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Social identification, exercise participation, and positive exercise experiences:

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1 Running title: SOCIAL IDENTITY AND EXERCISE

2

3 **Social identification, exercise participation, and positive exercise experiences:**

4 **Evidence from parkrun**

5

6 Mark Stevens^a, Tim Rees^a, Remco Polman^b

7

8 ^aDepartment of Sport and Physical Activity, Faculty of Management, Bournemouth

9 University, Dorset House, Talbot Campus, Fern Barrow, Poole BH12 5BB, UK.

10 ^bSchool of Exercise and Nutrition Sciences, Queensland University of Technology,

11 O-A411, Kelvin Grove Campus, Brisbane QLD, 4059, Australia.

12

13 Corresponding author: Mark Stevens

14 e-mail: mstevens@bournemouth.ac.uk

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17 **Social identification, exercise participation, and positive exercise experiences:**

18 **Evidence from parkrun**

19

20 **Abstract**

21 Growing evidence suggests that social identities may have profound implications for
22 physical activity participation. Real-world examinations of this relationship have,
23 however, been lacking, with research predominantly examining intentions and
24 hypothetical scenarios. To address this shortcoming and further advance
25 understanding in this area, the present study tested relationships between group
26 identification, participation, two exercise-specific outcomes (exercise-specific
27 satisfaction and group cohesion), and a broad health indicator (life satisfaction)
28 among individuals recruited from parkrun. Participants ($N=289$) completed
29 questionnaires measuring all variables except participants' parkrun participation,
30 which was objectively assessed. Structural equation modeling demonstrated that
31 group identification was significantly associated with greater participation, exercise-
32 specific satisfaction, group cohesion, and life satisfaction. Findings provide real-
33 world evidence of the health-related benefits associated with forming strong social
34 identities in exercise settings.

35

36 Key words: social identity; exercise; structural equation modeling; parkrun

37 Introduction

Physiological benefits of physical activity include a reduced risk of stroke, hypertension, and contracting non-communicable diseases such as diabetes, ischaemic heart disease, and certain types of cancer (World Health Organization, 2017). Psychological benefits include improved self-esteem, cognitive functioning, and mood, as well as reductions in both the symptoms and incidence of anxiety and depression (Biddle, Mutrie, & Gorely, 2015). Nevertheless, almost a quarter of adults (23.3%) worldwide remain insufficiently active, with the latest data further suggesting that global physical activity levels are not improving, despite many countries having a national physical activity policy or plan (Sallis et al., 2016). To address this problem, researchers have recently begun to emphasise the need to adopt broader approaches to promoting physical activity, which consider the numerous individual, environmental, policy, and social determinants (e.g., Ding et al., 2012; Garcia, Healy, & Rice, 2016; Sallis et al., 2006). In line with these proposals, evidence suggests that social factors—and in particular the development of *social identities*—may have profound implications for participation in physical activity (Strachan, Shields, Glassford, & Beatty, 2012; Terry & Hogg, 1996; see also Stevens et al., 2017). Building on this promising research, the present study sought to advance understanding by testing relationships between group identification, participation, and a range of previously unexplored exercise-specific outcomes and broad health indicators in a real-world setting (i.e., moving beyond a focus on the hypothetical effects of group identification; Strachan et al., 2012; Terry & Hogg, 1996).

60 *Social Identity and Exercise*

61 According to the *social identity approach* (Tajfel & Turner, 1979; Turner,
62 Hogg, Oakes, Reicher, & Wetherell, 1987), defining (or *self-categorising*) oneself in
63 terms of a specific social identity (e.g., as a parkrunner) is associated with a desire
64 both to discover the meaning of that identity, and to align one's attitudes and
65 behaviours with others who share it (Turner et al., 1987). Put slightly differently, this
66 means that the stronger an individual's sense of identification as a member of a
67 group (and therefore the stronger that social identity's contribution to their sense of
68 self), the more motivated the individual will be to engage in behaviours normative of
69 *in-group* members. Evidence from various domains supports these suggestions. For
70 example, Tarrant and Butler (2011) found that university students reported greater
71 intentions to reduce alcohol consumption when their social identity as a 'British
72 person' rather than a 'university student' was made salient. Similarly, Falomir-
73 Pichastor, Toscani and Despointes (2009) demonstrated that the strength of nurses'
74 identification as a member of their professional group was significantly and
75 positively associated with their likelihood of having received a flu vaccination the
76 previous year, and intention to be vaccinated the following year.

77 Along similar lines, and of particular relevance to the present study, evidence
78 also suggests that, in group exercise settings—where exercise behaviour is likely to
79 be a group norm—high levels of group identification may promote greater exercise
80 participation. Terry and Hogg (1996) found that individuals who identified more
81 strongly as a member of a group in which exercise was normative reported greater
82 intentions to engage in regular exercise than those who identified weakly as a
83 member of the group. Similarly, Strachan et al. (2012) found that runners who had
84 formed a stronger identity as a member of their running group completed a greater

85 proportion of their runs with the group and were less confident they would continue
 86 running should the group disband. Given the well-documented (and often
 87 considerable) gap between individuals' exercise intentions and behaviours (e.g., see
 88 Rhodes & de Bruijn, 2013; Sniehotta, Scholz, & Schwarzer, 2005), however,
 89 exploring the relationship between group identification and individuals' actual
 90 (rather than intended) exercise participation is a vital next step for research.

91 *The Present Study*

92 Building on the foregoing discussion, the first aim of this study was,
 93 therefore, to explore the relationship between group identification and participation
 94 in a real-world exercise setting (parkrun). To further extend understanding in this
 95 area, we also examined relationships between group identification and an exercise-
 96 specific affective outcome (individuals' satisfaction with their parkrun experiences)
 97 and a key group construct (group cohesion), and between participation and a broad
 98 health indicator (life satisfaction).

99 All hypotheses are represented schematically in Figure 1. First, building on
 100 previous research (Strachan et al., 2012; Terry & Hogg, 1996), and a fundamental
 101 assertion of the social identity approach that self-categorisation as a member of a
 102 specific group is associated with a desire to co-ordinate one's own behaviours with
 103 those normative of in-group members (Turner et al., 1987), we hypothesised that
 104 higher levels of group identification (i.e., stronger identification as a parkrunner)
 105 would be associated with higher levels of parkrun participation (H1).

106 Second, extending this, we hypothesised that individuals who possess a
 107 greater sense of shared identity or, in slightly different terms, a greater sense of
 108 social connectedness (Greenaway et al., 2015) with those they exercise with, would
 109 report more positive exercise experiences. Specifically, we hypothesised a positive

110 relationship between individuals' group identification and their satisfaction with
111 their parkrun experience (H2).

112 With regard to group cohesion, Carron and Spink's (1993) influential model
113 suggests that strategies targeting the group's environment, processes, and structure
114 will be most effective for its development, with research demonstrating the benefits
115 (including increases in group members' physical activity) of interventions based on
116 this premise (e.g., Estabrooks et al., 2011; Estabrooks, Bradshaw, Dzewaltowski, &
117 Smith-Ray, 2008). Proposed strategies for targeting the group environment (i.e.,
118 promoting a sense of distinctiveness by, for example, having group t-shirts) have
119 also been used to promote group identification in experimental social identity
120 research (Høigaard, Boen, De Cuyper, & Peters, 2013). Indeed, distinctiveness is a
121 key concept of social identity theorising, with the social identity approach suggesting
122 that self-categorisation as a group member is associated with a desire to see the in-
123 group as positively distinct from rival out-groups (Haslam, 2004). To date, the
124 relationship between group identification and group cohesion has not been explored
125 in an exercise setting. Based on the preceding observations, we hypothesised a
126 positive relationship between the two variables (H3).

127 Finally, we hypothesised a positive relationship between participation and
128 life satisfaction (H4). Despite research demonstrating the relationship between
129 overall exercise participation and life satisfaction (e.g., see Grant, Wardle, &
130 Steptoe, 2009) and growing evidence of the potential for one-off distance running
131 events to improve participants' life satisfaction (Sato, Jordan, & Funk, 2015, 2016),
132 the relationship between participation and life satisfaction has yet to be explored in
133 the parkrun setting, where there are opportunities for weekly participation. We
134 therefore took the opportunity to advance understanding in this area.

135 **Methods**

136 ***Participants***

137 Our sample consisted of 289 participants (130 males; 159 females, aged 18 to
138 78, $M_{\text{age}} = 43.90$, $SD = 10.96$; 94.1% White British) all of whom had completed at
139 least one parkrun in the six months prior to completing the study measures.

140 ***Procedure***

141 Following clearance from parkrun UK, we contacted parkrun event teams in
142 the South of England to request that a link to our online questionnaire be placed
143 alongside a brief description of the study on parkrun event websites and social media
144 pages. Visitors to these sites who wished to take part were then able to follow the
145 link and complete the questionnaire. The study received ethical approval from the
146 first author's institutional human research ethics board on 15th March 2016 (project
147 reference ID 11153). Anonymity was assured and the decision of participants to
148 complete the questionnaire represented their provision of informed consent.

149 ***Measures***

150 *Group identification.* Participants' identification as a parkrunner was
151 measured using a four-item scale (Postmes, Haslam, & Jans, 2013; e.g., "Being part
152 of this running group is an important part of how I see myself"). To encourage
153 participants to answer these items in relation to their social identity as 'a
154 parkrunner', the question stem "please indicate the extent to which you agree with
155 the following statements" was prefixed with "Thinking about parkrun as a whole".
156 Items were scored on a scale ranging from 1 (fully disagree) to 7 (fully agree). In
157 line with previous research (Haslam et al., 2017), this measure demonstrated good
158 internal consistency (Cronbach's $\alpha = .94$).

159 *Participation.* For the purposes of this study we were solely interested in
 160 participants' parkrun participation (i.e., their participation in the group that we
 161 measured their identification as a member of). As such, two objective measures of
 162 participation were obtained: the number of parkruns completed in the six months
 163 prior to, and following, completing the study measures. Each parkrunner registers
 164 once and is provided with a unique barcode. They take a copy of this barcode to all
 165 events to be scanned when they finish their run (and are reminded to do so at every
 166 event). All results are then uploaded to the parkrun website (www.parkrun.org.uk).
 167 Participants were, therefore, asked to provide their name and barcode to indicate
 168 their consent to their questionnaire data being matched to the parkrun data available
 169 online.

170 *Exercise-specific satisfaction.* Exercise-specific satisfaction was measured
 171 using a single item adapted from Moen, Hoigaard and Peters (2014): "Overall, how
 172 satisfied are you with the parkrun experience". The item was scored on a scale
 173 ranging from 1 (extremely dissatisfied) to 7 (extremely satisfied).

174 *Group cohesion.* Group cohesion was assessed using a single item:
 175 "Members of your running group all stick together" scored on a scale ranging from 1
 176 (do not agree at all) to 7 (completely agree). Although developed from Carron,
 177 Brawley, and Widmeyer's (1998) influential definition of cohesion, we eschewed
 178 use of the 18-item Group Environment Questionnaire (GEQ; Carron, Widmeyer, &
 179 Brawley, 1985) to keep the burden of measurement to a minimum, but also because
 180 some GEQ (and Physical Activity Group Environment Questionnaire; Estabrooks &
 181 Carron, 2000) items (e.g., "I am not going to miss the members of this team when
 182 the season ends") were not relevant to parkrun. Furthermore, notwithstanding
 183 questions regarding the construct validity of the GEQ (Whitton & Fletcher, 2014),

specific hypotheses regarding the GEQ's four factors were not a key focus of our study.

Life satisfaction. Life satisfaction was measured using the five-item Satisfaction With Life Scale (Diener, Emmons, Larsen, & Griffin, 1985). In contrast to the parkrun-specific satisfaction measure, this scale measured participants' global life satisfaction (an aspect of their overall well-being). An example item is: "I am satisfied with my life". Answers were provided on a scale ranging from 1 (strongly disagree) to 7 (strongly agree). In line with previous research (Diener et al., 1985), the scale demonstrated good internal consistency (Cronbach's $\alpha = .92$).¹

Analytic Procedures and Preliminary Analyses

Data were screened for missing values, outliers, and indices of non-normality. The measurement models for the two multiple-item psychological instruments (group identification and life satisfaction) were then tested using confirmatory factor analysis (CFA), before using structural equation modeling. We adopted a data-driven, exploratory approach to model testing in which modification indices and parameter estimates were used to identify the cause of any model misspecification and guide changes. Changes were, however, only made if they

¹ We also measured enjoyment, via Raedeke's (2007) 8-item version of Kendeirski and DeCarlo's (1991) 16-item Physical Activity Enjoyment scale, hypothesising a positive association between this variable and group identification. However, confirmatory factor analysis (see Analytic Procedures and Preliminary Analyses section) demonstrated poor fit for this scale: $\chi^2[20] = 253.829$, $p < 0.001$, B-S $p = 0.004$, CFI = 0.870, SRMR = 0.072, RMSEA = 0.201 (90% CI .180; .224), PCLOSE < 0.001. Alternative models (e.g., covarying error terms for which large modification indices were observed), while significantly improving model fit (e.g., by $\Delta\chi^2$)—by way of example, after covarying the two pairs of items with the largest modification indices, the model improved to: $\chi^2[18] = 145.706$, $p < 0.001$, B-S $p = 0.008$, CFI = 0.929, SRMR = 0.051, RMSEA = 0.157 (90% CI .134; .181), PCLOSE < 0.001, ECVI = .631 (90% CI .510, .778), BIC = 247.701, CAIC = 265.701—still resulted in models with some unacceptably poor fit indices. Furthermore, neither models with items removed, nor two- and three-factor models demonstrated acceptable fit. Thus, given warnings about including poorly fitting measurement models in structural models (e.g., see Bowen & Guo, 2011), we removed enjoyment from all subsequent analyses.

201 made theoretical sense (Byrne, 2016). All models were tested in AMOS 23.0
202 (Arbuckle, 2014).

203 Due to the process of online data collection, no data were missing.
204 Examination of Mahalanobis distances revealed two potential outliers (i.e., cases
205 with squared Mahalanobis distance values that stood distinctively apart from other
206 values; Byrne, 2016). Further examination of these potential outliers (Osborne &
207 Overbay, 2004) revealed atypically high or low responses (compared to the sample
208 mean) to multiple questionnaire items. In both cases, however, there was no
209 evidence of a systematic pattern of responses. Given this evidence, and repeated
210 warnings about the risks associated with removing outliers (e.g., see Ghosh & Vogt,
211 2012; Osborne & Overbay, 2004), these cases were retained. Univariate skewness
212 values for questionnaire items (including the two participation measures) ranged
213 from -4.432 to -0.087 (only 7.7% of items were below the cut-off value of -2; West,
214 Finch, & Curran, 1995) and univariate kurtosis values ranged from -1.138 to 28.353
215 (only 7.7% of items were above the cut-off value of 7; West et al., 1995). Mardia's
216 coefficient was 63.496, indicating a departure from multivariate normality (Bentler,
217 2005). Steps were therefore taken to address this non-normality.

218 First, maximum likelihood estimation was used, because non-normality has
219 negligible effects on model parameters estimated by this method (Lei & Lomax,
220 2005; Nevitt & Hancock, 2001). Second, because the chi-square (χ^2) statistic is
221 influenced by multivariate non-normality (Lei & Lomax, 2005), the Bollen-Stine (B-
222 S) bootstrapping procedure was employed. This adaptation of χ^2 provides an
223 adjusted *p*-value correcting for non-normality (Bollen & Stine, 1992). Two hundred
224 and fifty resamples were used because greater numbers of bootstrap replications

225 have been shown to have minimal impact on model rejection rates (Nevitt &
226 Hancock, 2001). As with χ^2 , non-significant B-S p -values indicate better model fit.
227 Consistent with recommendations (Hooper, Coughlan, & Mullen, 2008; Hu
228 & Bentler, 1999; Kline, 2005), various additional absolute and incremental fit
229 indices were used to examine the adequacy of our models: the Comparative Fit Index
230 (CFI), the Standardised Root Mean Square Residual (SRMR), and the Root Mean
231 Squared Error of Approximation (RMSEA) and its associated p -value (PCLOSE; $p >$
232 0.05 for close fit). CFI values > 0.90 and > 0.95 indicate good and excellent fit
233 respectively (Hu & Bentler, 1999), while values < 0.08 for SRMR and < 0.06 for
234 RMSEA are desirable as they provide optimal protection against type I and II errors
235 (Hu & Bentler, 1999). Additionally, given (1) our data-driven approach to model
236 testing, and recommendations for modified models to be evaluated in an independent
237 sample (MacCallum & Austin, 2000), and (2) our intention to assess competing
238 models, we also used the Expected Cross-Validation Index (ECVI) and two
239 information criteria: the Bayes Information Criteria (BIC) and the Consistent
240 Akaike's Information Criteria (CAIC). In the absence of an independent sample in
241 which to test our modified models, the ECVI offers a means of assessing the
242 likelihood that a model's covariance matrix would cross-validate to similar size
243 samples from the same population; the BIC and CAIC indicate the extent to which
244 parameter estimates from the original sample would cross-validate to future samples
245 (Byrne, 2016). For these three additional indicators of fit, smaller values when
246 comparing two or more models indicate the greatest potential for replication in an
247 independent sample (Byrne, 2016). The ECVI, BIC, and CAIC are also particularly
248 useful when assessing non-nested models, such as in the present study. Of all
249 available information criteria, the BIC and CAIC were chosen because they have

250 been shown to perform well under conditions of non-normality (Whittaker &
251 Stapleton, 2006).

252 **Results**

253 *Confirmatory Factor Analysis*

254 The single factor group identification model demonstrated the following fit:

255 $\chi^2[2] = 85.935, p < 0.001$, B-S $p = 0.004$, CFI = 0.926, SRMR = 0.036, RMSEA =
256 0.382 (90% CI .315; .453), PCLOSE < 0.001, ECVI = .354 (90% CI .261, .472), BIC
257 = 131.267, CAIC = 139.267. Modification indices suggested that model fit would be
258 (most) improved by covarying the error terms of items 3 ('being part of this running
259 group is an important part of how I see myself') and 4 ('I identify with my running
260 group'). With these items both designed to capture individuals' investment in their
261 group membership (Postmes et al., 2013), covarying these error terms made
262 substantive sense and we proceeded with this change. The subsequent model
263 demonstrated an excellent ($\chi^2[1] = .685, p = 0.408$, B-S $p = 0.594$, CFI = 1.000,
264 SRMR = 0.002, RMSEA = 0.000 (90% CI .000; .145), PCLOSE = 0.555, ECVI =
265 .065 (90% CI .066, .087), BIC = 51.683, CAIC = 60.683), and significantly
266 improved ($\Delta\chi^2(1) = 85.250, p < .001$), fit and was used for subsequent analyses.

267 The single factor life satisfaction model demonstrated the following fit: $\chi^2[5]$
268 = 24.198, $p < 0.001$, B-S $p = 0.016$, CFI = 0.984, SRMR = 0.024, RMSEA = 0.115
269 (90% CI .072; .163), PCLOSE = 0.009, ECVI = .153 (90% CI .113, .220), BIC =
270 80.863, CAIC = 90.863. Modification indices suggested that model fit would be
271 (most) improved by covarying the error terms of items 2 ("the conditions of my life
272 are excellent") and 4 ("so far I have gotten the important things I want in life").
273 Given that it makes theoretical sense for people to consider the conditions of their
274 life to be excellent if they have got the important things they want from life, we

proceeded with this change. The subsequent model demonstrated a good ($\chi^2[4] = 9.203, p = 0.056$, B-S $p = 0.163$, CFI = 0.996, SRMR = 0.017, RMSEA = 0.067 (90% CI .000; .125), PCLOSE = 0.252, ECVI = .108 (90% CI .090, .153), BIC = 71.534, CAIC = 82.534), and significantly improved ($\Delta\chi^2(1) = 14.995, p < .001$), fit and was used for subsequent analyses.

Structural Equation Modeling

Means, standard deviations, and correlations are presented in Table 1. The hypothesised model (Model 1, see Figure 1) demonstrated a good fit: $\chi^2[51] = 71.392, p = 0.031$, B-S $p = 0.135$, CFI = 0.992, SRMR = 0.089, RMSEA = 0.037 (90% CI .012; .056), PCLOSE = 0.852, ECVI = .435 (90% CI .372, .527), BIC = 224.385, CAIC = 251.385. Modification indices suggested that model fit would be (most) improved by specifying an additional path from group identification to life satisfaction. Given evidence for a positive association between individuals possessing multiple meaningful social identities and their global well-being (e.g., Jetten et al., 2015), estimation of this path was theoretically justified and, in the interest of model parsimony (Byrne, 2016), we proceeded with this change. The resulting model (Model 2, see Figure 2) demonstrated an excellent fit: $\chi^2[50] = 59.115, p = 0.177$, B-S $p = 0.311$, CFI = 0.996, SRMR = 0.038, RMSEA = 0.025 (90% CI .000; .048), PCLOSE = 0.969, ECVI = .400 (90% CI .368, .481), BIC = 217.774, CAIC = 245.774, which was significantly better than Model 1 ($\Delta\chi^2(1) = 12.277, p < .001$). Modification indices suggested that model fit would not be substantially improved by estimating any additional paths. Hypotheses 1-3 were supported, with group identification significantly and positively associated with participation ($\beta = .21, p < 0.001$; H1), exercise-specific satisfaction ($\beta = .29, p < 0.001$; H2), and group cohesion ($\beta = .55, p < 0.001$; H3). Group identification was

also significantly and positively associated with life satisfaction ($\beta = .22, p < 0.001$). Hypothesis 4 was not supported, with the path from participation to life satisfaction non-significant ($\beta = .005, p = .936$).² In this model, group identification accounted for 4.6%, 8.4%, and 30.5% of the variance associated with participation, satisfaction, and group cohesion respectively, while group identification and participation accounted for 4.9% of the variance associated with life satisfaction.³

To test our assumptions about variable order, we tested an additional model (Model 3) in which the paths in Model 2 were reversed. Although a χ^2 difference test between Models 2 and 3 was not possible because the models were not nested, fit indices suggested that Model 3 did not fit the data as well as Model 2: $\chi^2[50] = 96.347, p < 0.001$, B-S $p = 0.020$, CFI = 0.981, SRMR = 0.080, RMSEA = 0.057 (90% CI .039; .074), PCLOSE = 0.244, ECVI = .529 (90% CI .446, .639), BIC = 255.007, CAIC = 283.007. In particular, the χ^2 , B-S p , SRMR, ECVI, BIC, and CAIC values were higher, indicating (1) a greater discrepancy between the sample and hypothesised covariance matrices, and (2) a greater likelihood that model 2 would cross-validate to an independent sample than model 3 (Byrne, 2016). In Model 3, the paths from participation, satisfaction, group cohesion, and life satisfaction to group identification were all significant (suggesting some reciprocal effects). In all instances, however, the magnitudes of these paths were smaller than

² A subsequent model in which the path from participation to life satisfaction was removed in the interest of model parsimony produced a very similar fit: $\chi^2[51] = 59.121, p = 0.203$, B-S $p = 0.323$, CFI = 0.997, SRMR = 0.038, RMSEA = 0.024 (90% CI .000; .046), PCLOSE = 0.976, ECVI = .393 (90% CI .365, .474), BIC = 212.114, CAIC = 239.114.

³ Given our primary interest in participation as an outcome variable in our hypothesised model, we considered it most appropriate to use participation data for the six months following questionnaire completion throughout these analyses. A test of Model 2 with participation data for the six months prior to questionnaire completion also produced a good fit ($\chi^2[50] = 66.403, p = 0.060$, B-S $p = 0.199$, CFI = 0.993, SRMR = 0.039, RMSEA = 0.034 (90% CI .000; .054), PCLOSE = 0.903, ECVI = .425 (90% CI .368, .513), BIC = 225.063, CAIC = 253.063), while the same paths were significant in both instances.

319 those found in Model 2 (β 's: .20, .17, .49, and .10 respectively). These findings
 320 therefore provide support for our hypothesised theoretical sequence.⁴

321 **Discussion**

322 This study examined associations between group identification, participation,
 323 an affective exercise outcome, a key group construct, and an indicator of overall
 324 health in parkrun. Supporting hypotheses 1-3, results revealed an array of exercise-
 325 specific benefits associated with developing a strong social identity in this setting.
 326 Results failed to support hypothesis 4, with a non-significant relationship observed
 327 between participation and life satisfaction. However, a positive relationship was
 328 observed between group identification and life satisfaction. Overall, findings extend
 329 the results of previous research that has focused on individuals' identity-based
 330 intentions (Strachan et al., 2012; Terry & Hogg, 1996) by providing real-world
 331 evidence for numerous benefits associated with possessing a social identity as a
 332 member of an exercise group.

333 First, a significant relationship was observed between group identification
 334 and participation. This finding supports suggestions from organisational-based
 335 research that group identification is positively related to group commitment
 336 (Ellemers, Spears, & Doosje, 1997), with this commitment seemingly manifesting as
 337 more frequent participation in group activities in exercise settings. Evidence that this
 338 effect is particularly strong when people self-select their group memberships
 339 (Ellemers, Kortekaas, & Ouwerkerk, 1999) may partially explain the transferability

⁴ Given our primary interest in testing the potential for participation to act as a predictor variable in this model, we considered it most appropriate to use participation data for the six months preceding questionnaire completion for these analyses. A test of Model 3 with participation data for the six months following questionnaire completion produced a similar fit to that observed when it was tested with the participation data for the six months preceding questionnaire completion ($\chi^2[50] = 82.851$, $p = 0.002$, B-S $p = 0.064$, CFI = 0.987, SRMR = 0.079, RMSEA = 0.048 (90% CI .028; .066), PCLOSE = 0.559, ECVI = .482 (90% CI .409, .583), BIC = 241.511, CAIC = 269.511), while the same paths were significant in both instances.

340 of these findings to exercise settings, given that people almost always have the
341 opportunity to self-select groups in these contexts (and certainly do in parkrun).
342 Broadly, and most importantly, this finding substantiates claims that social identities
343 could be harnessed to promote participation in physical activity (Stevens et al.,
344 2017). In particular, building on previous research (Falomir-Pichastor et al., 2009;
345 Strachan et al., 2012; Tarrant & Butler, 2011; Terry & Hogg, 1996), this finding
346 provides further evidence for a potentially powerful (and favourable) process of
347 identity-based social influence whereby individuals' self-categorisation as a member
348 of a particular group fosters their desire to engage in identity-congruent behaviour
349 (Gaffney & Hogg, 2017; Turner et al., 1987). Specifically, the present findings
350 suggest that, in exercise groups where regular participation is a group norm (e.g.,
351 parkrun), individuals' desire to align their behaviour with this norm may have
352 positive implications for their group-relevant participation. Findings therefore
353 strengthen the foundation for fresh interventions to improve individuals'
354 participation in, and adherence to, physical activity by attending to their social
355 identities. Furthermore, the reciprocal effects we observed between group
356 identification and participation further speak to the potential of such interventions.
357 Specifically, they suggest that, to the extent that individuals' participation increases,
358 their sense of group identification should also increase, with a positive upward spiral
359 potentially ensuing.

360 Second, the present findings suggest that the strength of individuals' identity
361 as a parkrunner is associated with their satisfaction with their parkrun experiences.
362 Previous research has shown that various factors, including the ability to exercise
363 outdoors, and greater satisfaction with exercise instructors and the music used in
364 exercise environments, contribute to positive affective exercise experiences (Focht,

2009; Wininger & Pargman, 2003). Group identification represents a novel and important additional correlate. Although many previously identified factors are external and changeable, social identities contribute to people's internal sense of 'who they are' (Haslam, 2004). Strong identities in particular may therefore be relatively enduring, suggesting that promoting group identification may represent an effective long-term strategy for facilitating positive exercise experiences (and greater participation).

Findings relating to group cohesion also advance current understanding. Various benefits—including long-term increases in physical activity—have been documented following the implementation of interventions designed to increase cohesiveness in exercise groups (e.g., Estabrooks et al., 2011; Estabrooks et al., 2008). The present findings extend this by indicating that group identification is positively associated with group cohesion (and physical activity participation). Although a marginally stronger path was observed from group identification to group cohesion in Model 2 compared to the reverse path in Model 3, the small difference in the magnitude of the path coefficients, coupled with the cross-sectional nature of our research, prevents definitive conclusions regarding the directionality of this relationship. Regardless, the association between the two variables has positive implications. Specifically, it suggests that improvements in at least one (and, given that reciprocal effects were observed, probably both) of the constructs will elicit improvements in the other, which will likely have the effect of promoting additional benefits for group members. Based on current understanding, using strategies that promote a sense of distinctiveness in exercise groups (e.g., providing group t-shirts or encouraging the group to select a group song) would be a shrewd approach for those seeking to improve participation and adherence rates, given the capacity of

390 such strategies to promote increases in both group identification and group cohesion
 391 (Carron & Spink, 1993; Høigaard et al., 2013).

392 Findings also extend previous research—collectively referred to as the ‘social
 393 cure’ (Jetten, Haslam, & Haslam, 2012)—which has demonstrated the positive
 394 relationship between individuals’ membership of multiple important social groups
 395 and their global well-being. Although previous research has demonstrated this
 396 relationship in various contexts, including care homes (Haslam et al., 2014) and
 397 choirs (Dingle, Brander, Ballantyne, & Baker, 2013), and with regard to various
 398 health indicators, including self-esteem (Jetten et al., 2015) and quality of life
 399 (Steffens, Cruwys, Haslam, Jetten, & Haslam, 2016), this is the first study to
 400 demonstrate this relationship (1) in an exercise setting, and (2) in relation to
 401 individuals’ life satisfaction.

402 Finally, although previous research has demonstrated that individuals’ overall
 403 exercise participation and life satisfaction are positively associated (Grant et al.,
 404 2009), the present findings indicate that participation in parkrun alone (at most a
 405 once-weekly activity) is not associated with greater life satisfaction. Sato et al.
 406 (2015) suggested that, for distance running events to enhance people’s life
 407 satisfaction, participation must be accompanied by an increase in their weekly
 408 running. In line with these suggestions, a lack of additional running (or other
 409 exercise) besides parkrun may underlie the non-significant relationship observed
 410 among our participants. Further research tracking the full range of individuals’
 411 exercise behaviours would, however, be required to test this.

412 ***Limitations and Future Research***

413 The present study extended previous research by examining social identities
 414 in a specific real-world exercise setting. By solely recruiting parkrunners, we were

415 able to examine the relationship between group identification and objectively
416 assessed participation, as well as the relationship between group identification and
417 several additional variables measured via self-report. This approach limited the
418 generalisability of our findings, however, and further research is therefore required
419 in other exercise settings (e.g., Crossfit, SoulCycle, Orangetheory Fitness). Indeed,
420 further research in these various settings is particularly important given our data-
421 driven analytic strategy, with the post hoc model modifications requiring replication
422 (MacCallum & Austin, 2000). There is also a particular need for additional research
423 examining the relationship between group identification and group cohesion. The
424 present study provided an initial test of this relationship. The single-item measure of
425 cohesion used could, however, be considered a limitation, and the strong association
426 found between the two constructs should, therefore, be viewed as a foundation for
427 further research.

428 Given the present findings, and the consistent trends displayed in previous
429 cross-sectional research (Strachan et al., 2012; Terry & Hogg, 1996), there is now
430 also a need for (1) longitudinal studies to confirm the directionality of the
431 relationships explored in the current research, and (2) experimental and intervention-
432 based studies to test the causal effects of group identification on key outcomes such
433 as participation, adherence, and effort. Such studies would yield an understanding of
434 whether changes (particularly increases) in group identification lead to positive
435 changes in key variables. Addressing a limitation of this study, future studies may
436 also consider measuring the full range of individuals' physical activity behaviours
437 (i.e., their engagement in physical activity outside, as well as within, the group
438 setting) to determine whether group identification is (at least indirectly) associated
439 with individuals' overall physical activity levels. Measuring the full range of

440 individuals' physical activity behaviours would also improve our understanding of
 441 the relationship between individuals' participation in specific exercise programmes
 442 or initiatives (e.g., parkrun), their overall exercise participation, and their global
 443 well-being (e.g., their life satisfaction).

444 **Conclusion**

445 Our findings indicate positive relationships between individuals developing
 446 strong social identities in exercise settings and their participation in group-relevant
 447 exercise, as well as their sense of exercise-specific satisfaction, group cohesion, and
 448 life satisfaction. Although further research is required to determine the directionality
 449 of these relationships, our findings indicate that they may be reciprocal, with
 450 individuals' sense of social identity potentially representing both a cause and, to
 451 varying degrees, an effect of greater participation, exercise-specific satisfaction,
 452 group cohesion, and life satisfaction.

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457 The authors report no conflicts of interest.

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Table 1. Means, standard deviations, and correlations.

Variable	Mean	SD	1	2	3	4	5	6
1. Group identification	5.82	1.39	-					
2. Group cohesion	4.49	1.84	.548**	-				
3. Exercise-specific satisfaction	6.67	0.74	.280**	.185*	-			
4. Participation 1	14.25	7.45	.310**	.215**	.106	-		
5. Participation 2	12.79	7.35	.204**	.175**	.067	.790**	-	
6. Life satisfaction	4.96	1.30	.167**	.168**	.164**	.115	.045	-

Notes: * $p < 0.05$, ** $p < 0.01$. Participation 1 = parkruns in six months prior to questionnaire completion;
 Participation 2 = parkruns in six months following questionnaire completion.

Figure 1. Hypothesised model of the relationship between group identification, behavioural, affective, and group-related outcomes, and life satisfaction. Ellipses denote latent variables and rectangles observed variables.

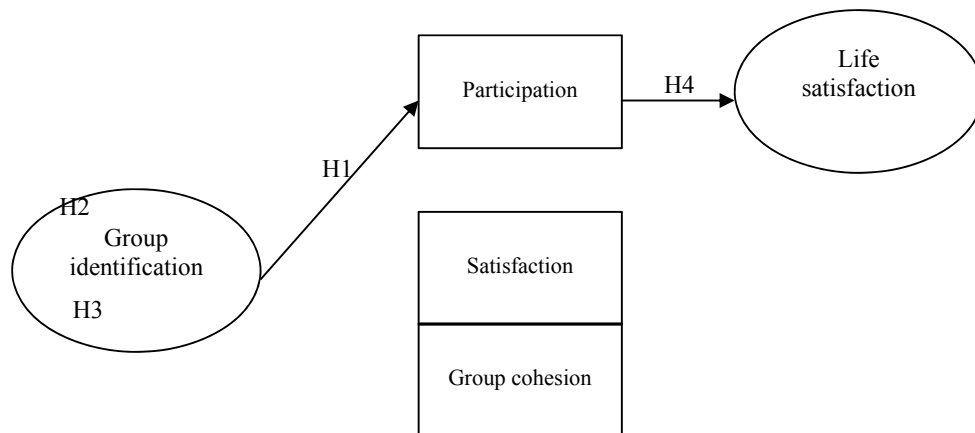


Figure 2. The final model including the standardised regression path coefficients. Ellipses denote latent variables and rectangles observed variables.

