b) and drawn
130 from highly specified populations (e.g. McCarty et al.'s (2008) study of
131 adolescent girls from low-income households). This reduces test sensitivity
132 (Masten et al., 2005) and limits generalizability and comparability of findings
133 (Deighton et al., under review). Hence, we drew upon a large, representative
134 sample of adolescents. Second, most studies in this area have been carried
135 out in North America. Transferability of findings cannot be assumed because
136 the cultural context is a primary component of the developmental eco-system.
137 For example, socialisation practices relating to emergent behaviour problems

138 can vary across countries and cultures (Chen, Huang, Chang, Wang, & Li,
139 2010). The current study is among the first of its kind in England. Third,
140 following Deighton et al (under review), we took the opportunity to extend
141 assessment of shared risk to include disability status, which has been
142 neglected in previous research despite its associations with both academic
143 achievement (Department for Education, 2013) and conduct problems (Green,
144 McGinnity, Meltzer, Ford, & Goodman, 2005). Fourth, developmental
145 cascade research has traditionally focused on symptom-driven pathways, with
146 less attention paid to the potential fortifying effects of positive adjustment in
147 key developmental domains (Lewin-Bizan et al., 2010). Thus, we sought to
148 integrate a positive youth development perspective by assessing the cascade
149 pathways emanating from and to adolescent emotional self-efficacy.
150 Emotional self-efficacy as a positive adjustment marker carries considerable
151 intuitive appeal; emotion regulation and social problem-solving skills are likely
152 to influence both behaviour and learning in the school context (Qualter,
153 Gardner, Pope, Hutchinson, & Whiteley, 2012; Qualter, Dacre-Pool, Gardner,
154 Ashley-Kot, Wise, & Wols, 2015). Accordingly, emotional self-efficacy forms a
155 key aspect of many non-cognitive school based interventions (Durlak,
156 Weissberg, Dymicki, Taylor, & Schellinger, 2011; Sklad, Diekstra, Ritter, &
157 Ben, 2012; Wigelsworth et al., in press). Both its hypothetical presence and
158 empirical measurement have typically assumed a linear development (as
159 proposed above), but our understanding of this relationship is incomplete with
160 further consideration of the potential inter-relations within a cascade model.
161 For instance, to what extent do conduct problems mediate the relationship
162 between emotional self-efficacy and academic attainment across time?

163

164 Finally and critically, research findings pertaining to the adjustment
165 erosion, academic incompetence and shared risk hypotheses have been
166 inconsistent. For example, in contrast to the findings of Moilanen et al. (2010)
167 outlined above, Romano, Babchishin, Pagani, and Kohen (2010) found no
168 significant links between behaviour problems and later attainment. Thus, the
169 current study confers an opportunity to provide further clarification of the
170 nature and magnitude of developmental cascade effects.

171

172 **Aims and objectives**

173

174 The primary aim of the current study was to examine the longitudinal inter-
175 relationships between emotional self-efficacy, behaviour problems and
176 academic attainment in early adolescence. To achieve this aim, we sought to
177 test four hypotheses, as follows:

178

- 179 1. **Adjustment erosion** – early behaviour problems will lead to later
180 academic difficulties (H1a) and lower emotional self-efficacy (H1b).
- 181 2. **Adjustment fortification** – early emotional self-efficacy will lead to
182 enhanced academic attainment (H2a) and reduced behaviour problems
183 (H2b).
- 184 3. **Academic incompetence** – early academic difficulties will lead to later
185 behaviour problems (H3a) and lower emotional self-efficacy (H3b).

186 4. **Shared risk** – cascading effects in H1-3 above are attributable to
187 common cause risk markers, specifically socio-economic and disability
188 status.

189

190 In each of the above hypotheses, we examine cross-time cascading
191 effects, whilst controlling for cross-time, within-domain stability, and within-
192 time, cross-domain co-variance (see ‘analytical strategy’).

193

194 **Method**

195

196 The study utilizes secondary analysis of data from a government-
197 funded evaluation of a universal social-emotional learning intervention in
198 English secondary schools (Humphrey, Lendrum, & Wigelsworth, 2010).
199 Here we make use of a longitudinal, cross-lagged panel design with 3 annual
200 waves of measurement – T1, T2 and T3 (T1 and T3 only for academic
201 attainment – see below).

202

203 ***Participants***

204

205 The final sample was made up single cohort of 2,414 children. All
206 children were in their first year of secondary education (year 7, aged 11 years)
207 at T1, drawn from 41 geographically diverse secondary schools in England.
208 One sample *t*-tests confirmed that the study sample mirrored national norms
209 in terms of attainment, attendance, proportion of children eligible for free
210 school meals (FSM) (as a proxy for socio-economic status) and proportion of

211 children with special educational needs (SEN) (as a proxy for disability status)
212 at the school level, and sex, ethnicity, FSM eligibility and SEN status at the
213 child level. Study schools were shown to be slightly larger than is seen
214 nationally.

215

216 Approximately 53.5% ($N=1291$) of the study sample were female,
217 82.6% ($N=1994$) were classified as 'White British', 9.9% ($N=239$) were
218 identified as eligible for FSM, and 12.9% ($N=312$) were identified with SEN.

219

220 ***Measures***

221

222 *Conduct problems*

223

224 Conduct problems (CP) were assessed using the relevant subscale in
225 the self-report version of the Strengths and Difficulties Questionnaire (SDQ)
226 (Goodman, 1997). This 25-item (5 items in the CP subscale) behavioural
227 screening measure requires respondents to endorse a series of descriptive
228 statements (e.g. 'I get very angry and lose my temper') on a three-point scale
229 (0 = not true, 1 = somewhat true, and 2 = certainly true). The SDQ has robust
230 psychometric characteristics (Goodman, 2001) and is amongst the most
231 widely used measures of its kind (Johnston & Gowers, 2005). In the current
232 sample, α ranged between .611 - .633 across each year the subscale was
233 used. This is approximately consistent to a reported alpha value of .60 for the
234 conduct problems subscale in a community sample of 5-15 year olds
235 (Goodman, 2001).

236

237 *Emotional self-efficacy*

238

239 Emotional self-efficacy (ESE) was measured using the Emotional
240 Literacy Assessment and Intervention (ELAI) instrument (Southampton
241 Psychology Service, 2003). This is a 25-item self-report survey that assesses
242 emotion-related dispositions and self-perceptions, producing a single,
243 broadband indicator. Traditionally this has been branded 'trait emotional
244 intelligence' but ESE is an increasingly used synonym (Petrides, Furnham, &
245 Mavroveli, 2007). Respondents endorse descriptive statements (e.g., 'I am
246 aware of my own strengths and weaknesses') using a 25-point scale. The
247 ELAI has acceptable psychometric properties (Southampton Psychology
248 Service, 2003). α ranged between .752-.762 across each year the scale was
249 used.

250

251 *Academic attainment*

252

253 Measures of academic attainment were extracted from a governmental
254 database (the National Pupil Database – NPD) and represented compulsory
255 academic testing at the end of Key Stages of education¹. Key Stage
256 assessments record children's attainment in the core curriculum subjects of
257 English, Math, and Science. These were aggregated in the current study. We
258 utilised children's Key Stage 2 (KS2) and Key Stage 3 (KS3) attainment
259 scores, which aligned with T1 and T3 (but use different scoring scales). No

1

260 compulsory testing occurred at T2 – hence, this is absent from the panel
261 design.

262

263 *Shared risk*

264

265 Additional data extracted from the NPD provided indices of socio-economic
266 and disability status. For the former, we used the Income Deprivation
267 Affecting Children Index (IDACI). This gives the deprivation ranking of the
268 neighbourhood in which a child lives; the score represents the proportion of
269 children under 16 in that area who live in a low-income household. Scoring is
270 from 0 to 1, with higher scores representing increased deprivation. For the
271 latter, we drew on information recorded about the nature of any special
272 educational provision made for a given child (known as Special Educational
273 Needs – SEN), and this was used to operationalise a categorical variable as
274 follows: (i) no additional provision (coded 0); (ii) School Action – reasonable
275 adjustments to normal teaching practice (coded 1); (iii) School Action Plus –
276 additional support provided by an external professional (e.g., speech and
277 language therapist) (coded 2); and (iv) Statement of special educational need
278 (coded 3)– a multi-professional assessment provides the foundation of a legal
279 document outlining support needs and securing financial support for
280 appropriate provision.

281

282 ***Procedure***

283

284 For each wave of data collection participating schools administered paper
285 surveys using a standardised instruction sheet. Survey completion was
286 conducted on a whole-year or whole-class basis. School staff supported any
287 students with literacy difficulties to enable them to access the measures.
288 Completed measures were collected, delivered, scored and input by
289 independent companies. The first author conducted checks on the integrity of
290 the data to ensure accuracy of scoring. Responses were tracked through
291 each wave of data collection and matched to NPD data through the use of a
292 unique reference number. This information was used solely for accurate data
293 matching and was destroyed shortly thereafter.

294

295 ***Analytical strategy***

296

297 Tabulated pattern analysis showed that less than 1% of missing cases across
298 all three time points were attributable to any of the socio-demographic factors
299 included in the analysis, indicating no discernible pattern to missing data.
300 Therefore, incomplete cases were removed on a list wise basis and analyses
301 were conducted for all complete cases.

302

303 Cascade and shared risk effects were tested using manifest structural
304 equation models in MPLus version 7 (Muthen & Muthen, 2012). Consistent
305 with previous work in this area (e.g. Moilanen et al, 2010), we first tested a
306 simple cascade model that assessed cascade pathways across domains over
307 time while accounting for temporal stability and within-time co-variance. A
308 second model was then constructed in which the shared risk variables were

309 added as predictors of each domain at each time point. These steps are
310 diagrammed in Figure 1. In both instances, model fit was assessed using χ^2
311 goodness of fit, Comparative Fit Indices (CFI), the Tucker-Lewis Index (TLI)
312 and Root Mean Square Error of Approximation (RMSEA) (including 90%
313 Confidence intervals). Model fit was considered to be acceptable if CFI and
314 TLI were above .95, RMSEA was below .05 (Bollen & Curran, 2006) and
315 SRMR was below .08 (Hu & Bentler, 1999).

316

317

<< FIGURE 1 >>

318

319 **Results**

320

321 ***Descriptive statistics***

322

323 Table 1 presents descriptives and correlations for all of the study variables.
324 Skew and Kurtosis were seen to be within acceptable range ± 1.5 (Tabachnick
325 & Fidell, 2013), omitting a very minor violation for IDACI. Almost all variables
326 were at least moderately correlated, with the highest correlations being
327 consistent with a priori expectations (i.e., correlations of the same measure
328 between time points).

329

*** TABLE 1 ****

330

331 ***Cascades Analyses***

332

333 All pathways in the model were tested, but in the interests of clarity, only
334 significant pathways are included in Figures 2 and 3. Given the limitations
335 associated with significance testing (Hubbard & Lindsay, 2008), we highlight
336 pathways with a co-efficient of at least .10 in bold; this corresponds to the oft-
337 cited conventions for the smallest effect of interest, deemed to be, “not so
338 small as to be trivial” (Cohen, 1992, p.156). RMSEA and TLI fell below the
339 established thresholds for both models described in the analytical strategy. A
340 partial explanation is offered by the combination of relatively high size of
341 correlations in a longitudinal model over such a short time period and the
342 large sample size. This is supported by a marginal improvement in model fit
343 for the second model (see Figures 2 & 3), supporting the inclusion of IDACI
344 and SEN. However, overall fit is sub-optimal, possibly suggesting the
345 presence of exogenous variables not accounted for in the current model.

346 *****FIGURE 2*****

347 Figure 2 shows the developmental cascade modelled to address hypotheses
348 1 & 2, specifically including the cross lagged pathways across all time points
349 for emotional self-efficacy, conduct problems, and academic attainment (after
350 accounting for temporal stability and concurrent correlations). Aside from the
351 pathways controlling for stability across time, the largest effects were seen
352 between T1 conduct problems predicting T2 emotional self-efficacy, and
353 subsequent T2 emotional self-efficacy predicting T3 conduct problems. This
354 is suggestive of a cascading relationship between these constructs.
355 Regarding hypotheses 1 and 2, there is evidence to support the presence of
356 both adjustment erosion and academic incompetence. Adjustment erosion is
357 indicated by the significant pathway between T1 conduct problems and T3

358 academic attainment, which although significant and in the direction
359 hypothesised (a rise in conduct problems is associated with a reduction in
360 academic attainment), the resulting effect is comparatively small (-.030) in
361 relation to other pathways in the model. There is arguably a slightly stronger
362 case for the presence of academic incompetence, because the relevant
363 pathway (T1 academic attainment to T3 conduct problems) is significant, in
364 the direction hypothesised (lower academic attainment is associated with a
365 rise in conduct problems), and is of relatively large effect (-.107) in relation to
366 the other pathways in the model. A similar pattern is shown between T1
367 academic attainment and T2 conduct problems, but to a lesser magnitude (-
368 .073).

369

*****FIGURE 3*****

370 In order to test for the effect of shared risk variables on the cascade effects
371 identified in the model above, SEN and IDACI were regressed onto each
372 factor, shown in Figure 3. Results showed a significant contribution of shared
373 risk factors for the majority regressed pathways, across all time points.
374 However, given the established associations of SEN and IDACI with both
375 mental health (Green et al, 2005) and academic achievement (Department for
376 Education, 2011), further significant pathways may have been expected. For
377 instance, there is no significant pathway between SEN and T3 academic
378 attainment. Similarly, associated effect sizes are relatively small, with only T1
379 shared risk pathways surpassing Cohen's effect of .1.

380 Regarding the effects of the previously identified pathways in Figure 2, there
381 is an almost identical pattern of findings, with only minor changes to the
382 academic pathways (T1 academic attainment to T2 conduct problems

383 reduced in strength, T1 academic attainment to emotional self-efficacy
384 increased in strength). This provides partial support for hypothesis 3.

385

386 **Discussion**

387 The current study sought to examine the development of children's conduct
388 problems, and its association with academic attainment, in order to better
389 understand the cumulative effects over time and interactions across
390 developing systems. We integrated emotional self-efficacy into the
391 developmental cascades model to examine emotional self-efficacy as a
392 process that might explain the relationship between children's conduct
393 problems and academic attainment. Disability and socio-economic status
394 were also examined as shared risk factors. We also used a large, nationally
395 representative dataset in the current study, enhancing the confidence by
396 which results can be generalised to the wider school-based population. Three
397 hypotheses were examined, consistent with developmental cascade theory,
398 especially examination of evidence for adjustment erosion, academic
399 incompetence, and shared risk. We examined adjustment fortification and
400 hypothesized that early high levels of emotional self-efficacy will lead to
401 enhanced academic attainment and reduced behaviour problems.

402

403 Consistent with *adjustment erosion* and *academic incompetence* models,
404 there was some evidence to suggest that developmental cascade effects
405 were in effect. Path models suggested that higher levels of conduct problems
406 at age 11 (Time 1) were associated with poorer academic competence at age

407 13 (Time 3). In turn, poor academic competence at age 11 was related to
408 higher levels of conduct problems at ages 12 and 13. Higher levels of conduct
409 problems at age 11 were also linked to lower levels of emotional self-efficacy
410 at age 12, which then predicted increased conduct problems at age 13. High
411 levels of conduct problems around the time of entry to High school (age 11)
412 were predictive of lower levels of emotional self-efficacy at age 12 and lower
413 levels of academic attainment at age 13. Finally, the *shared risk* analyses
414 suggested that socio-economic adversity and special educational need status
415 played a small role in the link between early externalizing problems and
416 academic competence in middle childhood. The current pattern of results
417 support previous research, which showed path links from conduct (i.e.
418 externalised) problems to academic incompetence in early to middle
419 childhood (e.g. Campbell et al., 2006; Capaldi, 1992; Chen et al., 1997;
420 Moilanen, Shaw, & Maxwell, 2010; Morgan et al., 2008). The inclusion of
421 shared risk variables did little to alter the magnitude or statistical significance
422 of any of the established pathways, suggesting that findings pertain to
423 different groups of academic attainment, including those across a socio-
424 economic spectrum and for those pupils identified with SEND. However,
425 practical limitations prevent a more detailed investigation of these groups
426 (SEND in particular), as the data were restricted to school-based provision.
427 Therefore, in future work, there is an opportunity to examine whether the
428 same patterns of effects can be found for those at the extremely high end of
429 youth externalizing problems, and those with other clinical problems. It is
430 noteworthy that all significant paths emerged after accounting for
431 autoregressive effects of each domain, which were moderately high in

432 magnitude in all three domains of child adjustment. This is indicative of the
433 comparatively short time scale of the measurements, in comparison to
434 broader developmental cascade literature, which can span up to 20 years (e.g.
435 Masten et al., 2005).

436 There was evidence to support the adjustment fortification model, with higher
437 levels of emotional self-efficacy at T1 and T2 predicting lower levels of
438 conduct problems at T2 and T3 respectively, and higher academic attainment
439 at T3. These findings support previous work that shows poor emotional
440 competence in adolescence predicts school difficulties associated with
441 subsequent academic underachievement (e.g. school drop-out and persistent
442 antisocial behaviour) (Gagnon, Craig, Tremblay, Zhou, & Vitaro, 1995;
443 Haapasalo & Tremblay, 1994; Kochenderfer & Ladd, 1996; Petrides et al.,
444 2004; Qualter et al., 2012; Vidal Rodeiro, Bell, & Emery, 2009). Our work
445 extends those findings and is the first to highlight the importance of emotional
446 self-efficacy in developmental cascades of conduct problems and academic
447 achievement.

448

449 Those findings are in line with Bandura's theoretical model (1986, 1999, 2001)
450 that argues that emotional self-efficacy is likely to influence whether
451 adolescents think in an enabling way when considering social engagement
452 and academic performance. It also affects how much effort adolescents will
453 invest in a particular revision or social strategy, how they persevere in the
454 face of social and academic difficulties, and how resilient they are to social
455 and academic stressors. Our findings provide support for the idea that lower
456 perceived emotional self-efficacy predicts higher levels of externalizing

457 problems and poor academic attainment. The finding that emotional self-
458 efficacy influences the developmental sequence between conduct problems
459 and academic attainment further supports the thesis that self-efficacies are an
460 indicator of successful development during adolescents and intervention
461 might be well suitable to the targeting of that domain.

462

463 **Strengths, Limitations, and Future Study**

464 A particular strength of the current study is the use of a large community
465 based sample that is representative of the general population. Also,
466 contrasting previous studies, we used national standardized test scores as
467 our measure of academic attainment at Time 1 and Time 3. These are
468 relatively free from reporter bias when compared to concurrent adolescent
469 self-reported attainment scores (Pataley, Deighton, Fonagy, & Wolpert, 2015).
470 Additionally, the use of standardized test scores permits the results in a
471 national context and supports future attempts at replication of our results.

472

473 Regarding limitations: First, the use of self-reported conduct problems by
474 young people could not be avoided in the current study. While the 'gold
475 standard' is to source multiple reporters (De Los Reyes, 2013), it was not
476 practical in this large community based longitudinal studies. Second, the
477 multi-level structure of the data (i.e. children clustered into schools) was not
478 accounted for in the analysis because the group level sample size (41) was
479 below minimal recommendations for analyses of this type (Hox & Maas, 2001).
480 However, mental health outcomes typically feature very small inter-cluster
481 correlations (typically around .02% (Hale et al., 2014)). Third, resultant model

482 fit was seen to be sub optimal. Although some explanation is likely to be
483 attributable to sample size and the strength of the within-domain correlations,
484 further consideration is required. Failure to capture idiosyncratic or even
485 systemic exogenous variables may be accountable, though this is difficult to
486 substantiate in the current design. We welcome further exploration in this
487 field (both theoretical and empirical) to establish a more accurate
488 representation of the apparent cascade effects.

489 Fourth, given the established paucity of the application of developmental
490 cascade theory in the current context (i.e. psychosocial and academic
491 measures within relatively short time period), there is a difficulty in
492 establishing 'benchmark' figures for effect sizes. Available literature indicates
493 effects are likely to be small. E.g. Deighton et al. (in press) report comparable
494 effects, however as this study was also conducted over a two-year period, this
495 may also be an artefact of the stability of the within domain correlations. A
496 future direction therefore, is to consider capturing a longer time period,
497 encapsulating more of a child's educational career.

498 Despite these limitations, the current paper is an early step in demonstrating
499 the usefulness and contribution of developmental cascade theory for
500 understanding the prospective associations between conduct problems,
501 emotional self-efficacy, and academic attainment, and in establishing
502 expectations for relative effects in the field.

503 This study represents a rigorous test of cascade effects of conduct problems,
504 emotional self-efficacy, and academic attainment in early adolescence. In
505 future cascade studies, it will be important to consider the developmental

506 timing of these effects. It is possible that there will be differences in the
507 pattern of effects based on the developmental timing of these events. For
508 example, in our sample, emotional self-efficacy contributed to how the
509 adolescents transitioned into High School, but it may become more important
510 during later stages of adolescents when adolescents will have to deal more
511 with peer pressure and also manage the conflicting desire to engage with
512 peers compared to revision. Thus, as peer relations become a more salient
513 domain of social adjustment, the association between academic attainment
514 and emotional self-efficacy is likely to become stronger. Further study is
515 needed to examine changes in the patterns over time and how those can be
516 accounted for by the changing social and academic environments.

517

518 **Conclusion**

519

520 The current study offers a valuable contribution to the emergent literature on
521 developmental cascades examining self-efficacy, conduct problems, and
522 academic attainment in an educational setting. Of particular note is the use of
523 a large, representative sample of English adolescents, demonstrating an
524 inclusiveness and rigour currently lacking in the field. Accordingly, new (but
525 tentative) benchmarks are provided for future research.

526

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704 Footnote

705 ¹ The Key Stages in the English education system are ages 5-7 (Key Stage 1), 7-11 (Key
706 Stage 2), 11-14 (Key Stage 3), and 14-16 (Key Stage 4).