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Facebook, Relatedness and Exercise Motivation in University Students: A Mixed Methods Investigation

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1 Facebook, Relatedness and Exercise Motivation in University Students: A Mixed
2 Methods Investigation

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Highlights

Highlights:

- FB can influence both controlled and autonomous forms of motivation
- Relatedness mediates the relationship between FB use and exercise motivation
- FB use that leads to feelings of disconnection can have negative effects on exercise

Abstract

Objectives: To examine the relationship between Facebook(FB) use, relatedness and exercise motivation.

Design: Two studies comprised a mixed-methods concurrent design. Study 1 was a cross-sectional quantitative assessment of the relationships between FB use, relatedness and exercise motivation.

Study 2 explored qualitative perceptions of how FB influences exercise motivation.

Method: Study 1: 311 undergraduate students completed a survey assessing FB use, exercise motivation and relatedness. Mediation analysis was conducted to examine relationships. Study 2: 19 participants took part in focus groups exploring experiences of exercise-related FB use and its perceived role in motivation.

Results: Study 1: FB use was related to external and introjected regulation. Relatedness mediated the relationships between FB use, introjection, and autonomous forms of motivation. Study 2: Qualitative data suggested FB can either promote (through connection, positive social comparison) or discourage exercise (through disconnection, negative social comparison, health-negating features).

Conclusion: FB use was related to external and introjected regulation. Positive relationships between FB and autonomous forms of motivation were mediated by relatedness, suggesting that interventions should focus on fostering feelings of connection with others. FB use that encourages relatedness with like-minded individuals has potential to promote autonomous motivation for exercise.

Keywords: social media, physical activity, self-determination theory, relatedness

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3 1. Introduction

4 Online social networking sites, such as Facebook (FB), are ubiquitous in society and have
5 changed the way people interact. FB provides its 1.28 billion daily users (Facebook, 2017) with a
6 personal profile and the ability to upload photos, access others' profiles, accumulate friends, and
7 interact with these friends through messaging, commenting on photos, status updates, wall posts
8 and other applications. Adults aged 18-25 years encompass 23% of all FB users (Facebook,
9 2017) and a large proportion (32%) of undergraduate students spend over four hours a day on
10 Facebook (Bicen & Cavus, 2011). Researchers have begun to investigate the potential for these
11 changing interaction patterns to positively (or negatively) affect health behaviours of young
12 adults, such as physical activity (PA).

13 Regular PA is beneficial for health, physical and psychological wellbeing (Lee, Shiroma,
14 Lobelo, Blair, & Katzmarzyk, 2012). The World Health Organization (2011) recommends that
15 adults participate in 150 minutes of moderate PA per week, yet due to a decline in PA during the
16 ages of 18 and 25 years young adults are not meeting PA guidelines (Kilpatrick, Hebert, &
17 Bartholomew, 2005). One form of PA is exercise, which is planned, structured, and involves
18 pursuit of a physical fitness objective(s) (Caspersen, 1985). Thus, an important focus within
19 health psychology is to understand the factors that influence exercise motivation and behaviour,
20 with recent interest growing in the potential role of social media, and FB in particular (e.g.,
21 Cavallo et al., 2014; Ellison, Steinfield, & Lampe, 2007; Mabe, Forney, & Keel, 2014).

22 One framework to understanding the effects of FB use on exercise motivation is through
23 Self Determination Theory (SDT; Deci & Ryan, 1985; Ryan & Deci, 2000), which examines the
24 different types of motivation underlying exercise behaviour. First, SDT distinguishes between

25 extrinsic and intrinsic motivation. Extrinsic motivation occurs on a continuum of less self
26 determined (controlled) to more self-determined (autonomous) motivation. Controlled forms of
27 motivation involve exercising due to external pressures such as financial rewards (external
28 regulation), or due to internal pressures such as seeking approval from others or avoiding guilt
29 (introjected regulation). More autonomous forms of extrinsic motivation involve exercising to
30 achieve a positive internal outcome such as improved health (identified regulation), exercising as
31 an activity integral to the self (integrated regulation) or exercising for the inherent enjoyment of
32 the activity (intrinsic motivation). Although some forms of controlled motivation may play a role
33 in initial exercise adoption (Daley & Duda, 2006; Edmunds, Ntoumanis, & Duda, 2006), there is
34 extensive evidence that autonomous motivation is related to sustained exercise participation
35 (Chatzisarantis & Hagger, 2009; Edmunds et al., 2006; Ingledeew & Markland, 2008; Teixeira,
36 Carraca, Markland, Silva, & Ryan, 2012).

37 Much of the research on FB use has focused on adolescents and college-aged individuals,
38 and has found FB use to be associated with negative self-perceptions related to weight and
39 exercise. FB use is associated with increased weight dissatisfaction, internalization of the thin
40 ideal, drive for thinness, and negative body image (Meier & Gray, 2014; Tiggemann & Slater,
41 2013), which can all lead individuals to increase their exercise behaviour (Anderson & Bulik,
42 2004; Brudzynski & Ebben, 2010). The motivation underlying these increases in exercise
43 behaviour may however be maladaptive. Individuals who exercise for extrinsic motives (such as
44 poor body image and the drive for thinness) are more likely to be driven by feelings of guilt and
45 shame (i.e., introjected regulation, (Thogersen-Ntoumani & Ntoumanis, 2006) and as a result
46 experience poorer psychological wellbeing. Thus whilst this chain of events suggests FB has
47 potential to increase engagement in exercise, this is likely through controlled forms of motivation
48 and accompanied by negative affect.

49 A second tenet of SDT indicates that satisfaction of three basic psychological needs
50 facilitates autonomous forms of motivation and positive wellbeing (Deci & Ryan, 2002; Deci &
51 Ryan, 2008). The three basic psychological needs are autonomy (a sense of ownership over one's
52 behaviour), competence (effectively mastering challenging tasks) and relatedness (feeling a
53 meaningful connection with others). It is within the social context that needs can be promoted or
54 thwarted (Deci & Ryan, 1985) suggesting FB, as a growing part of the social context for
55 undergraduate students, has potential to play a positive or negative role in exercise motivation
56 and wellbeing.

57 Given that FB is used as a tool to establish, maintain or enhance connections with others
58 (Bonds-Raacke & Raacke, 2010; Grieve, Indian, Witteveen, Tolan, & Marrington, 2013) the basic
59 need for relatedness is of interest to the present study. Perceptions of personal connections with
60 others, such as other members of a fitness class, can lead to fulfillment of the need for relatedness
61 (Teixeira et al., 2012). Satisfaction of the need for relatedness occurs through varying methods of
62 social interaction including, face to face, telephone, and online social interactions (Downie,
63 Mageau, & Koestner, 2008). Whilst relatedness plays an important role in fostering autonomous
64 motivation (Ryan & Deci, 2000), changes in relatedness have also been found to predict changes
65 in introjected regulation in exercise settings (Rahman, Thogersen-Ntoumani, Thatcher, & Doust,
66 2011). Therefore it is possible that relatedness might be a mediator through which FB enhances
67 both controlled and autonomous forms of exercise motivation. It is noteworthy that when
68 controlled motivation (such as introjected regulation) co-exists with more autonomous forms of
69 motivation it may not be detrimental to exercise adherence (Markland & Ingledew, 2007).

70 Recent research suggests that feelings of social connectedness derived from FB are
71 associated with improved mental health and well-being (Grieve et al., 2013). However whether
72 FB use provides positive or negative consequences may be related to the experience of

73 connectedness that occurs on FB. Relatedness appears to function as both a motivator and an
74 outcome of FB use. That is, feelings of disconnection (frustration of the need for relatedness)
75 motivate people to use FB, whereas feelings of connection (satisfaction of the need for
76 relatedness) are enhanced through positive experiences on FB (Sheldon, Abad, & Hinsch, 2011).
77 However, there are also instances whereby FB can lead individuals to feel disconnected, such as
78 evaluative social comparison with others (Steers, 2016). Thus FB can have either a positive or
79 negative effect on relatedness, which in turn may either positively or negatively affect
80 motivation. In the exercise context therefore, it is possible that engagement in types of exercise-
81 related FB communication that enhance feelings of connection may enhance exercise motivation,
82 whereas engagement in types of exercise-related FB communication that increase feelings of
83 disconnection may decrease exercise motivation. Indeed, research has demonstrated that PA-
84 related FB exchanges with existing friends lead to greater social support (and thus relatedness),
85 and increased PA behaviour compared to private FB intervention groups (Cavallo et al., 2014;
86 Ellison, Steinfield, & Lampe, 2007; Mabe, Forney, & Keel, 2014).

87 Taken together, the evidence reviewed suggests FB has the potential to increase exercise
88 engagement through both positive (social support) and negative (maladaptive weight-related
89 comparisons) mechanisms. To our knowledge however, no studies have directly investigated the
90 relationship between FB use, feelings of relatedness and exercise motivation. Given the centrality
91 of FB to the lives of undergraduate students, coupled with the poor PA levels of this population,
92 there is a need to understand the mechanisms through which FB might help or hinder the exercise
93 behaviour of undergraduate students. This understanding of the mechanisms through which FB
94 use relates to exercise and PA behaviour is needed for the development of interventions. This
95 mixed methods, multi-study investigation explored the FB use of undergraduate students, the
96 effects this has on their relatedness needs satisfaction, and in turn on their exercise motivation. A

97 concurrent explanatory design (Creswell, 2013) was used to explore relationships on multiple
98 levels, with qualitative data collected to provide an insight into potential mechanisms
99 underpinning quantitative observations. Study 1 was a quantitative cross-sectional investigation
100 of the relationship between types of FB use (e.g., emotional connection, social connections, and
101 exercise-related FB use), relatedness satisfaction and exercise motivation. Study 2 employed
102 qualitative focus groups to explore student experiences of FB use, feelings of relatedness and
103 exercise and physical activity behaviour. It was hypothesized that greater emotional
104 connectedness to FB, greater use of FB for social connections and greater, exercise-related FB
105 use would be associated with higher relatedness satisfaction, which would in turn would be
106 related to both greater autonomous and greater introjected exercise motivation.

107 2. Study 1: Quantitative Study

108 2.1 Methods

109 2.1.1 Participants

110 Adults aged 18 years and over were recruited through kinesiology and sport and exercise
111 psychology undergraduate classes in central Canada and the north-west of England, United
112 Kingdom to participate in a study investigating FB use and exercise motivation. Participants
113 were approached at the beginning of the class and told about the study and provided with a link
114 to the online questionnaire package. When participants went to the study link they were provided
115 with a letter of information outlining the details of the study and asked to provide informed
116 consent by clicking the appropriate button to continue the survey. Participants were eligible to
117 participate if they were students in sport and exercise sciences or kinesiology psychology classes
118 at the universities where the study took place. Participants were screened after providing consent

119 in the online questionnaire package by responding to a question asking if they were part of the
120 psychology class. Participants who indicated they were not students were directed to the end of
121 the survey and thanked for their time. The questionnaire took approximately 15 minutes to
122 complete. Ethics approval for this study was obtained from the Research Ethics Board at the host
123 university.

124 2.1.2 Measures

125 A summary of measures used, their definition and scales are presented in Table 1.

126 2.1.2.1 Demographic Information

127 Participants self-reported their age, gender, and current exercise behaviour by indicating
128 if they exercise regularly (2-3 times per week) and if so for how many years and the average
129 duration of their exercise session.

130 2.1.2.2 Facebook Use

131 Participants' FB use was examined using the Facebook Intensity Scale (FBI; Ellison et
132 al., 2007), which consists of eight items that measure the frequency, duration and emotional
133 connectedness with Facebook (e.g., "Facebook is part of my everyday activity") and is measured
134 on a five point Likert scale (1 *strongly disagree* to 5 *strongly agree*). Three further subscales
135 related to connection strategies were added (Ellison, Steinfield, & Lampe, 2011) and consist of
136 social information seeking (4 items, e.g., "I have used Facebook to check out someone I met
137 socially"), maintaining (4 items, e.g., "I use Facebook to contact a close friend"), and initiating
138 (5 items, e.g., "I use Facebook to meet new people"). The connection strategies are scored on one

139 of two 5 point Likert scales (1 *strongly disagree / not likely at all* to 5 *strongly agree / very*
140 *likely*). Additionally, to assess exercise-specific Facebook use, we created 11 items asking about
141 the frequency of engaging in exercise-related activity on FB. These items were based on types of
142 activities that people engage in on FB (Facebook, 2017), such as posting or commenting on
143 exercise-related photos, posting exercise-related status updates, and participation in exercise-
144 related groups. Participants were asked to rate how likely they were to engage in each activity on
145 a 5-point Likert scale (1 *not likely at all* to 5 *very likely*). Item wording and scoring was
146 determined based on the social connectedness strategies to maintain consistency. The Facebook
147 Intensity Scale and connection strategies demonstrated reliability with Cronbach's alphas ranging
148 between .67 -.86. The exercise related FB use scale demonstrated reliability with Cronbach's
149 alpha of .86.

150 2.1.2.3 Relatedness

151 The relatedness subscale of the Psychological Needs Satisfaction in Exercise Scale
152 (PNSE; Wilson, Rogers, Rodgers, & Wild, 2006) was used to measure relatedness in an exercise
153 context. This subscale consists of 6 items and is scored on a 6-point Likert scale (1 *not true for*
154 *me* to 6 *very true for me*). A sample item is "I feel connected to the people who I interact with
155 while we exercise together". This subscale demonstrated reliability with a Cronbach's alpha of
156 .93.

157 2.1.2.4 Exercise Motivation

158 The Behavioural Motivations in Exercise -3 (BREQ-3; Markland & Tobin, 2004; Wilson,

159 Rodgers, Loitz, & Scime, 2006) was used to assess exercise motivation. The BREQ-3 is scored
160 on a 5-point Likert scale from 0 (*not at all true for me*) to 4 (*very true for me*). The BREQ-3
161 consists of 6 subscales: amotivation (4 items, e.g., “I can’t see why I should bother exercising”),
162 external regulation (4 items, e.g., “I exercise because other people say I should”), introjected
163 regulation (4 items, e.g., “I feel guilty when I don’t exercise”), identified regulation (4 items,
164 e.g., “I exercise because it’s important to me to keep fit”), integrated regulation (4 items, e.g., “I
165 exercise because it is a fundamental part of who I am”), and intrinsic motivation (4 items, e.g., I
166 exercise because I enjoy it”). Four additional items were added to the introjected subscale to
167 reflect pride and self worth in exercise behaviour. These items were “ I exercise because I feel
168 proud of myself when I persist,” “I exercise because I feel better about myself when I continue to
169 participate,” “ I exercise because I can only be proud of myself when I continue to participate,”
170 and “ I exercise regularly to prove to myself that I can persist.” These additional items have been
171 added to comprise the BREQ4. The factor structure of the BREQ-4 has been assessed using
172 Bayesian Structural Equation Modeling. The model was estimated with the Markov chain Monte
173 Carlo algorithm with the Gibbs sampler, with 100,000 iterations. Items were specified to have
174 informative priors of .80 for loadings on their target factors and approximate zero cross loadings
175 and residual correlations. All prior variances were specified at $\pm .01$. The potential scale
176 reduction factor stabilized at ≤ 1.1 after 30,600 iterations, providing evidence of acceptable
177 convergence. The probability of the hypothesized model was good (posterior predictive p-value
178 = .64, Δ observed and replicated χ^2 95% CI [-106.05, 71.86]). Target and cross loadings all fell
179 within their a priori limits and only a small proportion of the residual correlations (20/435)
180 escaped their a priori bounds (Markland, personal communication, January 30, 2018). In the

181 present study, reliability was demonstrated with Cronbach's alphas ranging from .80-.92 and the
182 introjected subscale with the new items had an alpha of .90.

183 2.2 Data Analysis

184 Pearson product moment correlations were calculated to examine the relationships
185 between FB use and exercise motivation. The main analysis required testing the indirect effects
186 of FB use on the six behavioural motivations for exercise (amotivation, extrinsic motivation,
187 introjected regulation, identified regulation, integrated regulation, intrinsic motivation) through
188 the mediator of relatedness. A power calculation was conducted using MedPower (Kenny, 2017)
189 and indicated that for a sample size of 318, alpha set to .05 power to detect mediation (indirect
190 effects) was .945. Separate mediation analyses were conducted for each Facebook Use scale on
191 each of the behavioural motivations. The subscales of Facebook Use were the independent
192 variables, the behavioural motivations were the dependent variables and relatedness was the
193 mediator. The hypotheses were tested using PROCESS (Hayes, 2013) with 1,000 bootstraps.
194 PROCESS employs bootstrapping to estimate the size of direct and indirect effects using
195 adjusted percentile (asymmetrical) confidence intervals. The total effect quantifies the effect of X
196 on Y. The indirect effect (ab) is the mediation effect, which represents that effect of X on Y
197 through M. The direct effect (c') is that two cases that differ by one unit on the independent
198 variable (X) but are equal on the mediator (M) are estimated to differ by c' units on the
199 dependent variable (Y). Significance of the indirect effect was tested using a bias –corrected
200 bootstrap confidence interval based on 1,000 bootstrap samples in which the mediation effect is
201 deemed significant if the confidence interval does not cross zero. Effect sizes are represented by
202 Preacher and Kelley's Kappa Squared (κ). The mediation model is presented in Figure 1. [Figure
203 1 near here]

204 2.3 Results

205 Of the 318 participants that completed the online questionnaire, seven participants did
206 not have a FB account therefore were removed from the analyses. The final sample consisted of
207 311 (51.4 % male) participants with an average age of 20.14 ($SD = 1.82$) years. Ethnicity of
208 participants included: 67% White, 13% Asian, 10% South East Asian, 5 % Black, 2% Native
209 American and 2 % missing ($n=5$) data. Participants reported having exercised regularly for an
210 average of 7.88 ($SD = 4.89$) years. Weight training and running were the most commonly
211 reported exercise activities, with each exercise session lasting an average of 75 ($SD = 28.08$)
212 minutes. Participants spent an average of 77 minutes ($SD = 109.72$) using FB every day. Missing
213 data was less than five percent and was missing completely at random (Chi square = 26.147, DF
214 = 33, $p = .796$) and replaced with Expectation Maximation (EM) in Statistical Package for the
215 Social Sciences missing values procedures. EM uses an iterative approach to determine the most
216 likely expected value for missing data and impute that value (Alison, 2001).

217

218 2.3.1 Correlations.

219 Table 2 shows the means, SDs and correlations among variables [table 2 near here].
220 Positive small to moderate correlations were observed between variables. FB intensity was
221 positively correlated with external and identified and regulation, as well as relatedness. Social
222 information seeking was positively correlated with relatedness, external, introjected and
223 identified and regulation. Maintaining relationships was positively correlated with relatedness,
224 external, identified and integrated regulation. Initiating was positively correlated with relatedness
225 and integrated regulation. Exercise-related FB use was positively correlated with relatedness,
226 amotivation, external, introjected and integrated regulation.

227 2.3.2 Mediation Analysis

228 Complete mediation results are presented in Figures 2-7, including unstandardized beta
229 weights for direct effects, indirect effect and total effects. A summary of the significant
230 mediation (indirect effects) are presented in Table 3.

231 2.3.2.1 Amotivation (figure 2)

232 Total effects on amotivation were significant for FB intensity ($b = .06, p = .036$) and
233 exercise-related FB use ($b = .10, p = .023$), but significant indirect effects were observed for
234 exercise-related FB use only ($b = -.03, 95\% CI .04-.16$). Participants who engaged in greater
235 exercise-related FB use had greater feelings of relatedness and participants with greater
236 relatedness had less amotivation.

237 2.3.2.2 External regulation (figure 3)

238 Total effects for all FB scales, except for Initiating, were independently and positively
239 related to external regulation. Indirect effects were not significant for any of the FB subscales on
240 external regulation. [Figures 2 and 3 near here]

241 2.3.2.3 Introjected regulation (figure 4)

242 Total effects were significant between FB intensity ($b = .26, p = .030$), social information
243 seeking ($b = .31, p < .001$), maintaining relationships ($b = .24, p = .023$), and exercise-related FB
244 use ($b = .24, p = .04$), and introjected regulation. Indirect effects were significant for all five FB
245 subscales and introjected regulation. (FB intensity, $b = .08, 95\% CI .02, .17$; social information
246 seeking, $b = .06, (.02, .13)$; maintaining relationships, $b = .07, (.03, .26)$; initiating relationships, b
247 $= .07, (.03, .21$ exercise related FB use, $b = .09, (.04, .17)$). Participants who scored higher on FB
248 Intensity, FB Initiating, Social information seeking, Maintaining relationships and Exercise
249 related FB use had greater relatedness and participants with greater feelings of relatedness had
250 increased introjected regulation. [Figure 4 near here]

251 2.3.2.4 Identified regulation (figure 5)

252 Total effects were significant between FB use for maintaining relationships ($b = .17, p$
253 $= .023$) and exercise-related FB use ($b = .22, p = .005$) on identified regulation. Indirect effects
254 were significant for all five subscales of FB use on identified regulation. (FB intensity, $b = .11$,
255 $95\% CI (.06, .28)$; social information seeking, $b = .09, (.05, .26)$; maintaining relationships, b
256 $= .15, (.03, .23)$; initiation relationships, $b = .15 (.03, .23)$ exercise related FB use, $b = .13, (.10,$
257 $.29)$. Greater FB use was associated with higher levels of relatedness and greater feelings of
258 relatedness was associated with greater identified regulation. [Figure 5 near here]

259 2.3.2.5 Integrated regulation (figure 6)

260 All FB subscales had significant total effects on integrated regulation except for initiating
261 relationships. (FB intensity, $b = .17, p = .032$; social information seeking, $b = .17, p = .009$;
262 maintaining relationships, $b = .28, p < .001$; exercise related FB use, $b = .14, p = .001$ Indirect
263 effects were significant between all five types of FB use (FB intensity, $b = .11 (.03-.20)$; social
264 information seeking, $b = .08 (.02-.16)$; maintaining relationships, $b = .10 (.03-.18)$; initiating, b
265 $= .11, (.04-.19)$; and exercise related FB use, $b = .13, (.07-.21)$) and integrated regulation.
266 Participants who had greater use of FBI, and for social information seeking, maintaining and
267 initiating relationships and exercise-related FB use had higher levels of relatedness and
268 participants with greater feelings of relatedness had greater integrated regulation. [Figure 6 near
269 here]

270 2.3.2.6 Intrinsic (figure 7)

271 There were no significant total effects found between FB use and intrinsic motivation.
272 However, indirect effects were significant for all five all five FB subscales and intrinsic
273 motivation. Participants who scored higher on Facebook intensity, social information seeking,
274 maintain and initiating relationship and exercise-related FB use had greater relatedness and

275 participants with greater feelings of relatedness had increased intrinsic motivation. [Figure 7 near
276 here]

277 [Table 3 near here]

278 2.4 Discussion

279 Study 1 investigated relationships between FB use, relatedness and exercise motivation.
280 Different types of FB use had associations with amotivation, and external and introjected
281 regulation. However, all types of FB use were related to more autonomous forms of motivation
282 only when mediated by relatedness, with the exception of integrated regulation, for which only
283 FB use for maintaining relationships and exercise related FB was related to motivation through
284 relatedness. FB use was associated with greater relatedness satisfaction, which in turn was
285 associated with reduced amotivation, increased introjection and increased autonomous
286 motivation (identified, integrated and intrinsic). These results are in line with previous SDT
287 research indicating that needs satisfaction is associated with more autonomous forms of
288 motivation (Teixeira et al., 2012). Moreover, the current study provides novel findings for the
289 impact of FB use on exercise motivation, suggesting that when relatedness is present, FB may
290 have a positive impact on autonomous exercise motivation. The relationship between types of FB
291 use and relatedness on introjected regulation are in line with previous studies that have
292 demonstrated a relationship between relatedness and introjection (Kinnafick, Thogersen-
293 Ntoumani, & Duda, 2014; Markland & Tobin, 2010; Rahman et al., 2011), possibly due to the
294 feelings of internal pressure that might arise as peer relationships develop in exercise contexts
295 (i.e., attending an exercise class for fear of letting others down). As noted earlier, however, such
296 introjection need not have a negative effect on exercise adherence if autonomous motivation is
297 also present (Markland & Ingledew, 2007).

298 Associations between exercise-specific FB use were evident with amotivation, external
299 regulation and introjected regulation. Since the measures used in this study provided no
300 information about the content and interpretation of exercise-specific FB material, it is not
301 possible to determine the reasons why FB might lead to amotivation or controlled motivation. It
302 is plausible however that motivation may have been negatively influenced by evaluative social
303 comparisons, or experiences of disconnection that arise from certain forms of FB use (Steers,
304 2016). It is also noteworthy that no measure of disconnection was collected, therefore further
305 research is required to explore the potential effect of FB-related disconnection on exercise
306 motivation.

307 Study 2 was conducted concurrently with Study 1. The aim of Study 2 was to use qualitative
308 focus groups to explore student experiences of FB use, feelings of relatedness and exercise and
309 PA behaviour. A broader focus on PA was adopted to allow participants to discuss experiences
310 related to sport, lifestyle activity and/or exercise.

311 3. Study 2: Qualitative

312 3.1 Methods

313 3.1.1 Participants and procedure

314
315 Twenty-four undergraduate students (from the same UK university as study 1, but a
316 different cohort) were invited to take part in a qualitative study exploring the relationship
317 between FB and PA. Students were identified on the basis of their studying applied sports
318 psychology and being known to the researcher [third author]. To be eligible for the study
319 students needed to hold a FB account that they accessed at least once a week. Of the 24 students
320 who were invited, 19 consented to take part (32% male; age range 19-25 years). Participants each
321 took part in one focus group lasting between 30 and 60 minutes. Focus group make-up was
322 determined by participant availability, although where possible groups were gender-specific and

323 participants were encouraged to attend in friendship groups, since shared social culture can
324 enhance focus group interactions (Kitzinger, 1994). Four focus groups were conducted in total,
325 two female-only (n=5, n=6), one male-only (n=4) and one mixed gender (n=4). Ethical approval
326 was granted by the departmental ethics committee at the university where data was collected.

327 3.1.2 Focus groups

328 All focus groups were facilitated by an undergraduate peer of the participants [third
329 author] who had been trained in qualitative methods and focus group facilitation. It was felt this
330 peer facilitation enhanced the authenticity of the data through creating a natural environment that
331 allowed participants to be themselves (creating a “fly on the wall effect”). This shared rapport
332 encouraged honest reflections and the use of informal expressions that participants might have
333 been reluctant to use if interviewed by someone in a position of power (e.g., a university tutor).
334 The interview guide was semi-structured in nature, designed to explore participant experiences of
335 exercise and PA-related FB interactions, motivation, and the role FB plays in relatedness (both
336 connection and disconnection). Participants were first asked some general questions about their
337 involvement in PA, then were asked to give examples of ways they thought FB could be used to
338 talk about PA. This was followed by several open questions about their own experiences, such
339 as “Can you tell me about your experiences in regards to FB and your participation in PA?”,
340 “How does your FB use relate to your PA motivation?”, and “How does your FB use influence
341 how connected you feel with others in regards to your PA?” Each open question was followed
342 with more direct probes asking for positive and negative examples (e.g. “Can you give any
343 examples of how FB makes you feel connected with regards PA?” (positive); “Can you give any
344 examples of how FB makes you feel disconnected with regards PA?” (negative)). Further
345 prompts and probes were used flexibly to elicit a deeper understanding of issues raised.

346 3.2 Analysis

347 Data were transcribed verbatim, yielding 45 pages of raw data for analysis. An inductive
348 thematic analysis (Braun & Clarke, 2006) was conducted to allow themes and subthemes to
349 emerge from the data. Initial codes were produced through tagging and naming selections of text
350 that could potentially form the basis of repeated patterns (themes) across the data. These codes
351 were then compared and contrasted to form subthemes which were further organized into
352 overarching themes. All analysis was conducted by [third author] with regular meetings with
353 [second author] to review emerging themes for conceptual meaning, clarity and
354 representativeness of the data. The thematic structure was modified throughout this process, until
355 both researchers were in agreement the final themes presented an authentic and meaningful
356 representation of participant views.

357 3.3 Results

358 Four overarching themes were identified in relation to the role of FB in exercise motivation:
359 *connection* (promotes exercise), *disconnection* (discourages exercise), *social comparison* (both
360 promotes and discourages exercise), and *health-negating features of FB* (discourages exercise).
361 Participant experiences suggested FB can act as both a positive and a negative influence on
362 exercise motivation. In the text that follows, each theme is explained in turn, with illustrative
363 quotes to support the narrative. Participants are identified by focus group number (FG1, FG2
364 etc.), participant number within each group (P1, P2 etc.) and gender (male, female).

365 3.3.1 Connection

366 Several examples were provided to demonstrate how exercise-related interaction on FB
367 increased relatedness through feelings of connection with others. One student described how
368 sharing their interest in sport through FB brought them closer to their friends, another explained
369 how use of a FB group brought their football team closer together.

370 *When I share posts or my mates share posts or videos of football or whatever it kind of makes*
371 *you feel closer to each other...you've got the same interests and I suppose without seeing that*
372 *stuff on FB and interacting with each others' stuff you wouldn't necessarily have had that extra*
373 *contact with your friends (FG4/P4/male)*

374 *We have a FB chat for the whole football team...talking about training and arranging the socials*
375 *on FB makes us more connected together as a team (FG2/P5/female)*

376 In turn, the PA-related interaction that occurred through FB motivated students to take part
377 so they could see their friends (FB connection promoted PA which in turn promoted further
378 connection).

379 *Before training someone will always post 'who's coming'...seeing who's engaging in the posts*
380 *makes you want to go as you know you're gonna see your mates (FG2/P4/female)*

381 3.3.2 Disconnection

382 Conversely, some students described experiences in which PA-related FB activities led
383 to relatedness frustration through feelings of disconnection, which in turn discouraged them from
384 participating in PA.

385 *You can see exactly what your FB friends are doing, what they are liking, who they are talking*
386 *to or whatever...you can feel disconnected to people when you no longer kind of interact with*
387 *each other's stuff, or you might see that your one mate has been tagged in a picture and you*
388 *wasn't invited along...so it could make you feel disconnected in that sense*
389 *too (FG3/P2/female)*

390 Where changes in circumstances had disconnected students from past sports teams,
391 having access to team-related information on FB heightened the lack of relatedness they were
392 feeling.

393 *I feel disconnected to the people in my old football team...I see all their stuff on FB and I kind of*
394 *wish I was still playing with them but obviously I'm not so I don't have anything in common with*
395 *them anymore (FG4/P6/male)*

396 Whilst in other situations, students (particularly female focus groups) described active
397 needs thwarting behaviours from others, and the detrimental effect this might have on their PA
398 motivation.

399 *On FB people can be very judgemental...you often see people sharing stuff that are taking the*
400 *mick out of people and their hard work...some people may get put off [from PA]...in fear that*
401 *they are going to get criticised (FG3/P5/female)*

402 Such judgement from FB peers led some students to “disconnect from their
403 disconnections” to prevent their feelings of relatedness frustration having a negative effect on
404 their exercise behaviour. The following student shared how she had been judged on FB and
405 received negative comments from friends when she was posting pictures of her weight-lifting
406 progress, which led the student to “unfriend” those friends on FB.

407 *I recently deleted like loads of people the other week... I would say they were my best friends at*
408 *one time, but since I've kind of moved to uni...when I was training they were really horrible to*
409 *me about it, so they're the sort of people that I haven't got anything in common with anymore so*
410 *I thought 'what's the point of having them on FB' (FG1/P1/female)*

411 3.3.3 Social comparison

412 One of the reasons FB was perceived to influence students' PA motivation (both
413 positively and negatively) was the ease with which FB allowed students to compare themselves
414 with others. For many students, viewing others' PA experiences was perceived as a motivator.

415 *If I see like a gym video getting shared loads I'll watch it and it will make me feel motivated and*
416 *want to do more physical activity (FG4/P4/male)*

417 In some cases however, students' motives for PA were extrinsic (e.g., aesthetics, need for
418 approval): *When they [people in the fitness business] post like pictures of themselves, so it's like*
419 *motivation... 'I wanna look like that so I'm gonna go to the gym rather than sit at home'*
420 *(FG1/P2/female)*

421 *When people post progress pictures it kind of motivates you to keep going the gym and train*
422 *hard...especially 'cos you see all the praise they are getting so it makes you think if you were to*
423 *do it, like you would get recognition for all your hard work (FG4/P1/male)*

424 For some students, social comparison reduced their perceived competence or led to
425 feelings of body dissatisfaction, which in turn discouraged them from participating in PA.

426 *When I see people who are really progressing in their physical activity it makes me feel*
427 *disconnected to them as well, because I haven't been doing anything and I guess it kind of stops*
428 *me from re-starting as I feel I'd be crap in comparison" (FG4/P6/male)*

429 *When I see people's progress pictures or just pictures in general with girls with tiny frames...I*
430 *kind of automatically get demotivated as I know I could never really achieve that*
431 *(FG3/P5/female)*

432 *3.3.4 Health-negating features of FB*

433 Finally, the nature of FB itself was seen as a de-motivator for PA, firstly through the extent
434 of food-related interactions students are exposed to, and secondly due to the sedentary nature of
435 engaging with FB itself.

436 *When you see like unhealthy kind of food, or proper high calorie food or when people are saying*
437 *they are going to the pub or whatever it always makes me think ‘what’s the point doing PA now*
438 *if I’m just gonna consume all these calories’ (FG4,P1, male)*

439 *Sometimes I’ll plan to go to the gym and I’ll sit in my gym stuff ready to go and I’ll go on FB for*
440 *a while...there has been occasions where I’ve sat there for that long that I don’t end up going [to*
441 *the gym] (FG3/P3/female)*

442 3.4 Discussion

443 Study 2 provided a qualitative insight into undergraduate students’ experiences of
444 exercise and PA-related FB interactions and the effects these have on their motivation and
445 behaviour. Data suggested exercise and PA-related interactions were common in this group of
446 sports psychology students, although the effect of these interactions on motivation could be
447 either positive or negative. As suggested in previous literature (Ellison 2007; Cavallo et al.,
448 2014; Mabe et al., 2014), connection was achieved through interactions with existing peers about
449 PA and this in turn promoted active PA participation. Conversely, disconnection occurred
450 through both feelings of “being left out” (needs neglect) and instances of cyber-bullying from FB
451 friends (needs thwarting).

452 Recent literature (Vansteenkiste & Ryan, 2013) suggests a distinction needs to be made
453 between “needs-neglectful” behaviours that lead an individual to experience a lack of needs
454 satisfaction (where the feelings are driven by internal perceptions) and “needs-thwarting”
455 behaviours that lead to feelings of needs frustration (where the feelings are driven by external
456 actions of others), with the latter being more harmful for psychological wellbeing.
457 The other dominant theme in the data was the social comparison inherent in FB. There seemed to
458 be some individual variation in how students interpreted PA-related posts from others, and the

459 effect this had on their own PA motivation. For some students, seeing positive role models
460 appeared to heighten their PA motivation, although their motives were extrinsic and their
461 motivation introjected. For other students however, the lack of perceived similarity between the
462 model (e.g., “girls with tiny frames”) and themselves (Bandura, 1996), de-motivated them from
463 PA since they perceived no point in trying.

464 4. General Discussion

465 The first aim of this research was to determine the relationship between FB use,
466 relatedness and exercise motivation. It was hypothesized that greater FB use would be associated
467 with higher levels of relatedness and in turn greater autonomous and introjected regulation. In
468 support of this hypothesis, we found that the relationships between all five types of FB use and
469 autonomous motivations, introjected regulation and amotivation were mediated by relatedness.
470 More specifically, through feelings of relatedness, FB use was associated with greater
471 autonomous forms of motivation, including identified, integrated and intrinsic motivation,
472 greater introjected regulation and less amotivation. Additionally, the intensity of FB use, which
473 reflects the duration, frequency and emotional connectedness to FB, had associations with
474 external and introjected regulation. The second aim of this investigation was to qualitatively
475 explore student experiences of FB use, feelings of relatedness and exercise and physical activity
476 behaviour. Key findings indicated that PA-related FB experiences have both positive and
477 negative influences on motivation dependent on whether FB use leads to connection or
478 disconnection, and how individuals interpret posts from others with reference to their self.
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480 It is widely accepted that autonomous motivation is associated with greater PA (Teixeira
481 et al., 2012; Thøgersen-Ntoumani & Ntoumanis, 2006). We found that all types of FB use, with
482 the exception of using FB to initiate relationships were associated with both greater introjected
483 regulation. However, a different pattern emerged for more autonomous forms of motivation.

484 Specifically, only FB use of maintaining social relationships and exercise related FB use was
485 associated with greater integrated regulation. FB use was related to intrinsic motivation only
486 when relatedness was present, thus suggesting relatedness may be more important in the
487 development of autonomous motivation, including intrinsic motivation than previously thought.
488 This notion is supported by the fact that relatedness also mediated the relationship between all
489 types of FB use and other autonomous forms of motivation (identified, integrated), and that when
490 friends shared a common interest in PA on FB, this connection increased their motivation to
491 engage in PA. The current findings are consistent with research that has demonstrated that
492 psychological well-being and self-esteem (Abellera, Ouana, Conway, Camilotes, & Doctor,
493 2012) are enhanced through FB use when feelings of relatedness or social support (Hu, Kim,
494 Siewek, Wilder, 2017) are present. Indeed, interactions with good friends on FB contributes to
495 well being (Abellera et al., 2012). College students not only have large declines in physical
496 activity (Kilpatrick et al., 2005), but also spend a significant amount of time engaged with FB
497 (Bicen & Carvus, 2011). Given that FB is known to increase feelings of connection (Sheldon et
498 al., 2011), interventions that foster exercise-related connections (i.e., relatedness) via FB could
499 offer a means of promoting PA for student populations. Indeed, research has demonstrated PA-
500 related FB exchanges with existing friends lead to greater feelings of relatedness and increased
501 PA behaviour (Cavallo et al., 2014; Ellison et al., 2007; Mabe et al., 2014).

502 In addition to the mediated relationships with autonomous motivation, we found higher
503 FB use was directly (with the exception of initiating relationships through FB) and indirectly
504 (through relatedness) linked to introjected regulation. Despite general findings that controlled
505 forms of motivation tend to be maladaptive for PA behavior (Teixeira et al., 2012) and
506 psychological wellbeing, there is some evidence to suggest introjected regulation is associated
507 with greater PA and exercise participation (Thogersen-Ntoumani & Ntoumanis, 2006), and when

508 accompanied by autonomous forms of motivation psychological wellbeing may be preserved
509 (Markland & Ingledew, 2007). Our findings shed some light on the potential positive and
510 negative functions of introjection. It is plausible introjected regulation might serve an adaptive
511 motivational function (without harming psychosocial wellbeing) when the basic need of
512 relatedness is met (and feelings of introjection stem from not wanting to let others down).
513 Indeed, relatedness plays an important part in adherence to group-based exercise programmes
514 (Kinnafick et al., 2014; Rahman et al., 2011). Introjected regulation may be maladaptive,
515 however, when focused on imagined approval from others or contingent self-esteem (Ryan &
516 Deci, 2017). Responses in Study 2 highlighted that seeing others' exercise-related FB posts
517 increased introjected regulation as students wanted to engage in PA to "look like" others or to
518 receive the same approval for their efforts that others had received. Although we found these
519 egocentric desires did motivate participants to engage in PA, if not accompanied by more
520 autonomous regulations such introjected motives may be damaging for psychosocial wellbeing
521 (Markland & Ingledew, 2007).

522 Although exercise-related FB use made some participants feel more connected and
523 motivated to be active, results from both Study 1 (showing a positive association between
524 exercise-specific FB use and amotivation) and Study 2 (showing instances of disconnection and
525 needs thwarting) suggest there is a maladaptive side to exercise-related FB use, analogous to that
526 reported by Sheldon et al. (2011). Some participants found that seeing their friends engaged in
527 activity without them led to feelings of disconnection (i.e., needs neglect) and others described
528 instances of unkind posts from others (i.e., active needs thwarting), both of which decreased
529 motivation. The concept of psychological need thwarting has been proposed as the mechanism
530 through which negative dimensions of social interaction lead to ill-being (Bartholomew,
531 Ntoumanis, & Thøgersen-Ntoumani, 2011). Indeed, illbeing and negative outcomes in sport

532 result from needs thwarting (Bartholomew et al., 2011). For some students, seeing others'
533 progress in PA goals led to feelings of disconnection and negative self-perceptions about their
534 body. This finding supports previous research indicating that FB use can be associated with
535 weight dissatisfaction and negative body image (Tiggermann & Slater, 2013). Although these
536 feelings of dissatisfaction have been found elsewhere to lead to increases in PA behavior
537 (Anderson & Bulik, 2004; Brudzynski & Ebben, 2010), the students in our study were
538 demotivated by their negative social comparisons. Whilst it is not possible to tell from the
539 current data what role individual psychological characteristics played in responses to FB use,
540 individual difference research shows the effect of FB on psychological wellbeing varies with
541 personality (Hu et al., 2017) and with attachment styles (Lin, 2016). For example, those who
542 worry that others will leave them (anxious attachments) use FB to satisfy needs for relatedness
543 that is in turn related to positive well being (Lin, 2016). Thus, further research is required to
544 understand the ways in which individual differences affect the relationship between FB,
545 relatedness and exercise motivation.

546 This study is the first to examine how forms of FB interaction, including overall
547 intensity of FB use, employing FB for social connections and exercise related FB use influences
548 exercise motivation. This novel approach is timely, given the pervasive nature of social media
549 outlets such as FB at a societal level and the concerning rates of physical inactivity. The mixed
550 methods approach is a strength of this research, with the cross-sectional quantitative data
551 providing evidence of the relationship between FB use and exercise motivation, and the
552 qualitative data elucidating potential mechanisms underpinning this relationship. There are
553 however, limitations that need to be taken into consideration. First, the PNSE does not measure
554 disconnection. Whilst our qualitative data is suggestive of a maladaptive link between FB,
555 disconnection and amotivation, further research is required to substantiate these links with

556 quantitative data. Second, PA and exercise are conceptually different, however Study 1 focused
557 on exercise behavior, whereas, Study 2 discussed PA in a broader context. Nevertheless, it is
558 important to note the majority of examples used in Study 2 were either sport or exercise-related.
559 Third, although the distinction between positive and negative interactions was present in Study 2,
560 it is not possible from the Study 1 measures to tell whether the FB interactions were positive or
561 negative. This will likely have an important influence on exercise motivation; therefore, the
562 development of tools to explore the valence of FB interactions may be worthwhile. Fourth, it is
563 noteworthy that study 1 (quantitative) and study 2 (qualitative) participants were drawn from
564 different populations, thus whilst the qualitative data can provide some insight into *potential*
565 mechanisms underpinning the FB and exercise motivation relationship, this data cannot be taken
566 as specific explanatory evidence of the study 1 observations. It must be noted also that
567 participants in both studies were from sport-related programs, therefore their exercise-related FB
568 behavior may differ from others by virtue of their interest in sport and exercise. Fifth, given that
569 the majority of the sample is Caucasian, the countries in which the study took place are similar
570 and that the students are all studying sport and exercise-related classes, the results may not
571 generalize to other students with different academic backgrounds, race and in different countries.
572 In addition, exercise motivation may have been influenced by income and education background
573 however, income and education were not included in the mediation analyses. Lastly, it is
574 important to note limitations to mediational research within cross sectional data. While
575 mediation effects provide important information about the relationships between FB, relatedness
576 and exercise motivation, it is possible that the temporal ordering of the variables may be
577 incorrect. However, previous research has demonstrated that feelings of relatedness result from
578 using FB (Sheldon et al., 2011). Future research may consider employing a longitudinal
579 approach to confirm temporal ordering of the variables within these relationships.

580 4.1 Conclusion and recommendations

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PA levels in undergraduate students have declined to levels that are not sufficient for health benefits (Kilpatrick et al., 2005). As such, this is an important population to focus PA interventions. Using a mixed methods approach, the aim of this research was to investigate the relationships between FB use, relatedness and exercise motivation and the mechanisms that underpin these relationships. Our findings suggest that providing supportive PA environments within FB that promote relatedness and support may be a successful avenue to promote PA participation for the student population. We did however identify a potential maladaptive side of FB resulting from social comparisons, active needs thwarting (e.g., bullying), and needs neglect (e.g., feeling left out).

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Further research is needed to investigate this maladaptive side of FB use on exercise motivation and the impact of individual differences. Finally, this research provided a novel insight into the nature of introjected regulation and the different ways introjection may impact exercise behaviour and wellbeing. Further research is warranted to conceptualize the different elements of introjection and their relationship with exercise and wellbeing.

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Table 1. Summary of Measures			
	Definition	Scale	Alpha
Motivation (Behavioral Regulation in Exercise Questionnaire-3)			
Amotivation (4 items)	Lack of exercise motivation	Not at all true for me (0) – very true for me (4)	.80
External (4 items)	Exercising for external pressures such as financial rewards	Not at all true for me (0) – very true for me (4)	.84
Introjected (8 items)	Exercising due to internal pressures such as seeking approval from others or avoiding guilt	Not at all true for me (0) – very true for me (4)	.90
Identified (4 items)	Exercising because you value the benefits of exercise such as improved health	Not at all true for me (0) – very true for me (4)	.84
Integrated (4 items)	Exercising because the activity is seen as part of the self	Not at all true for me (0) – very true for me (4)	.87
Intrinsic (4 items)	Exercising for the inherent enjoyment of the activity	Not at all true for me (0) – very true for me (4)	.92
Facebook Use (Facebook Intensity Scale, Ellison et al. 2007; Ellison et al., 2011)			
Facebook Intensity (8 items)	Frequency, duration and emotional connectedness with Facebook	Strongly disagree(1) -strongly agree (5)	.86
Social Information Seeking (4 items)	How likely people are to use Facebook to learn more about someone they met socially	1 item, Not at all likely (1) – very likely (5) 3 items, Strongly disagree (1) – strongly agree (5)	.83
Maintaining Relationships (4 items)	The degree to which people use Facebook to maintain relationships with existing friends.	2 items Strongly disagree (1) to strongly agree (5) 2 items, Not at all likely (1) – very likely (5)	.84
Initiating Relationships (4 items)	How likely people are to use Facebook to initiate a relationship with a stranger	3 items, Not at all likely (1) – very likely (5) 1 items, Strongly disagree (1) – strongly agree (5)	.67
Exercise related Facebook use (11 items)	How likely people are to engage in exercise-related Facebook activities based on the features of Facebook.	Not at all likely (1) – very likely (5)	.86
Relatedness (Psychological Needs Satisfaction in Exercise, Wilson et al., 2006)			
Relatedness (3 items)	Feeling meaningful connections to others in an exercise context	Not true for me (1) – very true for me (6)	.93

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Table 2. Correlations, Means and Standard Deviations for Facebook use, Relatedness and Exercise Motivation

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Facebook Intensity	1											
2. Social information seeking	.37**	1										
3. Maintaining relationships	.34**	.40**	1									
4. Initiating relationships	.35**	.55**	.37**	1								
5. Exercise related FB use	.39**	.39**	.29**	.38**	1							
6. Relatedness	.19**	.17**	.19**	.18**	.29**	1						
7. Amotivation	.04	-.04	-.05	.03	.11*	-.14*	1					
8. External regulation	.22**	.22**	.14*	.09	.22**	.04	.22**	1				
9. Introjected regulation	.17**	.25**	.17**	.29**	.17**	.31**	-.17**	.27**	1			
10. Identified regulation	.12*	.15**	.22**	.03	.11	.43**	-.35**	.046	.60**	1		
11. Integrated regulation	.09	.07	.13*	.06	.16**	.47**	-.31**	-.04	.50**	.69**	1	
12. Intrinsic motivation	-.01	.06	.08	-.04	.05	.44**	-.32**	-.14*	.33**	.62**	.68**	1
Mean	3.76	3.30	4.24	2.66	2.04	4.43	1.31	2.48	4.53	5.95	5.19	5.12
Standard Deviation	.81	.96	.85	.81	.84	1.18	1.26	1.26	1.17	1.08	1.47	1.11

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Table 3. Summary of Significant Mediation Results Between Facebook Use and Exercise Motivation via Relatedness

	Path a	Path b	Total Effect (path c)	Indirect effect (Path ab)		Direct Effect (Path c')	Effect Size
Facebook Use			b (SE)	B 95% CI		b	κ
Amotivation Motivation							
Exercise - Related	.30 (.07)*	-.66 (.04)**	.10 *	-.03 [†]	(-.08, -.01)	.10 (.06)*	.04
Introjected regulation							
Total Intensity	.25 (.08)	.31 (.06)*	.26 (.08)*	.08 [†]	(.02, .12)	.18 (.08)*	.05
Social Information Seeking	.29 (.07)**	.27 (.03)**	.31 (.08)**	.06 [†]	(.02, .12)	.25 (.07)**	.05
Maintaining Relationships	.29 (.08)**	.28 (.06)**	.24 (.07)*	.07 [†]	(.02, .15)	.16 (.08)*	.05
Initiating Relationships	.28 (.09)**	.29 (.06)**	.03 (.08)	.07 [†]	(.02, .12)	.26 (.08)**	.05
Exercise -Related	.34 (.08)**	.29 (.06)**	.24 (.08)*	.09 [†]	(.04, .16)	.15 (.08)	.05
Identified regulation							
Total Intensity	.27 (.08)**	.39 (.05)**	.17 (.07)*	.11 [†]	(.03 - .20)	-.06 (.07)	.08
Social Information Seeking	.23 (.07)**	.39 (.05)**	.11 (.06)*	.08 [†]	(.02 - .16)	-.02 (.06)	.08
Maintaining Relationships	.26 (.08)*	.37 (.05)**	.22 (.07)*	.10 [†]	(.03 - .18)	.08 (.07)*	.08
Initiating Relationships	.29 (.08)**	.42 (.05)**	.10 (.08)	.10 [†]	(.04 - .19)	-.05 (.07)	.08
Exercise -Related	.32 (.08)**	.41 (.05)**	.28 (.08)*	.13 [†]	(.07 - .21)	.09 (.07)	.10
Integrated							
Total Intensity	.19 (.08)*	.59 (.06)*	.17 (.08)*	.16 [†]	(.06, .28)	.06 (.09)	.09
Social Information Seeking	.18 (.08)*	.45 (.07)**	.17 (.00)*	.15 [†]	(.05, .26)	.09 (.08)	.09
Maintaining Relationships	.20 (.06)*	.59 (.07)**	.28 (.10)*	.15 [†]	(.04, .27)	.18 (.09)*	.09
Initiating Relationships	.17 (.02)*	.56 (.06)**	.04 (.09)	.12 [†]	(.03, .23)	-.07 (.09)	.09
Exercise -Related	.31 (.08)**	.60 (.07)**	.14 (.10)**	.18 [†]	(.10, .29)	.01 (.09)	.11
Intrinsic Motivation							
Total Intensity	.23 (.08)*	.52 (.05)**	-.01 (.07)	.12 [†]	(.04 - .22)	-.13 (.09)	.09
Social Information Seeking	.22 (.08)**	.41 (.06)**	.07 (.09)	.09 [†]	(.03 - .17)	-.02 (.08)	.09
Maintaining Relationships	.23 (.07)**	.47 (.08)**	.11 (.08)	.11 [†]	(.03 - .20)	.00 (.07)	.09
Initiating Relationships	.19 (.04)*	.59 (.05)**	-.05 (.07)	.11 [†]	(.04 - .20)	-.16 (.07)*	.08
Exercise -Related	.31 (.08)**	.45 (.05)**	.08 (.06)	.14 [†]	(.07 - .12)	-.06 (.08)	.11

Note: N = 311. Unstandardized *b* values are presented. CI = confidence interval. **K** = Preacher and Kelley's Kappa Squared effect size. Significance of pathways are denoted by * for $p < .05$ and ** for $p < .001$. Significance of the indirect path is determined by a confidence interval not containing zero and is denoted by [†]

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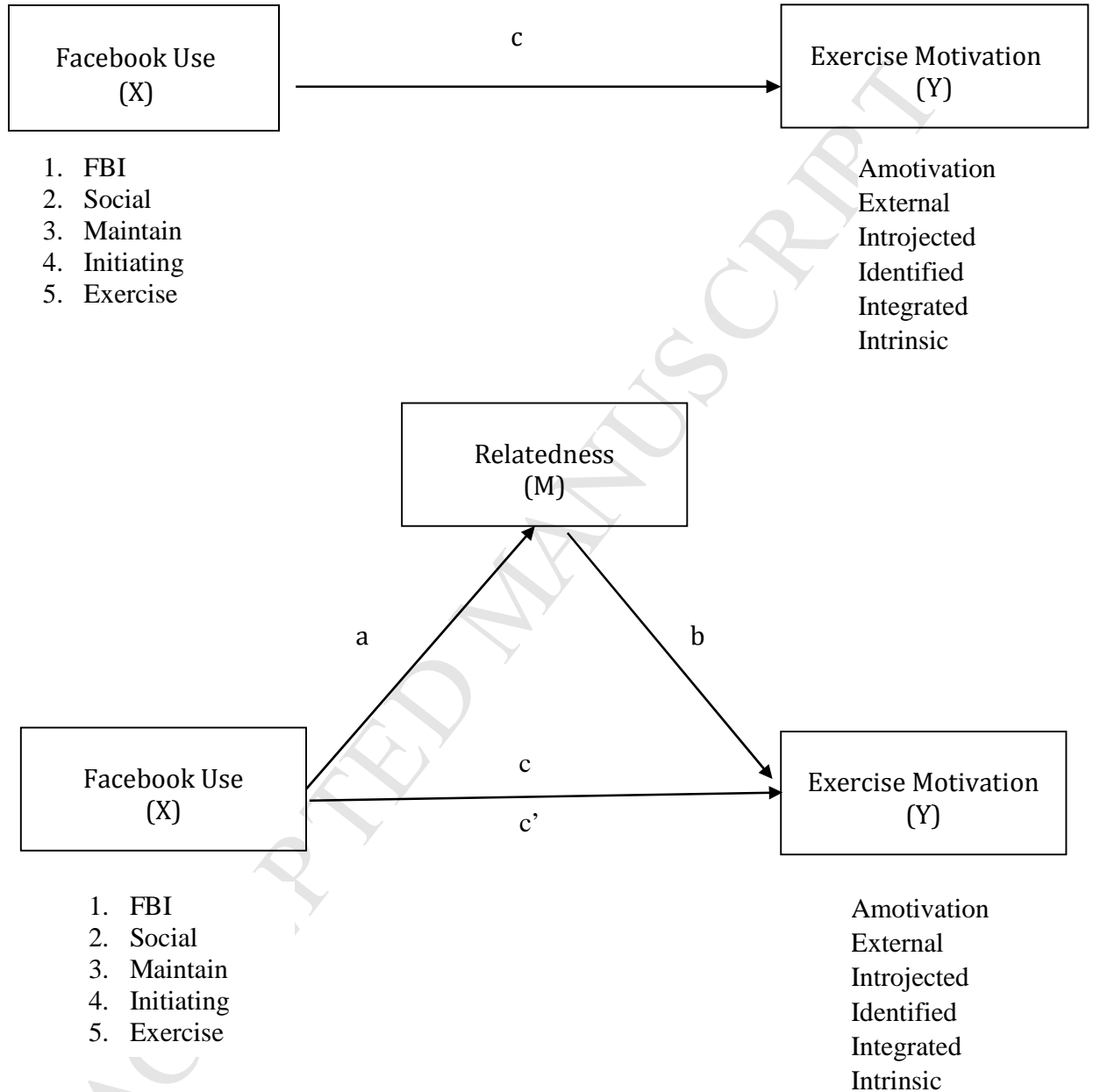


Figure 1. Mediation model for total, direct and indirect effects. The direct effect quantifies the effect of X on Y. The indirect effect (ab) is the mediation effect, which represents that effect of X on Y through M. The total effect (c') is that two cases that differ by one unit on the independent variable (X) but are equal on the mediator (M) are estimated to differ by c' units on the dependent variable (Y).

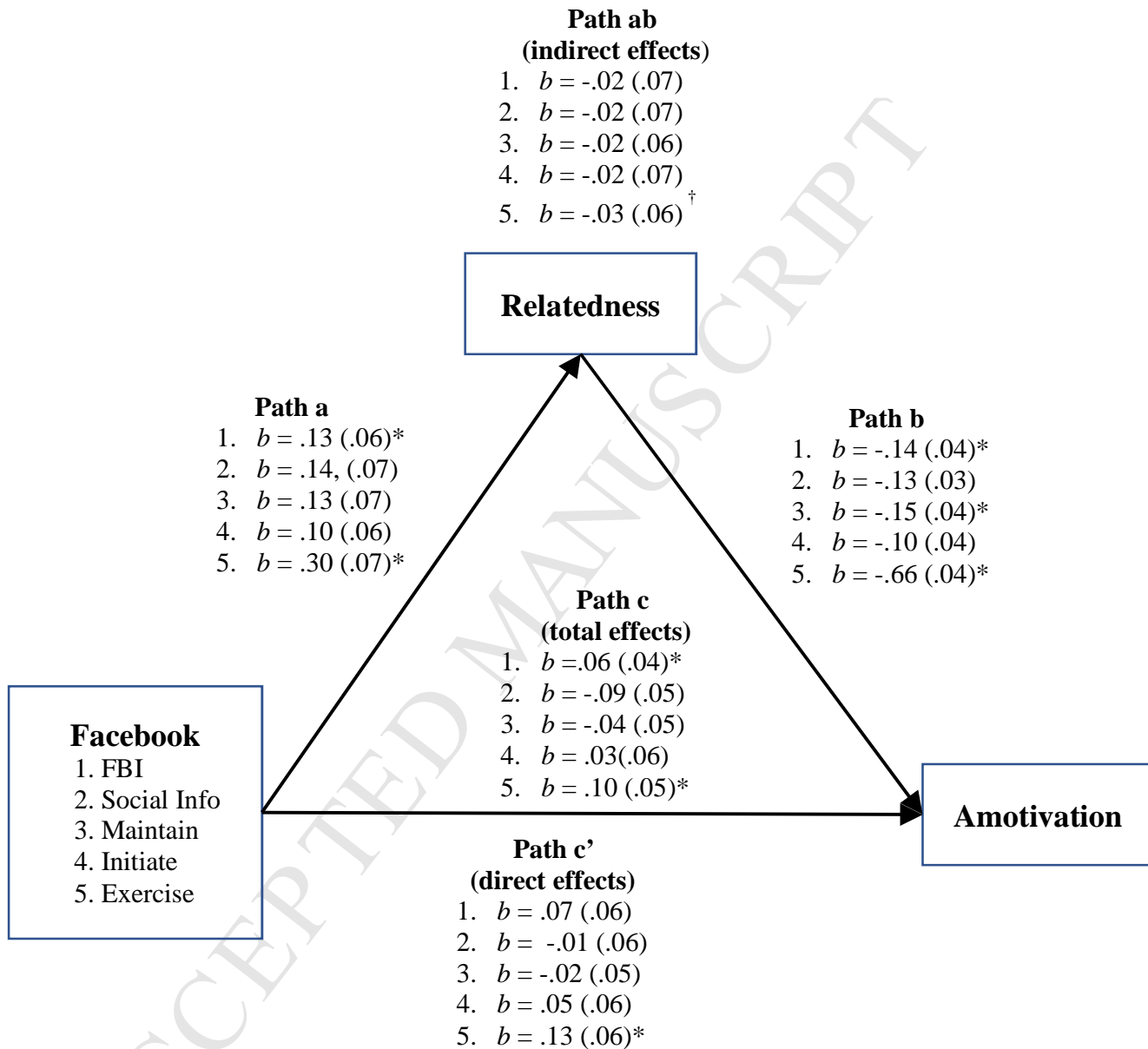


Figure 2. Results of the mediation models for the effects of Facebook Use on Amotivation. Unstandardized beta coefficients and standard errors in (SE) are presented. FBI, Facebook Intensity Scale; Social Info, Social Information Seeking; Maintain, Maintaining Relationships, Initiating, Initiating Relationships; Exercise, Exercise related Facebook use. Significance of pathways are indicated with * for $p < .005$ and ** for $p < .001$. Significant indirect effects are indicated with a † , where 95% confidence intervals do not contain zero.

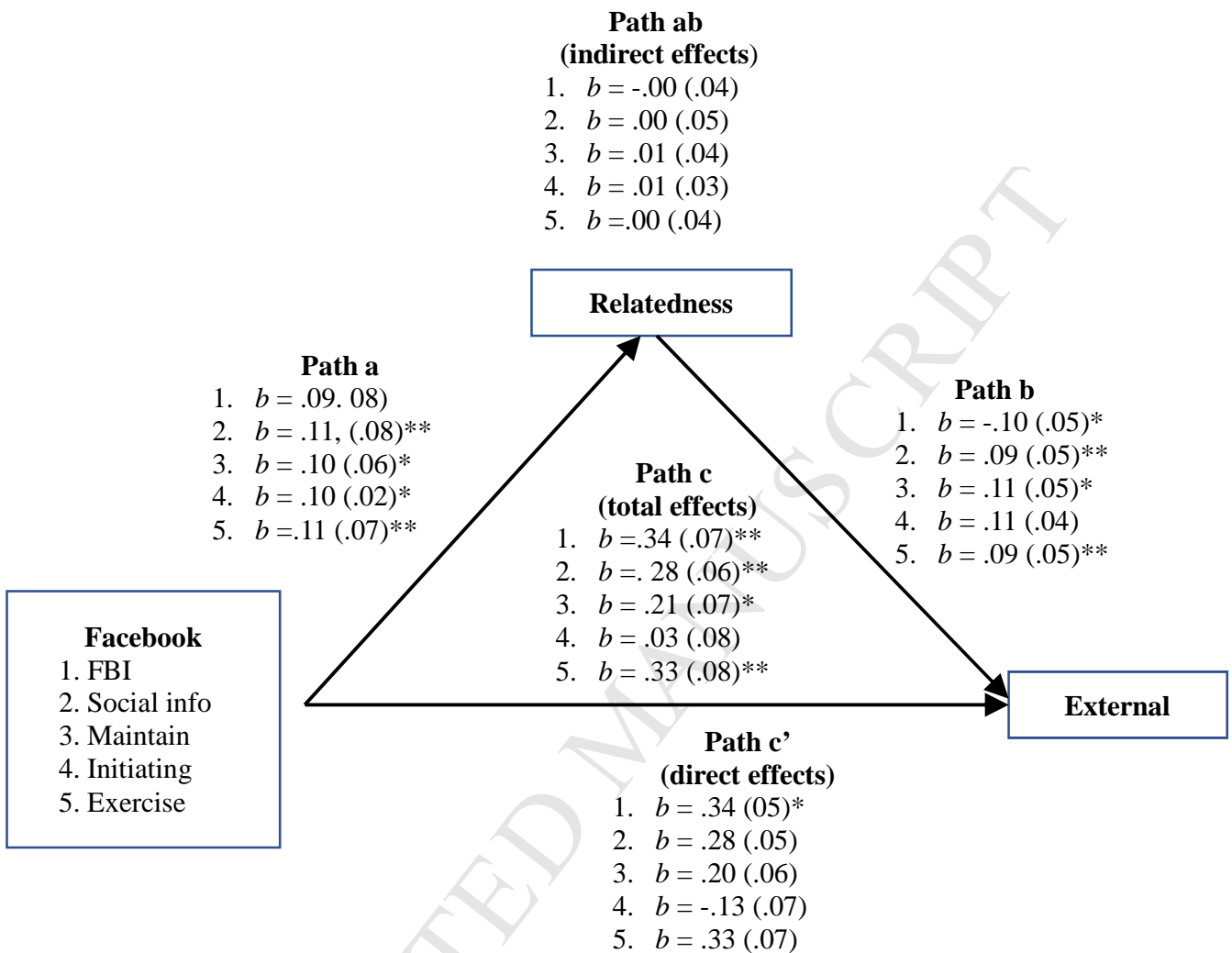


Figure 3. Results of the mediation models for the effects of Facebook Use on External regulation. Unstandardized beta coefficients and standard errors in (SE) are presented. FBI, Facebook Intensity Scale; Social Info, Social Information Seeking; Maintain, Maintaining Relationships; Initiating, Initiating Relationships; Exercise, Exercise related Facebook use. Significance of pathways are indicated with * for $p < .005$ and ** for $p < .001$. Significant indirect effects are indicated with a †, where 95% confidence intervals do not contain zero.

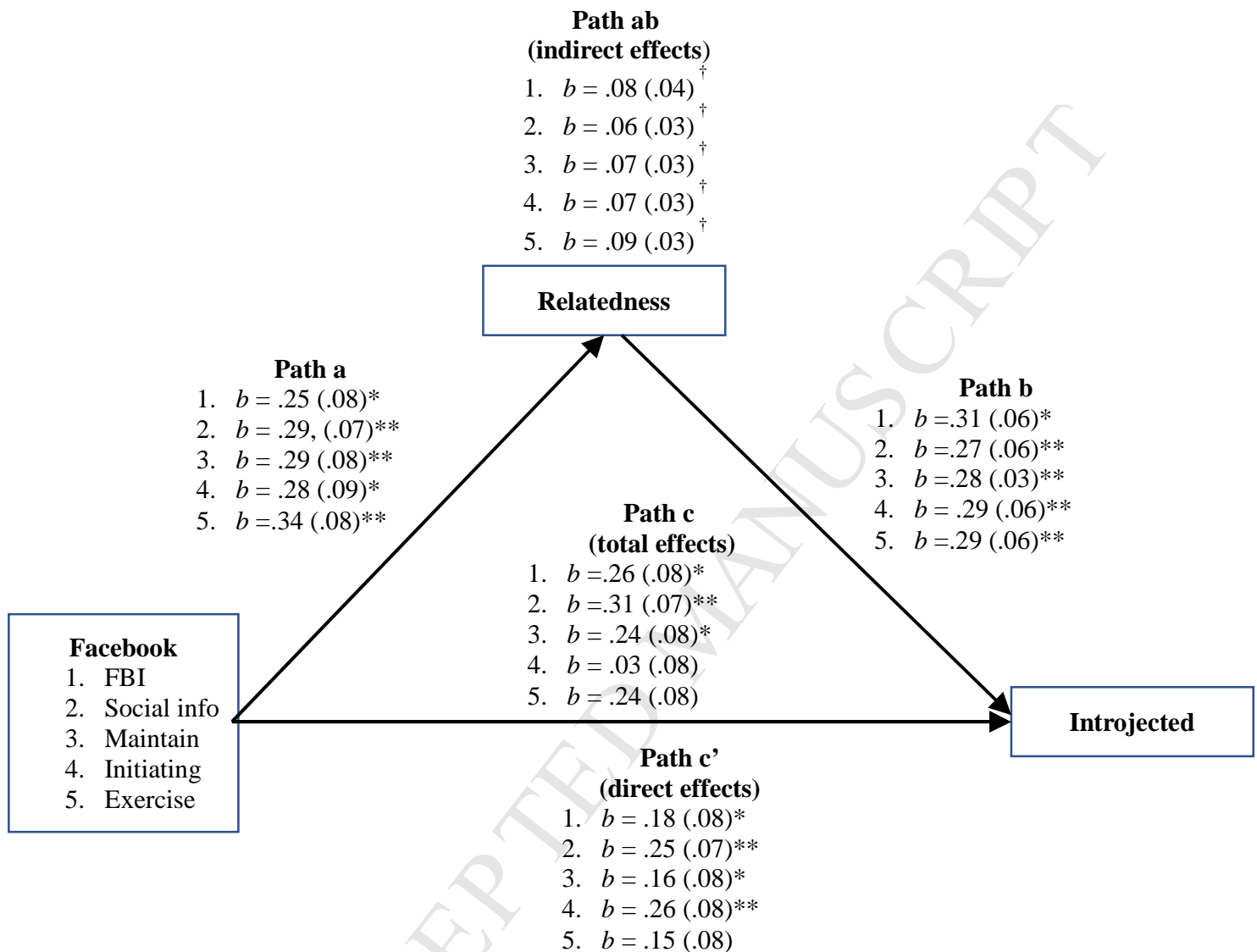


Figure 4. Results of the mediation models for the effects of Facebook Use on Introjected regulation. Unstandardized beta coefficients and standard errors in (SE) are presented. FBI, Facebook Intensity Scale; Social Info, Social Information Seeking; Maintain, Maintaining Relationships, Initiating, Initiating Relationships; Exercise, Exercise related Facebook use. Significance of pathways are indicated with * for $p < .005$ and ** for $p < .001$. Significant indirect effects are indicated with a †, where 95% confidence intervals do not contain zero

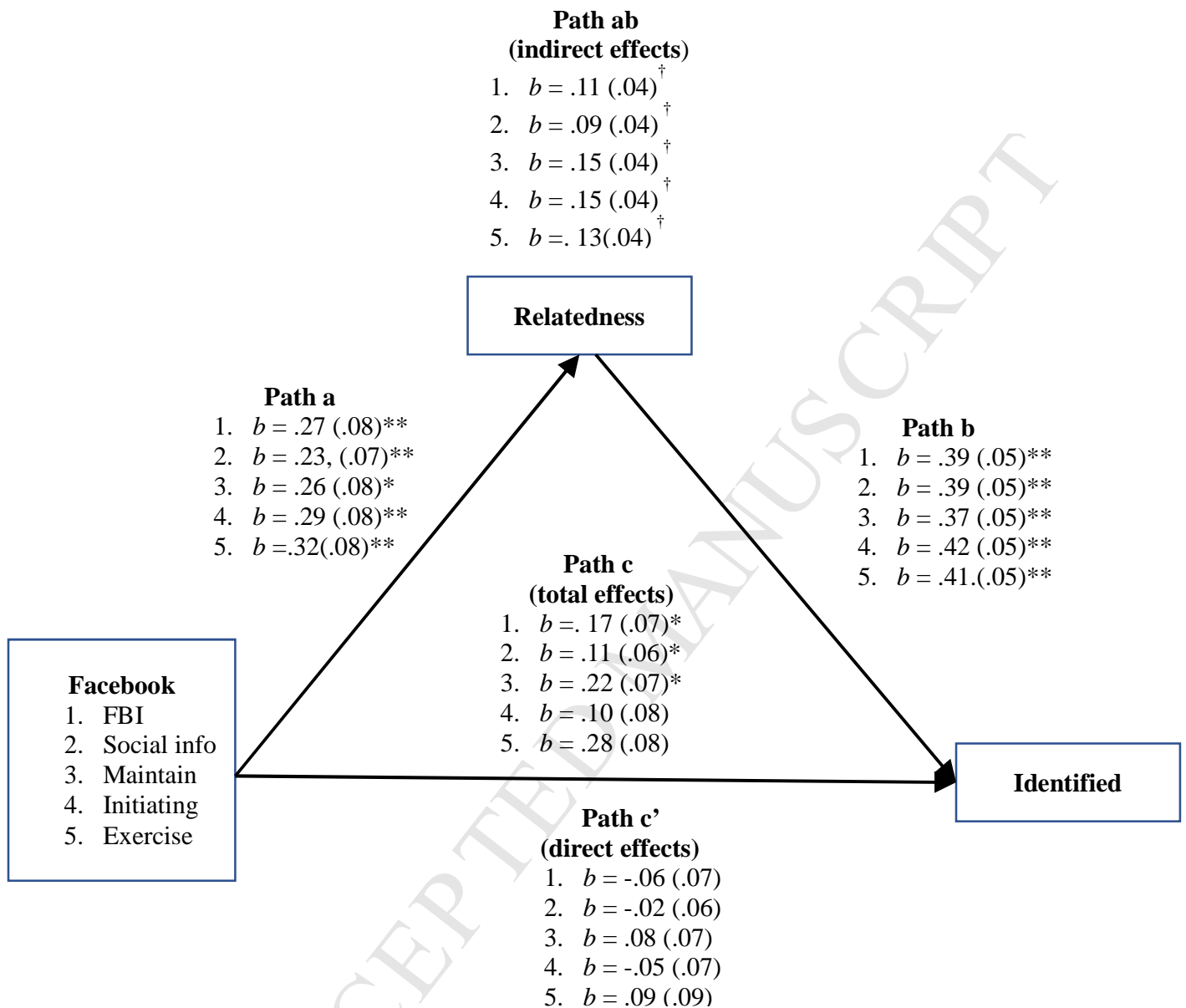


Figure 5. Results of the mediation models for the effects of Facebook Use on Identified regulation. Unstandardized beta coefficients and standard errors in (SE) are presented. FBI, Facebook Intensity Scale; Social Info, Social Information Seeking; Maintain, Maintaining Relationships, Initiating, Initiating Relationships; Exercise, Exercise related Facebook use. Significance of pathways are indicated with * for $p < .005$ and ** for $p < .001$. Significant indirect effects are indicated with a †, where 95% confidence intervals do not contain zero

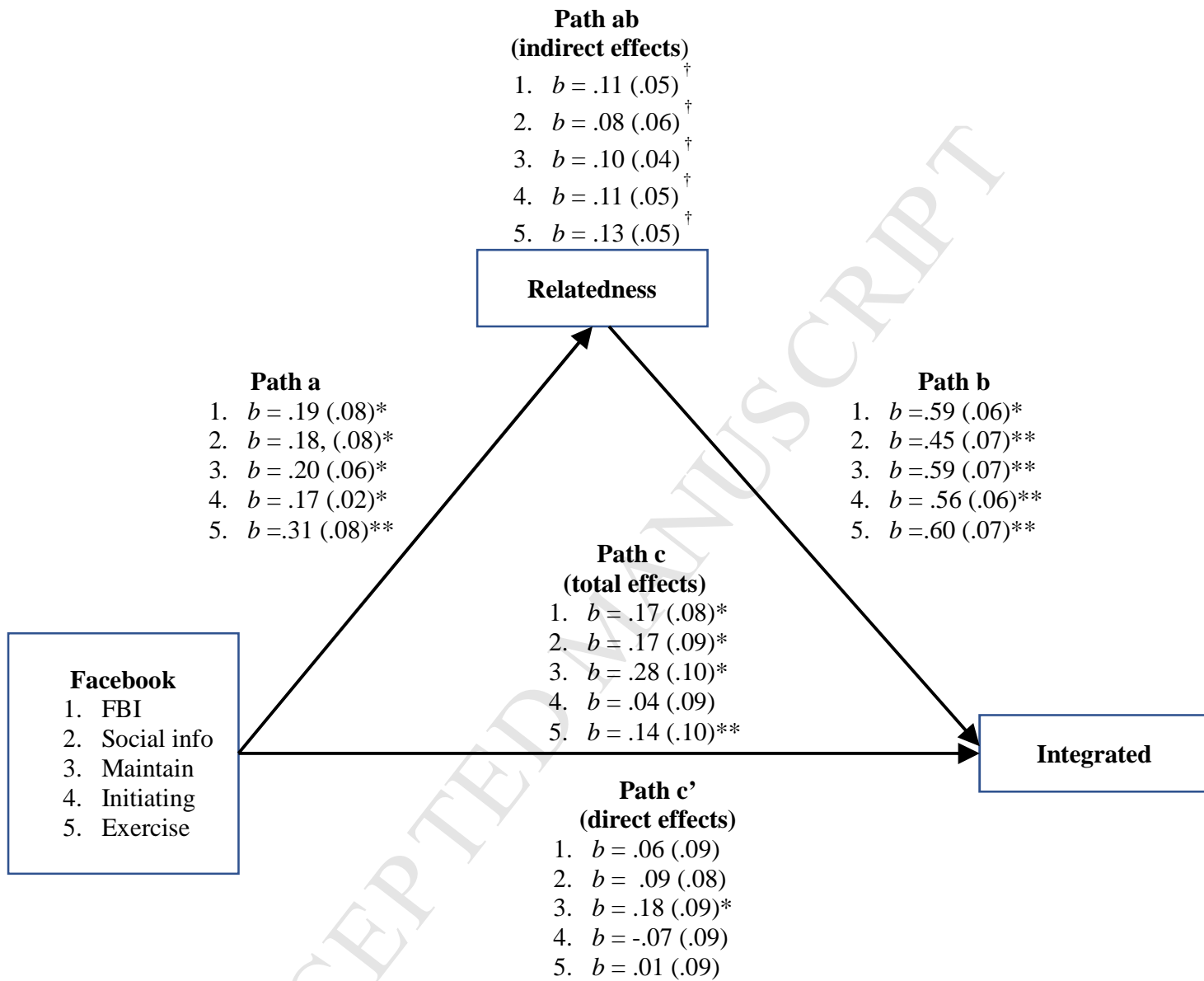


Figure 6. Results of the mediation models for the effects of Facebook Use on Integrated regulation. Unstandardized beta coefficients and standard errors in (SE) are presented. FBI, Facebook Intensity Scale; Social Info, Social Information Seeking; Maintain, Maintaining Relationships, Initiating, Initiating Relationships; Exercise, Exercise related Facebook use. Significance of pathways are indicated with * for $p < .005$ and ** for $p < .001$. Significant indirect effects are indicated with a \dagger , where 95% confidence intervals do not contain zero

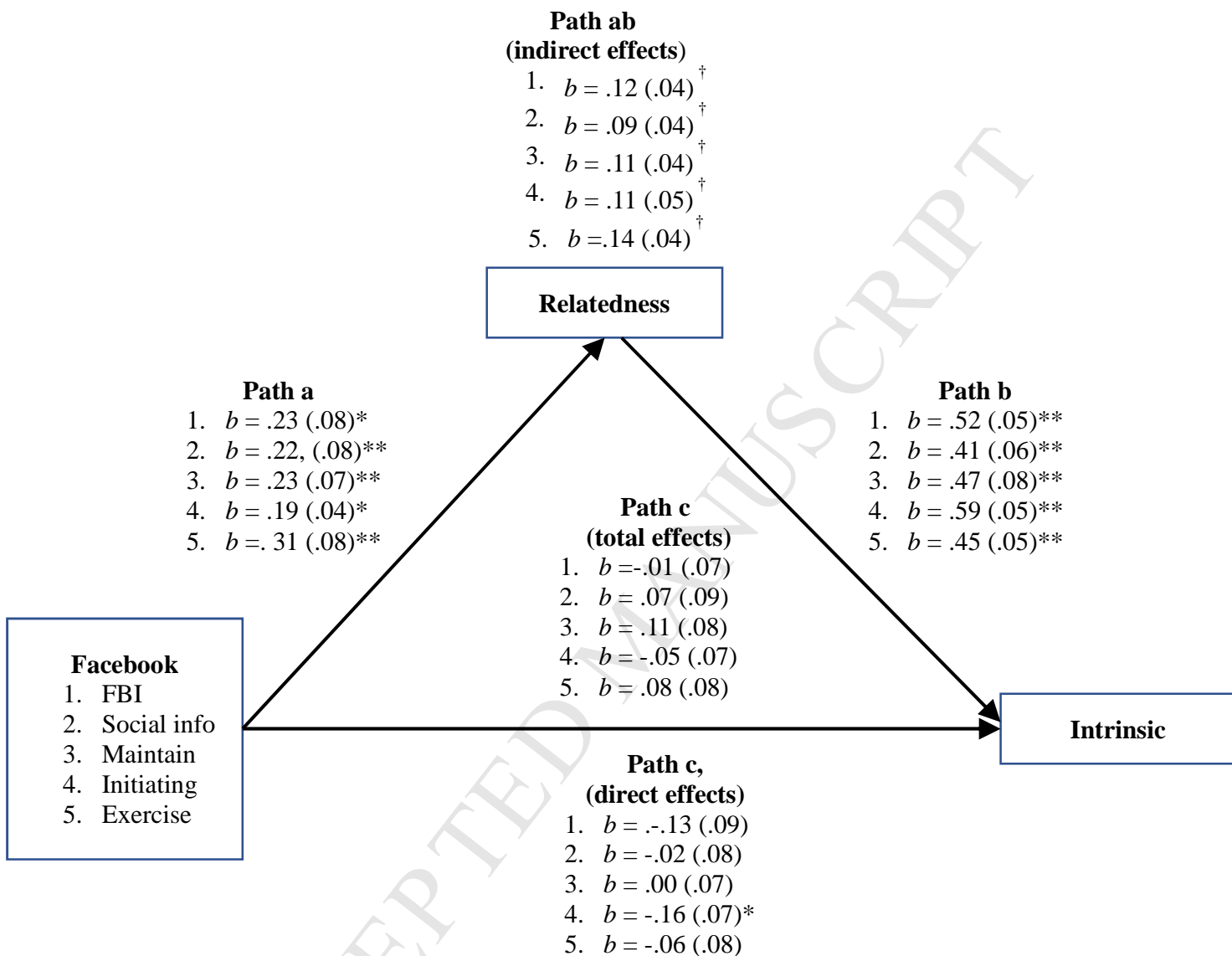


Figure 7. Results of the mediation models for the effects of Facebook Use on Intrinsic regularion. Unstandardized beta coefficients and standard errors in (SE) are presented. FBI, Facebook Intensity Scale; Social Info, Social Information Seeking; Maintain, Maintaining Relationships, Initiating, Initiating Relationships; Exercise, Exercise related Facebook use. Significance of pathways are indicated with * for $p < .005$ and ** for $p < .001$. Significant indirect effects are indicated with a \dagger , where 95% confidence intervals do not contain zero

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