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Manuscript

2 **Abbreviations:** PA = physical activity; PE = physical education; SDT = self-determination

3 theory

4

5

Introduction

6 Abundant evidence shows that physical activity (PA) is associated with greater mental health

7 and a reduced risk of mental ill-health (Biddle & Asare, 2011). However, the strength of the

8 association between PA and mental wellbeing varies considerably between different studies.

9 Early attempts to understand such inconsistency focused on determining the frequency,

10 duration, and intensity required for optimal mental health benefits. However, researchers

11 have been unable to confirm an optimal PA dose, with evidence supporting both higher and

12 lower amounts of light, moderate, and vigorous PA (Biddle, 2000; Haarasilta, Marttunen,

13 Kaprio, & Aro, 2004; Janssen & LeBlanc, 2010; Teychenne, Ball, & Salmon, 2008). These

14 findings suggest that the amount of PA, and the intensity of PA, are not responsible for the

15 large variation in the strength of association between PA and mental wellbeing, or at least,

16 cannot be the only factors that influence the strength of association.

17

18 Given that PA is defined as any muscular movement that expends energy (Shephard, 2003),

19 the term PA includes a broad range of bodily movements that are conducted in a variety of

20 life domains (i.e., different areas of life including work or school, travel, and leisure-time).

21 Recent meta-analytic evidence shows that the relationship between PA and mental health is

22 not consistent across different life domains, and that PA during leisure-time has a stronger

23 positive association with mental health than PA during work, transport, housework, and

24 physical education (PE) (White et al., 2017). However, no study has explored factors that

25 may help to explain why leisure-time PA is more optimal than other domains. Additionally,
26 no study has identified ways of making PA within less optimal domains more beneficial to
27 mental health. However, the majority of people's weekly PA does not occur during leisure-
28 time (Active Healthy Kids Australia, 2014; Jurakić, Pedišić, & Andrijašević, 2009; Smith,
29 Berdel, Nowak, Heinrich, & Schulz, 2016) and, therefore, it is of the utmost importance that
30 we understand why leisure-time PA appears optimal, and what factors increase the strength of
31 association in other domains. This understanding would enable the development of strategies
32 to enhance other life domains, and to tailor interventions and physical activity guidelines, in
33 order to ensure that mental health benefits are derived from as much of people's daily PA as
34 possible, regardless of the domain it occurs.

35

36 One factor that may partially explain why leisure-time PA is more strongly associated with
37 mental health is motivation. It has been suggested that leisure-time PA may be a more self-
38 determined behaviour than PA during other domains (e.g., active travel) (Asztalos et al.,
39 2009; Kull, Ainsaar, Kiive, & Raudsepp, 2012), and this higher quality motivation may
40 explain why leisure-time PA holds a stronger positive relationship with mental wellbeing
41 (Asztalos et al., 2009; Kull et al., 2012). Self-determination theory (SDT; Deci & Ryan,
42 1985) supports this idea, as it theorises that more self-determined behaviours lead to more
43 positive psychological outcomes because they are more likely to satisfy peoples' need for
44 autonomy, competence, and relatedness (Deci & Ryan, 2002a). However, no study has
45 examined the role of motivation in the PA and mental health relationship, either in terms of
46 total PA, or within specific PA domains.

47

48 Self-determination theory classifies motivation along a continuum from self-determined to

49 non-self-determined, and explains that autonomous motivation is the most self-determined
50 form of motivation and is defined as acting “with a full sense of volition and choice because
51 the activity is interesting or personally important” (Williams, 2002, p. 235). In the middle of
52 the continuum lies controlled motivation – “engaging in an activity for internal (e.g., guilt) or
53 external pressure (e.g., external rewards)” (Gillet, Vallerand, Lafrenière, & Bureau, 2012, p.
54 455). Amotivation lies on the opposing end to autonomous motivation, is the least self-
55 determined, and is defined as “lacking intention to act” (Deci & Ryan, 2002b, p. 17).

56

57 Based on: (1) meta-analytic evidence demonstrating that life domain influences the strength
58 of association, (2) strong theoretical support for motivation as an important contextual factor,
59 and (3) the absence of studies investigating the role of motivation within different PA
60 domains, this study aims to explore adolescents’ experiences of PA and affect within
61 different PA domains, and among PA undertaken for different motivation reasons. The
62 purpose of examining these relationships is to identify factors that may be important in
63 explaining the varying strength in association between PA and mental health within different
64 domains. This could then lead to tailored guidelines and interventions so that not only leisure-
65 time PA is beneficial to mental health. Given that (1) a large portion of adolescents’ weekly
66 PA occurs at school (Carlson et al., 2016) or when travelling to and from school (Cooper,
67 Andersen, Wedderkopp, Page, & Froberg, 2005), and (2) few studies have examined mental
68 health or wellbeing associated specifically with PA during school or travel, the current study
69 focuses on PE, active travel, and leisure-time.

70

71

Methods

72 **Methodological Approach and Epistemological Perspective**

73 Qualitative methods are important in understanding the mechanisms that underlie the effect
74 of PA on wellbeing (Mutrie, 1997) and are particularly useful in understanding a relationship
75 in detail in different contexts (Faulkner & Biddle, 2004). Therefore, we conducted this study
76 using a qualitative method to begin to explore the potential role of motivation in relation to
77 PA and mental wellbeing in different life domains. We also employed a realist
78 epistemological perspective as realism purports that investigating an event (i.e., PA) as well
79 as the context and mechanisms associated with that event (i.e., life domain and motivation)
80 lead to an enhanced understanding of the outcomes experienced (i.e., positive and negative
81 affect; Pawson & Tilley, 1997). However, when exploring a new topic or relationship,
82 combining quantitative and qualitative data can enhance the interpretation of findings
83 (Onwuegbuzie & Leech, 2004). As such, we also included frequency counts and percentages
84 to indicate the proportion of participants reporting certain affective experiences and
85 motivational constructs when describing PA participation in different domains. Including this
86 data adds meaning to the interpretation of the qualitative findings by demonstrating the
87 strength of certain themes.

88 **Participants**

89 In order to describe the role of motivation in detail within a specific population (i.e.,
90 adolescents; Patton, 2002), we invited Year 9 students from two independent secondary
91 schools in Western Sydney, Australia to participate. With regards to the socioeconomic status
92 of the schools, one school was close to, and within one standard deviation of, the average
93 Australian score on the SEIFA Index of Relative Socio-economic Advantage and
94 Disadvantage (Pink, 2011), and the average score on the Australian Curriculum Assessment
95 and Reporting Authority's (2013) Index of Community Socio-Educational Advantage

96 (ICSEA). The second school was slightly above average, being within two standard
97 deviations of the mean on both the SEIFA and ICSEA indexes. All Year 9 students at both
98 schools were invited to participate and 114 students provided parental consent and participant
99 assent and agreed to participate (M age = 14.42 years, SD = .58, 28% female). While
100 common guidelines recommend between 20 and 50 participants for qualitative studies
101 (Creswell & Clark, 2007; Patton, 2002), the participants in this study answered questions in
102 the absence of a researcher. Although the questions included many probing questions, there
103 was no researcher present one-on-one with the participant. Therefore, a larger sample size
104 was advantageous as it ensured enough data was collected overall if some participants gave
105 relatively short answers. The second reason for the large sample size was because of the need
106 to recruit students from at least two different schools to increase triangulation, which is
107 advantageous to the transferability of the results (Patton, 2002). Data saturation occurred after
108 collecting data from the two schools, as new data failed to add new themes or extend the
109 understanding of existing themes (Weed, 2009). Further, the main aim of this study was to
110 present qualitative findings; quantification is merely included to supplement the qualitative
111 results discussed. As such, 114 was deemed large enough for qualitative analysis, and a third
112 school was not recruited. The Western Sydney University Human Research Ethics
113 Committee provided ethics approval.

114

115 **Procedures**

116 Although interviews are perhaps the most common method of qualitative data collection and
117 can lead to the creation of large amounts of data, they can often lead to high levels of social
118 desirability bias, particularly when discussing topics such as affect (Bowling, 2005). Self-
119 administered questionnaires can increase respondents' willingness to disclose sensitive
120 information, and reduce social desirability bias, due to the absence of an investigator

121 (Bowling, 2005; Richman, Weisband, Kiesler, & Drasgow, 1999). Computer technology
122 provides a platform for self-administering open-ended questions and collecting anonymous
123 responses. Multiple studies have shown that interviews conducted using computer self-
124 administration methods reduce social desirability distortion compared with face-to-face
125 methods (Richman et al., 1999). Computerised methods also enable the collection of
126 responses from a larger and more diverse sample of students than face-to-face methods.
127 Additionally, adolescents have reported feeling comfortable reporting honestly about
128 sensitive topics via computerised methods (Watson et al., 2001). As such, we employed a
129 computerised self-administered interview procedure to ensure anonymity and encourage in-
130 depth, honest responses on this topic.

131

132 Prior to data collection, the computer-assisted-self-interview was piloted among five
133 adolescents aged 13-16 years of age. These adolescents completed the questions on the same
134 type of device and were given the same instructions as the main sample. Additionally, the
135 pilot sample was encouraged to make notes about questions they did not understand or found
136 difficult to answer and these issues were discussed with the researcher after completion.
137 Overall, the questions appeared well understood and no changes were made.

138

139 During a scheduled lesson at school we separated participants from each other as much as
140 possible within the confinements of the classroom provided, and distributed a computer tablet
141 to each participant with the computer-assisted-self-interview loaded on the screen.
142 Participants completed the interview questions at their own pace by typing on the on-screen
143 keyboard. To increase privacy by reducing the amount of data displayed on any screen at any
144 time, only one question was displayed at a time. However, participants were able to skip

145 forward and go back if they desired, as evidence suggests that social desirability bias is
146 reduced when skipping and backtracking is enabled (Richman et al., 1999). The lead author
147 was present to answer any questions or provide assistance to limit any impact of variations in
148 literacy ability.

149

150 The interview schedule commenced with general questions that were exploratory in nature.
151 We asked students to recall two PA experiences, one they felt “good” after, and one they felt
152 “unpleasant” after. We included affective states from the short version of the Positive and
153 Negative Affect Schedule for Children (Ebesutani et al., 2012) as examples to help elicit PA
154 experiences perceived to be associated with positive and negative affect (Clark & Watson,
155 1991). We then asked the students to describe: (1) the PA experience, (2) reasons for their
156 participation, (3) where the PA occurred, and (4) how they felt during and after participating
157 in the activity through a series of probe-like questions based on the participant’s initial PA
158 experience described. Questions slowly narrowed in focus as we specifically asked students
159 how they feel when participating in PA during their own time (i.e., leisure-time), when
160 walking or riding to or from school (i.e., active travel), and during PE. We also asked
161 students why they participated in each PA domain and why they perceive they feel the way
162 they do during and after participation. Please see the Supplementary Material for a full list of
163 interview questions.

164

165 **Data Analysis**

166 First, we conducted frequency counts in NVivo (version 10) for all closed-ended questions,
167 and open-ended questions where information on the most commonly reported answers was

168 useful (e.g., “Please list three words that sum up how physical activity makes you feel”).
169 Next, the lead author commenced thematic analysis by assigning an initial code to all data
170 segments in response to all open-ended questions by linking a code (i.e., words or phrases)
171 with sections of data that represented the participants’ perspectives (Patton, 2002). To
172 triangulate coding, the second author (RO) also coded 10 pages of randomly selected data.
173 We inductively coded sections of the data relating to physical activity and positive and
174 negative affect in different life domains by using codes that were a direct manifestation of the
175 data itself (Marks & Yardley, 2004). However, as exploring the role of motivation was driven
176 by an existing theory, we subsequently abductively coded participants’ responses based on
177 SDT tenets to explore new links between PA and affective wellbeing based on SDT (Marks
178 & Yardley, 2004). For example, participants did not use the words “autonomous” or
179 “controlled” in their responses; however, based on SDT tenets, we derived latent codes
180 mirroring autonomous motivation from quotes relating to undertaking PA because it was fun
181 (Marks & Yardley, 2004). Both authors conducted initial coding then compared codes for
182 similarity and mutually agreed upon any differences to ensure consistency. The lead author
183 then grouped codes together to develop broader categories which illustrated patterns in the
184 data (i.e., themes) (Patton, 2002). Finally, we grouped participants based on the dominant
185 motivation they described for each PA domain which enabled us to conduct frequency
186 counts, descriptive statistics, and further thematic analysis within each motivational category.
187 This grouping process enabled us to explore whether the themes arising in relation to
188 autonomously motivated PA were different from, or similar to, the themes arising in the data
189 describing PA experiences undertaken due to controlled motivation. Although the lead author
190 led the analysis, in collaboration with the second author, all authors reviewed the broader
191 categories before making final decisions about the overarching themes.

192

193

Results

194 The computerised interview method resulted in 123 pages of text-based data. While some
195 participants wrote more than others (ranging from a short sentence to an extended paragraph
196 depending on the question), all participants responded to all questions and provided valuable
197 depth. Despite a number of grammatical errors, there was no evidence of participants not
198 understanding the questions or not being able to formulate a legible answer. Overall,
199 frequency counts revealed that the most common words used to describe when PA leading to
200 positive affect took place referred to the weekend, after school, and organised sport; all of
201 which appear to relate to leisure-time PA (Table 1). Conversely, school was the most
202 commonly used word to describe when PA led to negative affect. However, school was not
203 solely associated with negative affect and leisure-time was not only associated with positive
204 affect. When reporting affect in relation to specific PA domains, adolescents perceived to
205 experience positive affect in relation to leisure-time PA and PE far more than active travel (as
206 shown in Table 2). Thematic data analysis conducted to explain students' perceptions of these
207 relationships led to the development of nine sub-themes which were then categorised under
208 four overarching themes: Social Interactions, Optimally Challenging Activities, Reasons for
209 Participation, and Other Factors. The four overarching themes represent the main factors that
210 were described in terms of influencing whether PA invoked positive or negative affect.

211

212 **Social Interactions**

213 *Sense of belonging*

214 Participants frequently mentioned their friends, peers, and teammates when explaining why
215 they perceived to experience positive affective states when participating in PA. With regards

216 to PE, approximately one third of participants that perceived they experience positive affect
217 during PE explained that one of the reasons they feel that way is because they are with their
218 friends. For example, in response to why do you believe you feel happy and cheerful during
219 PE, Participant 83 (female) stated: “because I am with my friends and my class is really great
220 to be around and it is just fun.” Few participants described their friends or teammates as a
221 main reason why they experience positive affect during leisure-time PA; however, those that
222 did provided more in-depth responses explaining the importance of doing PA with their team
223 or friends, as they perceived PA led to positive affect if they experienced a sense of
224 belonging. “When you play soccer you are in a team and this makes you feel part of a group
225 and welcomed” (Participant 61, male) and “because I feel like I belong, I feel happy”
226 (Participant 10, male). Although few participants reported positive affect in relation to active
227 travel (approximately one quarter), a number also explained it was because they get to walk
228 with their friends. Participant 105 (female) explained “it gives me time to talk to my friends
229 and be with them.”

230

231 *Negative influence of others*

232 Despite many students perceiving that social interactions led to a sense of belonging and
233 therefore positive affect, a number of participants discussed negative impacts of the other
234 people with whom they do PA. The *negative influence of others* theme captures the idea that
235 negative affect was derived through PA if students experienced judgment from other people,
236 felt self-conscious in front of others, or if negative peer comparisons were made. Of those
237 describing PE as a PA that brings out negative moods and emotions, around half discussed
238 feeling judged by others, or compared to their classmates that had a higher ability. Describing
239 her experience in PE, Participant 97 (female) said, “I am not very good at sport, and so when

240 I have to do things in front of lots of people I don't enjoy myself and can feel humiliated
241 when I do something wrong." Fewer participants discussed leisure-time PA in relation to
242 other people making them feel humiliated or judged. However, with reference to organised
243 sport, Participant 82 (female) explained that "swimming competitively is horrible, I felt sick
244 to my stomach, I felt everyone's eyes burning into me watching me fail and come last."

245

246 **Optimally Challenging Activities**

247 *Confidence, achievements, and progression*

248 Participants explained that experiencing improvements and achievements in sport generally
249 makes them feel good about themselves and boosts their self-confidence, which makes them
250 feel happy. For example, Participant 96 (female) stated, "I always feel accomplished when I
251 do physical activity and have a great sense of achievement, this makes me feel happy."
252 Similar to improvements and achievements, but more focused on an objective measurement
253 of success rather than personal improvement, Participant 47 (male) explained that "after
254 winning a game you feel happy about yourself and what you have done to contribute to that
255 victory." This theme was discussed particularly with reference to organised sport during
256 leisure-time; Participant 51 (male) stated "I felt happy because whilst we were winning I felt
257 a sense of pride and satisfaction that I was improving my game" and Participant 103 (female)
258 stated "I have goals and when I achieve them it makes me feel happy." A small number of
259 participants also reported experiencing positive affect because they achieved health-related
260 goals when exercising during leisure-time: "It makes me feel proud because I have finished
261 going for a run; it also makes me happy because I'm proud" (Participant 69, male). With
262 regards to PE, Participant 76 (male) explained: "I felt like I had learnt something new and
263 that it was an achievement."

264

265 ***Too difficult***

266 A small number of participants explained that when PA tasks were perceived as too difficult,
267 such that the participants did not feel competent, then the PA behaviour was perceived as
268 resulting in the experience of negative affect for one of two reasons. Firstly, because of the
269 difficulty they felt unable to participate, as demonstrated by Participant 80 (female) who
270 explained that during PE:

271 The game [rugby league] is confusing and I don't know how to get involved.
272 I try and participate as much as I can, but it's extremely difficult. After the
273 game I don't feel like I have accomplished anything, because I can't put
274 everything into it.

275 Further, Participant 90 (female) stated "sometimes [I] have low self-esteem during PE as I
276 feel I am not able to participate as well as others." Secondly, difficult activities were
277 perceived to result in negative affect due to poor performance. Participant 95 (male)
278 explained that: "[in a game of cricket] I was annoyed at myself because I got out so many
279 times."

280

281 **Reasons for Participation**282 ***Autonomous participation in physical activity***

283 With regards to PA experiences described as leading to positive affect, all participants
284 described autonomous reasons for participation. The vast majority of students reflected being
285 intrinsically motivated to undertake the activity, with students commonly reporting that they
286 did the activity because they enjoy it, they love the sport, they are passionate about the sport,

287 or because it is fun, as highlighted in the following quotes: “I participate in basketball
288 because it is fun and enjoyable to do” (Participant 2, male) and “I do Oz-tag [i.e., touch
289 rugby] because I wanted to play with my friends and have fun” (Participant 53, male). Fewer
290 participants described participating in order “to keep fit and feel good” (Participant 11,
291 Soccer, male), “to gain strength” (Participant 27, gym, male), and to “to relieve stress and
292 feel better about myself” (Participant 85, running, female); all of which are valued benefits of
293 PA, and therefore autonomous reasons for participation.

294

295 The data in Table 3 supports this theme as those who perceived their participation in PA was
296 autonomous, reported more positive affective outcomes than those who perceived their
297 participation to be underpinned by controlled motivation. This difference in affective
298 experiences between autonomously motivated PA and controlled participation was apparent
299 across all three PA domains (i.e., leisure-time, active travel, and PE).

300

301 With regards to leisure-time, all students discussed autonomous reasons for participation;
302 52% explained they participate due to enjoyment and 48% because of perceived benefits.
303 Although participating for enjoyment is more self-determined than participating for valued
304 benefits (Deci & Ryan, 2002a), both are autonomous in nature and students participating for
305 both reasons reported that they experienced positive affect during leisure-time PA far more
306 than negative affect (see Table 3). Additionally, participants explained that they experience
307 positive affect, such as happiness, because they are choosing to do something that they enjoy,
308 “I have the choice to participate, I do it because I enjoy it and because I have passion for the
309 sport it brings me joy when I play” (Participant 21, male).

310

311 Far fewer participants described enjoyment (11%) or health benefits (22%) as the reason for
312 their participation in active travel to school. Nevertheless, all of those who did, also perceived
313 to feel happy when they walk or ride to school (Table 3). They also described experiencing
314 other positive moods and emotions such as cheerful and lively. Participant 108 (male) stated:
315 “I like to ride to school because riding my bike is fun. I believe I feel happy, cheerful, joyful,
316 and lively because I love riding.” Alternatively, Participant 94 (female) highlighted the
317 perceived benefit of walking to school for health benefits:

318 I walk home from school sometimes for exercise. My parents come to pick
319 my brother up so I could get a ride with them, but I choose to walk because I
320 just like to. It makes me feel healthy and fit and good about myself because
321 I’m choosing to do something healthy.

322 Connecting the theme of autonomous participation to the earlier theme ‘Social Interactions,’
323 Participant 21 (male) explained he chooses to walk to school because he enjoys it, because he
324 walks with his friends:

325 I sometimes catch the bus to the shopping centre and meet up with friends to
326 walk to school. I have the choice to catch the bus straight to school if I want
327 but I rather walk because I’m happy and relaxed when I walk to school
328 because I’m with my friends and they keep my mind off things I could be
329 stressed about.

330

331 Participants described their participation PE as leading to positive affect slightly less than
332 leisure-time, but far more than active travel (Table 2). Further, students’ perceived reasons

333 for participation in PE were more mixed across the sample than they were for leisure-time or
334 active travel. Nearly half of all students explained that they participate in PE because they
335 enjoy it or because it's a way of doing exercise which is good for them (33% enjoyment and
336 9% valued benefits) and the majority of these students reported experiencing positive affect
337 during PE. For example, Participant 14 (male) reported feeling happy, proud, cheerful, and
338 joyful during PE. In terms of why he participates in PE, he stated "because I enjoy being
339 active and spending time with mates." Similarly, Participant 81 (female) reported
340 experiencing happiness, joyfulness, and cheerfulness during PE. When asked why she
341 participates in PE she stated "I participate in school PE because I always have fun and it is
342 really enjoyable to play against or with my friends in games we may not usually play outside
343 of school." In addition to the 42% of participants reporting autonomous participation in PE, a
344 further 37% reported both autonomous and controlled participation. These students were
345 slightly less likely to describe their participation in PE as leading to positive affect than those
346 who purely stated only autonomous reasons for participation, but still believed PE lead to
347 positive affect far more than negative affect (Table 3).

348

349 ***Forced participation***

350 When students felt forced or obliged to participate in PA they reported experiencing negative
351 affective states. For example, Participant 105 (female) stated "I feel angry and frustrated
352 because you have to do a sport that you don't have a choice in." In fact, PA experiences that
353 participants perceived as leading to negative affect were mostly undertaken due to controlled
354 motivation. With regards to these negative PA experiences described, students reported
355 participating because their friends did – "cause my mates play Rugby Union" (Participant 6,
356 male), because their parents encouraged them to – "because I was encouraged by my parents

357 and I was good at swimming” (Participant 91, female), and because their teacher instructed
358 them to – “I swam in the school swimming carnival because my homeroom teacher made
359 me” (Participant 82, female). In addition to participating because of other people, participants
360 also took part because they felt they had no choice or felt forced. Some students reported that
361 their parents told them to – “my parents said I needed to try a summer sport [cricket]”
362 (Participant 74, male), while many students reported that their school or teacher forced them
363 – “school makes me, they force you to do PE” (Participant 67, male). Similarly, Participant 9
364 (male) said “I did it because that’s what the teacher chose.”

365

366 While controlled reasons for participating were rarely discussed in reference to leisure-time
367 activities, most students (67%) reported walking or riding a bicycle to school because it was
368 their only means of getting to and from school. This controlled reason for participation was
369 demonstrated by Participant 112 (female) who stated:

370 I have to walk home from school because it is my only means of getting
371 home. I don’t have much choice if my mum is busy and she can’t pick me up
372 I have to walk. I feel miserable when I have to walk because it is a long way
373 and my bag is heavy.

374 She also reported feeling miserable while walking. Further, few participants like Participant
375 112 who walked because they were forced, reported experiencing positive affect. In fact, only
376 32% of students who walk because it’s their only method of travel (i.e., controlled
377 motivation) reported feeling happy while walking, compared to 100% of students who walk
378 because it’s fun or beneficial to their health. The following quote further illustrates that being
379 forced to walk was not described in relation to positive affect in the same way that walking to
380 school for enjoyment (autonomous participation) was. Participant 84 (female) stated that:

381 I have to walk to my house from the bus stop in the afternoon because my
382 parents are at work and can't pick me up from school. I feel as if I'm just
383 wasting my time. I'm tired, hungry, hot, stressed, and not in the mood for
384 walking with a heavy school bag.

385

386 With regards to PE, a small portion indicated that they participated because they were forced
387 (21%).

388 I only participate in PE because I am made to, I have no choice. We don't get
389 provided with input. I feel miserable and mad because I am being forced to
390 do it and I don't like the sports that we do. (Participant 79, female)

391 As shown in Table 3, those students who participated in PE because they felt forced (i.e.,
392 controlled motivation) more frequently reported feeling sad, mad, afraid, miserable, and
393 scared during PE, than those who reported doing PE because it's fun or because it's good for
394 them (i.e., autonomous motivation). Those who felt forced were also less likely to report
395 feeling happy, cheerful, joyful, proud, or lively during PE than those who participate due to
396 autonomous motivation. Although the majority of participants that reported feeling sad and
397 miserable in PE only took part because they "have to do it; it's compulsory" (Participant 82,
398 female), the majority of the reasons discussed as to why they experience negative affect were
399 related to other themes such as '*negative influence of others*' or '*no interest.*' As such, forced
400 participation appears to be linked to these themes.

401

402 **Other Factors**

403 *Fun and enjoyment*

404 When discussing PA in general, the majority of students perceived participation in PA as fun
405 and enjoyable, as demonstrated by the following quotes: “physical activity makes me feel
406 happy because I enjoy it” (Participant 26, male) and “physical activity makes me feel happy
407 because it’s fun” (Participant 42, male). However, when discussing specific domains, this
408 theme was discussed extensively by nearly all participants with regards to leisure-time and
409 was quite often discussed in combination with the theme ‘*autonomous participation in PA.*’
410 However, the majority of participants discussed PE as being fun and enjoyable, even though
411 some reported participating in PE because it’s compulsory. For example, Participant 87
412 (female) participated in PE because “it’s compulsory” and stated “I have no choice in what
413 we do in PE.” However, she also stated “I feel happy in PE because we do fun activities.”
414 Therefore, the fun and enjoyment associated with physical activities is often tied to
415 autonomous motivation, yet students also discuss fun activities as being directly related to
416 why they are happy when active even if motivation is partially controlled.

417

418 *No interest*

419 While undertaking physical activities which participants found enjoyable was described as
420 evoking positive affect, participation in activities which were of no interest was described in
421 relation to negative affect. Of those describing PE as an activity that brings out negative
422 moods and emotions, around half discussed having no interest in the activities they do in PE
423 as the reason they experience negative moods and emotions, or explained they only
424 experience negative moods and emotions during classes where the activity is not perceived as
425 interesting or enjoyable. Representing this view, Participant 79 (female) reported feeling
426 miserable and mad during PE because “I do not like the sports that we do in PE.” Similarly,
427 in terms of active travel, approximately half of the students who reported experiencing

428 negative affect in response to active travel, also discussed feeling bored, not wanting to walk,
429 and not liking it, as reasons for their negative affect. This theme was discussed almost solely
430 in terms of PE and active travel as fewer participants explained taking part in leisure-time
431 activities they weren't interested in. While often discussed in relation to having no choice,
432 this represents a distinct theme in which only a portion of those discussing controlled
433 motivation discussed having little interest. Nevertheless, the lack of interest in an activity was
434 part of the explanation as to why forced participation in PE and active travel was perceived as
435 related to negative affect.

436

437 *Distraction and opportunity for mindfulness*

438 Physical activity was perceived by participants to also be: (1) a method of releasing anger
439 which results in experiencing positive affect – “you get to release any anger and negative
440 energy and thoughts [in martial arts] leaving only room for good ones (Participant 91,
441 female); (2) a distraction from life stress - “it distracts you from what’s going on in your life”
442 (Participant 32, male) and “it takes away life’s problems and releases stress” (Participant 48,
443 male); and (3) an activity that promotes mindfulness – “I feel happy because I focus on the
444 sport I’m participating in at the current time” (Participant 23, male). Except for a small
445 number of participants who reported feeling happy while walking to school because they
446 listened to music to zone out or take their mind off other things, the distraction theme was
447 mostly discussed by participants in terms of organised sport during leisure-time.

448

449

Discussion

450 This study showed that adolescents perceived PA to be associated with both positive and

451 negative affect. More adolescents perceived positive affect to be associated with PA during
452 leisure-time than PA as a means of transportation or PA at school. Further, PA behaviours
453 that adolescents associated with positive affect were largely undertaken for autonomous
454 reasons, including enjoyment (i.e., intrinsic motivation) and valued benefits (i.e., identified
455 regulation), while PA experiences associated with negative affect were predominantly
456 undertaken for more controlled reasons. Controlled reasons for participation included feeling
457 pressured to do a sport due to cultural background, family history, or because their friends
458 played (i.e., introjected regulation) and being forced to participate, either by their parents in
459 terms of active travel or by their teachers in terms of PE (i.e., external regulation). While
460 these findings are in line with SDT which suggests autonomously motivated behaviours are
461 more likely to be associated with greater psychological wellbeing compared to activities
462 which are carried out due to controlled motivation (Deci & Ryan, 2008; Ryan & Deci, 2000),
463 this is the first study to specifically examine the role of motivation in the relationship
464 between PA and mental wellbeing.

465

466 According to SDT, the reason autonomous behaviours are likely to be associated with greater
467 mental health benefits is because individuals are likely to autonomously choose to participate
468 in activities that satisfy their psychological needs of autonomy, competence, and relatedness
469 (Weinstein & Ryan, 2010) which are essential for optimal wellbeing (Deci & Ryan, 2002a).
470 Conversely, the extent to which psychological needs are not satisfied influences the
471 likelihood of a behaviour being associated with negative psychological outcomes (Ryan &
472 Deci, 2002). Results from the current study supported the theory that competence plays an
473 important role in the relationship between autonomously motivated PA and affective
474 wellbeing, as PA perceived by adolescents to lead to positive affect was associated with
475 feelings of achievement and progress. Alternatively, negative affect was described in relation

476 to PA where participants felt incompetent or as though they performed poorly. Similarly,
477 these findings provide some support for the mastery hypothesis which posits that
478 participating in PA enhances feelings of success and confidence, which benefits mental
479 health when the feeling of mastery is carried into other areas of life (Paluska & Schwenk,
480 2000). However, given that not all PA experiences are necessarily associated with feelings of
481 competence and mastery, other mechanisms must also play a role.

482

483 Teychenne, Ball, and Salmon (2010) found that participants who completed some of their
484 leisure-time PA with another person were less likely to experience depression compared to
485 individuals who completed all their leisure-time PA alone. However, the relationship was not
486 linear and it was suggested that mental health benefits may be derived from participating in
487 leisure-time PA with others; but, not all PA with others is necessarily beneficial (Teychenne
488 et al., 2010). The results from the current study augment this idea, showing that adolescents
489 perceived PA with others to be beneficial if a sense of belonging was experienced, but
490 damaging if judgment occurs or peer comparisons are made. Therefore, it is apparent that
491 relatedness (i.e., the fundamental need to maintain close personal connections with other
492 people and feel like a valuable and cared for member of a group) is beneficial to positive
493 affect experienced during and after PA (Baumeister & Leary, 1995). Many adolescents
494 perceived that one of the reasons they chose to participate in PA during leisure-time was
495 because they felt a sense of belonging with their friends and teammates. However, few
496 participants reported walking to school with a friend. This difference in social interaction
497 may partially explain why, compared with active travel, leisure-time PA was more often
498 associated with positive affect. Regarding PE, students who described experiencing a sense of
499 belonging also perceived to experience positive affect during PE, while those who felt judged
500 and embarrassed in front of their peers experienced negative affect when participating in PE.

501 Hence, this study suggests that merely participating in PA with others is not necessarily
502 beneficial; instead, the satisfaction of the basic psychological need for relatedness appears to
503 influence whether PA is associated with positive affect or negative affect, and is therefore an
504 important mechanism.

505

506 Results from this study also support quantitative evidence showing that leisure-time PA is
507 more positively associated with mental wellbeing than PA during other domains (White et al.,
508 2017). However, adolescents accumulate a large portion of their weekly PA during school
509 (42%; Carlson et al., 2016). Therefore, greater understanding of the relationship between
510 school-based PA and mental health is necessary. Although many students perceived PE to be
511 enjoyable and associated with positive affect, those who were extrinsically motivated by
512 teachers' control were less likely to believe PE led to positive affect. As such, controlling
513 teacher behaviours not only contribute to reduced autonomous motivation and reduced PA
514 (Hagger et al., 2009; Standage, Duda, & Ntoumanis, 2006), but may also undermine the
515 benefits of PE for affective wellbeing. Hence, autonomy supportive behaviours should be
516 promoted further in the future; not only to increase PA, but to enhance the effect of school-
517 based PA on students' wellbeing (Cheon, Reeve, & Moon, 2012).

518

519 **Strengths and Limitations.**

520 The key strength of this study was that it was the first to explore adolescent perceived
521 affective wellbeing in relation to a range of different PA domains, and develop an initial
522 understanding of the role of motivation. The method of data collection (i.e., computer-
523 assisted-self-interview) was also a strength of the study, as it allowed for a larger sample size

524 for qualitative investigation than is typical, and ensured anonymity of responses, thereby
525 encouraging participants to discuss their views honestly. While the anonymity of the
526 computer-assisted-self-interview was a strength, the absence of an interviewer could be a
527 limitation as only probes that were pre-defined by the research team could be used. The using
528 both descriptive statistics and frequency counts to supplement thematic analysis was also a
529 strength in fostering the exploration of a phenomenon that was previously unstudied.

530

531 There are a number of additional limitations to note. Recalling positive and negative affect, as
532 opposed to measuring affect during or after PA, may have introduced recall bias (Hufford,
533 2007). Quantitatively testing the relationships between PA and affect immediately after PA
534 would allow for more rigorous measurement of post-exercise affect, and enable results to be
535 generalised to a broader sample. However, it is possible that PA behaviours that have an
536 immediate impact on affect, either positive or negative, may not influence longer term mental
537 health and wellbeing. As such, using validated psychological measures to determine the
538 relationships between domain-specific PA, motivation, and more stable affective states would
539 also be useful. Finally, mental wellbeing is comprised of both affective (i.e., emotions and
540 moods) and cognitive (i.e., evaluations of life satisfaction) components (Luhmann, Hawkey,
541 Eid, & Cacioppo, 2012), and measuring cognitive wellbeing in addition to affective
542 wellbeing could provide a more detailed understanding of mental wellbeing.

543

544

Conclusions

545 This study suggests that PA experiences in varying life domains may have differential
546 influences on adolescents' affective wellbeing. As such, promoting PA may not always be
547 beneficial to mental wellbeing. It appears that promoting autonomously motivated PA which

548 satisfies adolescents' psychological needs is likely to be the most effective method of
549 enhancing their mental wellbeing through PA.

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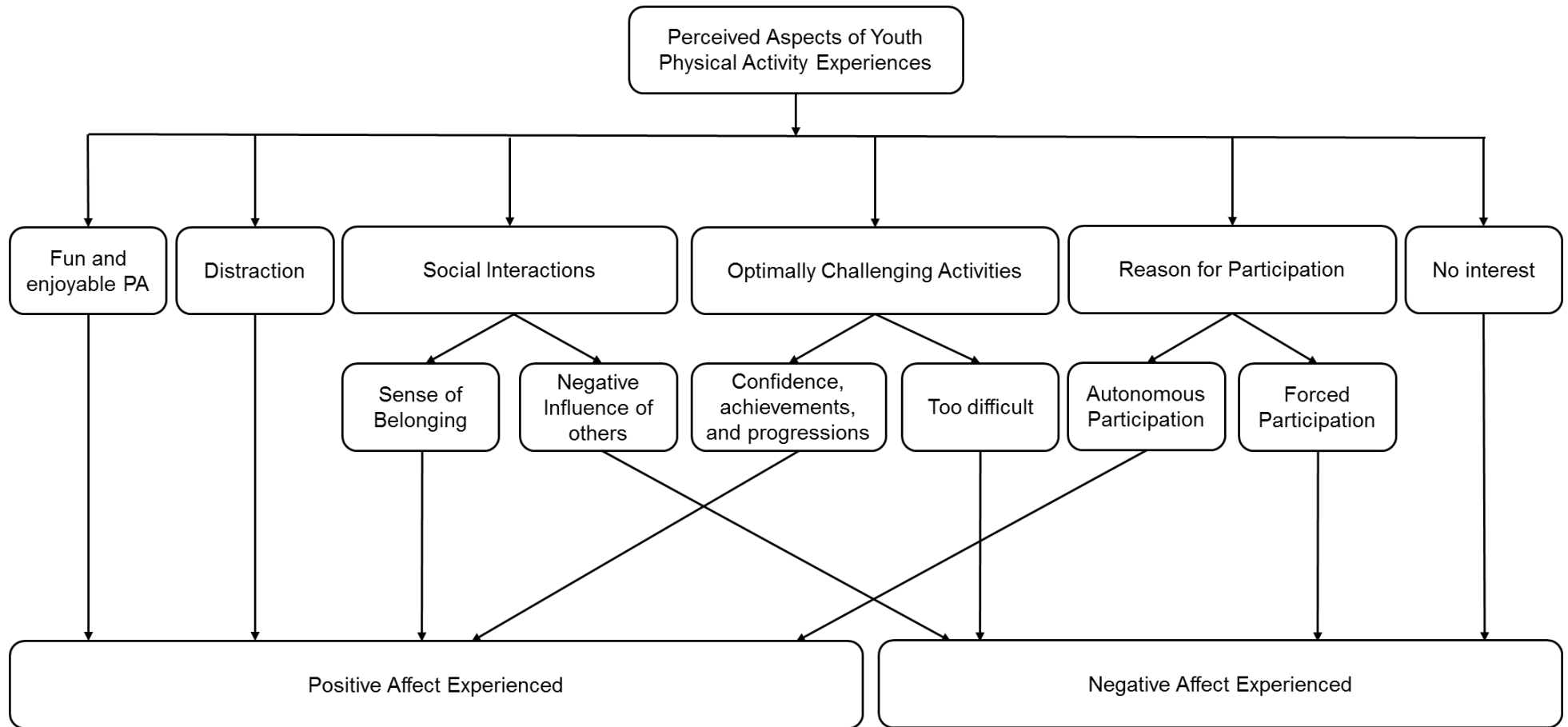


Figure 1. Adolescent perceived relationships between physical activity and positive and negative affect.

Table 1

Frequency Counts of the Most Common Words Used to Explain When Physical Activity Leads to Positive Affect as Opposed to Negative Affect

Positive Affect		Negative Affect	
Word	Frequency Count	Word	Frequency Count
Weekend	57	School	45
After school	33	Weekend	38
Organised sport	31	Organised sport	22
School	15	Physical education	18
Morning	8	After school	15

Table 2

Participants' reported positive and negative affect within three different Physical Activity Domains

	Leisure Time		Active Travel		Physical Education	
	Frequency	%	Frequency	%	Frequency	%
<u>Positive Affect</u>						
Happy	101	89%	33	37%	96	86%
Cheerful	73	64%	19	21%	77	69%
Joyful	72	63%	18	20%	65	58%
Proud	80	70%	16	18%	43	38%
Lively	88	77%	29	32%	75	67%
<u>Negative Affect</u>						
Sad	3	3%	6	7%	8	7%
Mad	8	7%	8	9%	8	7%
Afraid	4	4%	3	3%	8	7%
Miserable	2	2%	11	12%	16	14%
Scared	4	4%	8	9%	4	4%

Note. Frequency and % refer to the number of, and proportion of, students who indicated they experience that emotion during each particular physical activity domain.

Table 3

Participants' Perceived Affective Experiences in Different Physical Activity Domains according to Participants' Main Motivational Reason for Participation

	Leisure Time				Active Travel						Physical Education								
	Enjoyment		Health benefits		Fun		Health benefits		Only method		Enjoyment		Health benefits		Forced to participate		Compulsory, but I enjoy it		
	<i>n</i>		<i>n</i>		<i>n</i>		<i>n</i>		<i>n</i>		<i>n</i>		<i>n</i>		<i>n</i>		<i>n</i>		
	59		55		5		10		31		36		10		23		41		
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	
<u>Positive Affect</u>																			
Happy	49	83%	47	85%	5	100%	10	100%	10	32%	35	97%	9	89%	15	65%	35	86%	
Cheerful	37	63%	36	65%	4	80%	5	50%	6	18%	33	92%	7	67%	9	39%	27	66%	
Joyful	44	75%	39	70%	3	60%	3	33%	8	25%	31	86%	6	56%	5	22%	23	55%	
Proud	40	67%	33	60%	2	40%	5	50%	8	25%	19	53%	7	67%	4	17%	13	32%	
Lively	57	96%	47	85%	4	80%	8	83%	12	39%	27	75%	7	67%	8	35%	31	75%	
<u>Negative Affect</u>																			
Sad	2	4%	0	0%	1	20%	0	0%	4	14%	1	3%	0	0%	6	26%	1	2%	
Mad	8	13%	6	10%	1	20%	0	0%	7	21%	1	3%	1	11%	4	17%	2	5%	
Afraid	5	8%	3	5%	1	20%	0	0%	1	4%	0	0%	0	0%	2	9%	5	11%	
Miserable	5	8%	0	0%	1	20%	0	0%	10	32%	2	6%	2	22%	8	35%	4	9%	
Scared	2	4%	0	0%	1	20%	0	0%	2	7%	1	3%	0	0%	2	9%	1	2%	

Note. % refers to the proportion of students who indicated they experience each emotion during each particular physical activity domain, according to their reason for participating in that physical activity domain.