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**Is motivation for marathon a protective factor or a risk factor of injury?**

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## MOTIVATION AND PERCEIVED SUSCEPTIBILITY

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### Abstract

This research investigated whether and how self-determined motivation predicts perceived susceptibility to injury during competition (marathon). Two correlational studies including 378 (Study 1) and 339 (Study 2) marathon runners were conducted. Participants filled out a questionnaire the day before the race measuring self-determined motivation, perceived susceptibilities to marathon-related injury and to keep running through pain, and control variables. Study 1 showed that self-determined motivation was negatively related to perceived susceptibility to marathon-related injury. Study 2 replicated this finding and showed that this relationship was partially mediated by perceived susceptibility to keep running through pain during the race. Moreover, results indicated that the predictive role of self-determination was mostly driven by controlled forms of motivation, and more particularly external regulation. These results suggest that self-determined motivation for sport is a protective factor of injury.

*Keywords:* Self-determined motivation; perceived susceptibility to injury; competitive sport.

40 **Is motivation for marathon a protective factor or a risk factor of injury?**

41 **Background**

42 It is well established that physical activity, defined as any bodily movement produced  
43 by skeletal muscles that requires energy expenditure, has beneficial effects on health, as it can  
44 reduce the risk of cardiovascular diseases, diabetes, or cancer (World Health Organization,  
45 2010). However, while research highlights the benefits of moderate physical activity (i.e.,  
46 activity that requires a moderate amount of effort and noticeably accelerates the heart rate),  
47 intense physical activity (i.e., activity that necessitates a large amount of effort and causes  
48 rapid breathing and a substantial increase in heart rate) can be damaging for health (Landolfi,  
49 2013). For example, a large-scale study indicated a dose effect with moderate runners having  
50 the lowest mortality rate, while strenuous runners had a similar mortality rate to the sedentary  
51 group (Schnohr et al., 2015). There is also evidence that sport (i.e., the competitive form of  
52 physical activity) enhances risks of musculoskeletal injuries (e.g., Van Mechelen et al., 1992).  
53 It is therefore crucial to identify the risk and preventive factors of injuries in this context. The  
54 present research investigated this question in marathon, an intense competitive sport.

55 Models of injury prevention in sports have identified internal (e.g., physical fitness,  
56 previous injuries, psychological variables) and external (e.g., equipment, weather conditions)  
57 risk factors (e.g., Meeuwisse et al., 2007), among which perceived susceptibility to injury  
58 (i.e., the perceived likelihood that an injury will occur, Deroche et al., 2009). In running,  
59 people who evaluate their susceptibility to injury as high are more able to detect early  
60 warning signals, leading them to take preventive measures (e.g., reducing training intensity),  
61 and to thereby avoid injuries (Ekenman et al., 2001). Studies have identified past experiences  
62 of injury (Williams-Avery & MacKinnon, 1996), stress (Williams & Andersen, 1998), and  
63 personality variables (e.g., Deroche et al., 2007) as predictors of perceived susceptibility;  
64 however, few studies have investigated its motivational factors (Stephan et al., 2009). The

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65 goal of this research was to examine this question based on self-determination theory (e.g.,  
66 Ryan & Deci, 2002).

67 This model distinguishes different motives that vary depending on how they satisfy  
68 the need for autonomy. When motivation is autonomous, individuals experience a sense of  
69 personal choice and autonomy when behaving and feel their actions represent their true self  
70 (e.g., a person running for the satisfaction felt when mastering his/her abilities). Intrinsic  
71 motivation (i.e., enjoyment in the task itself) is the highest form of such motivation, that also  
72 encompasses identified regulation, which is adopted when the individual values the behaviour  
73 and its consequences (e.g., running for one's health). In contrast, when motivation is  
74 controlled, people feel pressured into behaving by external forces (e.g., a person running for  
75 the prestige associated with the activity). External regulation (i.e., when the behaviour is  
76 driven by external demands) represents the most controlled form of motivation, that also  
77 includes introjected regulation, which is more internalized but still involves feelings of  
78 pressure to engage in the activity. Finally, amotivation represents lacking the intention to act.

79 Research has shown that an autonomous motivation may be beneficial following  
80 serious injury (for a review see Podlog & Eklund, 2007), and may positively predict sport  
81 injury prevention intentions (Chan & Hagger, 2012). However, Chan and Hagger's (2012)  
82 study examined the motivation toward *health behaviours*, and not toward *sport*. In the present  
83 research, we hypothesized that self-determined motivation toward marathon predicts  
84 perceived susceptibility to injury. To our knowledge, no study has examined this relationship,  
85 but related research on harmonious passion (strong inclination toward an activity) may  
86 provide support to this hypothesis. Harmoniously passionate individuals are less likely to  
87 evaluate their probability to be injured as high (Stephan et al., 2009), suggesting that they are  
88 in control of injury occurrence through their ability to adopt preventive behaviours when  
89 detecting early warning signals (Deroche et al., 2012). Both harmonious passion and self-

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90 determined motivation are characterized by an autonomous regulation of an activity  
91 representing the person's identity (Vallerand et al., 2006), suggesting that self-determined  
92 individuals may also be more able to adopt preventive behaviours than non-self-determined  
93 individuals. Even if they feel early signs suggesting the occurrence of injury, controlled  
94 individuals may persevere in order to prove something to others or to gain prestige, being in  
95 turn more likely to be injured (Masters & Ogles, 1998).

96       Based on Stephan et al.'s (2009) results, we predicted a negative relationship between  
97 self-determined motivation for marathon and perceived susceptibility to injury. However,  
98 although this relationship may reflect the ability of self-determined individuals to adopt  
99 preventive behaviours, it could in contrast reflect a lower perception of the risks associated  
100 with sport participation, leading them to take less preventive measures to avoid injuries (e.g.,  
101 Ekenman et al., 2001). This alternative hypothesis rests on evidence that autonomous  
102 motivation is associated with positive emotions (e.g., Puente & Anshel, 2010), low stress  
103 levels and better scores of global indicators of well-being (Maltby & Day, 2001), even in the  
104 acute phase of exercise (i.e., a subset of physical activity that is planned, structured, and  
105 repetitive and aims at improving or maintaining physical fitness) (e.g., Guérin & Fortier,  
106 2013). Given that emotions play a prominent role in risky decision making (Loewenstein et  
107 al., 2001), autonomous individuals could be less likely to perceive the negative aspects of  
108 their sport, such as the risk it presents for their health. Related work on exercise addiction  
109 provides support for this hypothesis. According to Sachs (1981), people who exercise for  
110 extrinsic reasons do not consider their activity as a central part of their lives, and may  
111 therefore not suffer withdrawal symptoms when they cannot exercise. In contrast, people who  
112 exercise for intrinsic reasons may view exercise as a central part of their lives, and experience  
113 disturbing deprivation sensations when they are unable to exercise. They may therefore be



139 **Materials and methods**

140 **Participants and Procedure.** The day before the ‘Marathon des Alpes-Maritimes  
141 2009’ (Nice, France), we invited marathon runners when they went out of the registration  
142 office to take part to our study. The only exclusion criterion was to not speak French as native  
143 language. After being informed of the study, 378 marathon runners (106 women; 142  
144 competitive runners, 207 regular leisure-time runners, 26 occasional leisure-time runners;  
145  $M_{age}=43$  years,  $SD=9.76$ ) agreed to take part in this study on a voluntarily basis. They filled  
146 out a 20-minute long computerized anonymous questionnaire before being debriefed and  
147 thanked. The protocol followed the institutional rules in terms of ethics and informed consent  
148 was obtained.

149 **Measures**

150 ***Self-determined motivation for marathon*** was measured by the Sports Motivation  
151 Scale (Brière et al., 1995), composed of six subscales measuring the forms of motivation  
152 postulated by the self-determination theory (Ryan & Deci, 2002). After reading the following  
153 statement “I participate in marathon:...”, participants rated the extent to which each item  
154 corresponded to their own reasons to participate in marathon running on a 7-point scale from  
155 (1) never to (7) always. Four items measured intrinsic motivation to gain knowledge and  
156 intrinsic motivation to accomplishment (e.g., “for the satisfaction I experience while I am  
157 mastering my abilities”), four items measured intrinsic motivation to experience stimulation  
158 (e.g., “for the excitement I feel when I am really involved in the activity”), four items  
159 measured identified extrinsic motivation (e.g., “because what I learn in this activity will be  
160 useful later”), four items measured introjected extrinsic motivation (e.g., “because I would  
161 feel guilty if I could not succeed in this activity”), five items measured external regulation  
162 motivation (e.g., “to be seen in a good light by others”), and five items measured amotivation  
163 (e.g., “I do not know why I run this marathon, if I could, I would get exempted”). All items



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164 were presented in a random order. The average of items of the subscales was calculated, as  
165 each one presented an acceptable internal consistency ( $.70 < \alpha > .81$ ).

166 Each motivation was then separately submitted to the analyses, but we also merged  
167 them to assess the degree of self-determination, by giving each subscale a specific weight  
168 according to its respective place on the self-determination continuum, multiplying this weight  
169 by the score of the subscale, and adding the scores of all subscales to derive a single score  
170 (e.g., Li & Harmer, 1996). Specifically, the scores for the three types of intrinsic motivation  
171 were averaged and assigned the highest positive weight (+2) because intrinsic motivation is  
172 the highest self-determined form of motivation. Identified extrinsic motivation, a self-  
173 determined type of extrinsic motivation, was assigned a lower weight (+1). These positive  
174 weights represent the degree of autonomous motivation. The scores for external regulation  
175 and introjection were averaged and assigned a negative weight (-1), and amotivation, which  
176 represents the absence of self-determination, was weighted highly negatively (-2). These  
177 negative weights represent the degree of controlled motivation. Support for the validity and  
178 reliability of this type of composite index has been obtained in several studies (e.g., Vallerand  
179 & Losier, 1999). However, one limit of such index is that it does not distinguish between  
180 people with high autonomous and high controlled motivations, from people with low  
181 autonomous and low controlled motivations. In order to address this limit, we also considered  
182 the autonomous and controlled motivation indices separately.

183 ***Perceived susceptibility to marathon-related injury.*** Participants responded to the  
184 four items used in past research (Deroche et al., 2007) to measure their perceived  
185 susceptibility to experience injury during the marathon. This scale includes three absolute risk  
186 items: “What do you believe is the chance that you will get an injury during the marathon”,  
187 “How susceptible do you feel you will get an injury during the marathon?”, and “What do you  
188 think the likelihood is that you will get an injury during the marathon?”, and one comparative

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189 risk item: “What do you believe your chances are of getting an injury during the marathon  
190 compared to other runners?”. For the absolute risk items, participants responded on a 1–7  
191 scale (item 1: from 1 “*no chance of being injured*” to 7 “*certain to be injured*”; item 2: from 1  
192 “not at all susceptible” to 7 “very susceptible”; item 3: from 1 “less than a 10% chance” to 7  
193 “100% chance”). For the comparative risk item, participants answered on a scale ranging  
194 from 1 “a lot lower” to 7 “a lot higher”. The scale showed good reliability in the present study  
195 ( $\alpha=.83$ ). A principal-axis factor analysis showed that all items loaded on a single factor that  
196 explained 66.85% of the variance, with factor loadings ranging from .80 to .84.

### 197 **Results and Discussion**

198 Descriptive statistics and correlations among the measures are presented in Table 1. In  
199 line with the hypotheses, results showed that the self-determination index was negatively  
200 related to perceived susceptibility to injury,  $r=-.11, p=.035$ . In other words, the more  
201 participants were self-determined for marathon, the less they perceived themselves as  
202 susceptible to be injured during the race. More specifically, results indicated that while the  
203 autonomous motivation index was not significantly correlated to perceived susceptibility to  
204 injury,  $r=-.01, p=.871$ , the controlled motivation index was significantly related to this  
205 variable,  $r=.13, p=.011$ . In other words, the more runners adopted a controlled motivation  
206 toward marathon, the more they perceived themselves as susceptible to be injured during the  
207 race. Furthermore, when each form of motivation was considered separately, results showed  
208 that only external regulation ( $r=.11, p=.036$ ) and amotivation ( $r=.12, p=.02$ ) were  
209 significantly correlated with perceived susceptibility to injury.

210 Given that perceived susceptibility to injury is an important factor of health preventive  
211 behaviours (e.g., Ekenman et al., 2001), these results suggest that self-determined motivation  
212 for sports may be associated with health-related outcomes, and that this association may be  
213 driven mostly by controlled forms of motivation. However, they do not indicate whether self-

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214 determined motivation is beneficial or harmful. On the one hand, a low perceived  
215 susceptibility to injury may reflect high control of injury occurrence due to the appropriate  
216 adoption of precautionary behaviours. On the other hand, it may reflect a lower perception of  
217 the risks associated with running a marathon, which may lead to more risky behaviours. Study  
218 2 aimed at identifying which of these hypotheses may explain the relationships between self-  
219 determined motivation and perceived susceptibility to injury observed in Study 1, by  
220 examining the mediating role of perceived susceptibility to adopt a risky behaviour during the  
221 race. In addition, Study 2 included past experiences of injury as a control variable, as it is an  
222 important predictor of perceived susceptibility to injury (Williams-Avery & MacKinnon,  
223 1996). Finally, Study 2 used a different measure of self-determined motivation to further  
224 ascertain its relationship with perceived susceptibility to injury. A situational scale was  
225 chosen to better reflect the motivational state of the participants for the competition of  
226 interest.

### 227 **Study 2**

#### 228 **Materials and methods**

229 **Participants and Procedure.** The procedure of Study 2 was mostly the same as in  
230 Study 1. It was carried out during the following edition of the “Marathon des Alpes-  
231 Maritimes” in 2010. Three-hundred-and-thirty-nine participants (79 women;  $M_{age}=43.02$   
232 years,  $SD=10.18$ ) took part in Study 2 by filling out a computerized anonymous  
233 questionnaire. Among them, 118 participants ran everyday and 222 ran 2-3 times a week,  
234 during 73 minutes on average ( $SD=23.92$ ), and since 12 years on average ( $SD=9.53$ ).  
235 Participants had run 6.4 marathons on average ( $SD=10.18$ ) before this one, with a mean best  
236 performance of 218.38 min ( $SD=42.71$ ). The protocol followed the institutional rules in terms  
237 of ethics and informed consent was obtained.

#### 238 **Measures.**

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239           ***Self-determined motivation for marathon*** was measured by the Situational  
240 Motivation Scale (SIMS, Guay et al., 2000), recommended for the assessment of self-  
241 determined motivation in a specific event as it is the case in our study. The SIMS is composed  
242 of four subscales and begins with the following sentence: “Why do you participate in this  
243 marathon?” Four items measured intrinsic motivation (e.g., “because I think that this activity  
244 is interesting”), four items measured identified extrinsic motivation (e.g., “because I am doing  
245 it for my own good”), four items measured external regulation motivation (e.g., “because I am  
246 supposed to do it”), and four items measured amotivation (e.g., “I don’t know; I don’t see  
247 what this activity brings me”). Participants answered on a 7-point scale from (1) totally  
248 disagree to (7) totally agree. In this study, each subscale presented an acceptable internal  
249 consistency ( $.72 < \alpha < .88$ ). The average of items of each subscale was then used to calculate  
250 the self-determination index (e.g., Li & Harmer, 1996). The intrinsic motivation score was  
251 assigned the highest positive weight (+2). Identified regulation was assigned a lower weight  
252 (+1). The score for external regulation was assigned a negative weight (-1), and amotivation  
253 was weighted highly negatively (-2).

254           ***Perceived susceptibility to marathon-related injury.*** Participants responded to the  
255 same four items used in Study 1. The scale showed good reliability ( $\alpha = .86$ ). A principal-axis  
256 factor analysis showed that items loaded on a single factor that explained 74.98% of the  
257 variance, with factor loadings ranging from .81 to .91.

258           ***Situational susceptibility to adopt a risky behaviour.*** In line with measures developed  
259 in research on injury prevention (Deroche et al., 2011) and doping (Lazuras et al., 2010),  
260 participants responded to the following question: “During the marathon, if you feel a pain that  
261 you think might lead to injury, please indicate until what pain intensity you would continue  
262 running at the same pace.” Answers were provided on a 7-point scale ranging from (1) very

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263 low to (7) very high. Assessing susceptibility with a one-item measure is a common practice  
264 which has proved to be valid in the exercise domain (Courneya, 1994).

265 **Past experiences of injury.** Participants responded to the following question (e.g.,  
266 Deroche et al., 2007): “During the past 12 months, how many times have you been injured  
267 while running (injury necessitating to stop running for at least one session)?”

268 **Data analysis.** Multiple regression analyses were carried out to test our hypotheses.  
269 We first examined whether motivational variables predicted perceived susceptibility to injury  
270 and to keep running through pain, by testing the role of the self-determination index, then the  
271 role of autonomous and controlled motivation separately, and finally the role of each form of  
272 motivation. Next, the mediating role of perceived susceptibility to keep running through pain  
273 was tested with the *a* and *b* joint significance test (Cohen & Cohen, 1983). The joint  
274 significance test consists in testing mediation by estimating *a* (effect of the predictor on the  
275 process) and *b* (effect of the process on the outcome, controlling for the predictor), and testing  
276 them individually against zero. There is a significant indirect effect when both *a* and *b* are  
277 significant, and a significant mediation when *a*, *b*, and the total effect of the predictor on the  
278 criterion are significant. This test was chosen because it is the only test that does not suffer  
279 from the Type I error issue, and it is statistically as powerful as other commonly used tests,  
280 such as the percentile bootstrap and numerical integration tests (Judd et al., 2014).

### 281 **Results and Discussion**

282 Descriptive statistics and correlations among the measures are presented in Table 2.

283 First, as in Study 1, results showed that the self-determination index negatively  
284 predicted perceived susceptibility to injury,  $\beta = -.10$ ,  $p = .049$ , but Study 2 goes beyond Study 1  
285 by observing this relationship after controlling for past experiences of injury,  $\beta = .38$ ,  $p < .001$ .  
286 Importantly, the self-determination index also negatively predicted perceived susceptibility to  
287 keep running through pain during the marathon,  $\beta = -.11$ ,  $p = .045$ , after controlling for past

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288 experiences of injury,  $\beta=.16, p=.003$ . In other words, the more runners were self-determined  
289 toward marathon, the less they perceived themselves as susceptible to adopt a risky behaviour  
290 during the race. Moreover, when the self-determination index, perceived susceptibility to keep  
291 running through pain, and past experiences of injury were simultaneously entered as  
292 predictors of perceived susceptibility to injury, the perceived susceptibility to keep running  
293 through pain was a significant and positive predictor,  $\beta=.22, p<.001$ , along with past  
294 experiences of injury,  $\beta=.34, p<.001$ , whereas self-determination was not significant,  $\beta=-.07,$   
295  $p=.153$ . In sum, given that the predictor (self-determination) significantly affected the  
296 criterion (perceived susceptibility to injury) and the mediator (perceived susceptibility to keep  
297 running through pain), and that the mediator significantly affected the criterion after  
298 controlling for the predictor, this suggests that the perceived susceptibility to keep running  
299 through pain mediated the relationship between self-determination and perceived  
300 susceptibility to injury. In other words, the more runners were self-determined for marathon,  
301 the less they perceived themselves as susceptible to take the risk to be injured during the race;  
302 in turn, the less they were susceptible to adopt a risky behaviour, the less they perceived a risk  
303 to be injured during the race.

304         Next, we examined the role of autonomous and controlled motivation separately.  
305 Multiple regression analyses showed that neither autonomous motivation,  $\beta=-.07, p=.172$ , nor  
306 controlled motivation,  $\beta=.07, p=.176$ , significantly predicted perceived susceptibility to  
307 injury, after controlling for past experiences of injury,  $\beta=.38, p<.001$ . However, while  
308 autonomous motivation did not significantly predict perceived susceptibility to keep running  
309 through pain,  $\beta=-.05, p=.329$ , controlled motivation marginally predicted it,  $\beta=.10, p=.074$ ,  
310 after controlling for past experiences of injury,  $\beta=.16, p=.004$ . In other words, the more  
311 runners endorsed a controlled motivation toward marathon, the more they tended to be  
312 susceptible to keep running through pain. Given that the *a* path was significant, we examined

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313 whether the *b* path was also significant. Results confirmed that the perceived susceptibility to  
314 keep running through pain significantly predicted perceived susceptibility to injury,  $\beta=.22$ ,  
315  $p<.001$ , after controlling for controlled motivation,  $\beta=.05$ ,  $p=.342$ , and past experiences of  
316 injury,  $\beta=.34$ ,  $p<.001$ . Overall, these results suggest an indirect effect of controlled motivation  
317 on perceived susceptibility to injury, through its impact on perceived susceptibility to keep  
318 running through pain.

319 Finally, we examined the role of each form of motivation separately. Concerning  
320 perceived susceptibility to injury, results indicated that intrinsic motivation ( $\beta=-.06$ ,  $p=.215$ ),  
321 identified regulation ( $\beta=-.08$ ,  $p=.106$ ), and external regulation ( $\beta=-.00$ ,  $p=.985$ ) were not  
322 significant predictors (after controlling for past experiences of injury,  $\beta=.38$ ,  $p<.001$ ), while  
323 amotivation was a marginal predictor ( $\beta=.10$ ,  $p=.054$ ). In other words, the more runners were  
324 amotivated, the more they tended to perceive they were at risk of injury. Results concerning  
325 perceived susceptibility to keep running through pain showed that it was not significantly  
326 predicted by neither intrinsic motivation ( $\beta=-.05$ ,  $p=.367$ ), identified regulation ( $\beta=-.07$ ,  
327  $p=.222$ ), nor amotivation ( $\beta=.07$ ,  $p=.174$ ), after controlling for past experiences of injury,  
328  $\beta=.16$ ,  $p=.004$ . In contrast, external regulation significantly predicted perceived susceptibility  
329 to keep running through pain ( $\beta=.11$ ,  $p=.049$ , after controlling for past experiences of injury,  
330  $\beta=.15$ ,  $p=.006$ ). In other words, the more runners adopted an external regulation, the more  
331 they were susceptible to adopt a risky behaviour during the race. Given that the *a* path was  
332 significant, we examined the *b* path. Results confirmed that the perceived susceptibility to  
333 keep running through pain significantly predicted perceived susceptibility to injury,  $\beta=.23$ ,  
334  $p<.001$ , after controlling for external regulation,  $\beta=-.03$ ,  $p=.563$ , and past experiences of  
335 injury,  $\beta=.34$ ,  $p<.001$ . Overall, these results suggest an indirect effect of external regulation  
336 on perceived susceptibility to injury, through its impact on perceived susceptibility to keep  
337 running through pain.

338

**Discussion**

339           The present study examined the role of self-determined motivation in predicting injury  
340 prevention-related variables during an intense competitive sport (i.e., marathon). Results of  
341 two studies showed that the more runners were self-determined for marathon, the less they  
342 perceived a risk to be injured during the race. Two competing explanations of this relationship  
343 were examined. On the one hand, self-determined individuals engage in the activity willingly  
344 and have thus a flexible behavioural engagement (Ryan & Deci, 2002). Therefore, they may  
345 be able to initiate preventive actions as soon as they feel that the activity is hazardous for  
346 them, resulting in a low perceived susceptibility to injury (e.g., Masters & Ogles, 1998). In  
347 this case, adopting a self-determined motivation would be health protective. A concurrent  
348 explanation is that self-determined individuals may be less likely to perceive negative aspects  
349 of their sport such as the risk it may present for their health (e.g., Sachs, 1981). One could  
350 posit that self-determined motivation negatively predicted perceived susceptibility because  
351 self-determined individuals were less likely to perceive the risk running a marathon may  
352 present for their health. In this case, self-determined motivation could be health damaging.

353           The results provided support for an adaptive interpretation of the negative relationship  
354 between self-determined motivation and perceived susceptibility to injury. Study 2 showed  
355 that the more runners were self-determined, the less they were susceptible to engage in a risky  
356 behaviour during the race (i.e., keeping running through pain), which was a proxy of  
357 perceived susceptibility to injury. In addition, the predictive role of self-determination was  
358 mostly driven by controlled forms of motivation, and more particularly external regulation. In  
359 other words, the less runners were externally regulated, the less they felt susceptible to keep  
360 running through pain, and the less they perceived themselves as susceptible to be injured.

361           These findings suggest that self-determined individuals, who have more control over  
362 their behaviours, could pay more attention to their bodily signs of pain and fatigue, while non



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363 self-determined individuals, who feel coerced by external pressures would be more exposed  
364 to possible injuries. For example, if a runner feels an alerting pain during the race, this person  
365 might not want to abandon if he/she is motivated for external reasons such as the pride to  
366 finish a marathon while it is more likely that this person stops if he/she runs for the pleasure,  
367 as there is no pleasure to run with a continuous feeling of pain. Taken together, these findings  
368 indicate that self-determined motivation for sport may be a factor of engagement in  
369 preventive behaviours with regard to injury. However, this research presents some limitations.  
370 We did not measure the occurrence of actual injuries nor actual preventive behaviours, but  
371 instead situational susceptibility to adopt a risky behaviour. When questioning participants  
372 about their feeling of pain that might lead to injury, they may have understood the question  
373 differently, depending on their self-definition of injury. Finally, we used a cross-sectional  
374 design, which does not allow us to draw conclusions about causality. Future research should  
375 be conducted to confirm these results based on a prospective design and behavioural measures  
376 (i.e., objective injuries and objective preventive behaviours).

### 377 **Perspective**

378 While the role of self-determination for engaging in healthy behaviours has been  
379 examined (e.g., Chan & Hagger, 2012), the present study went a step further by showing that  
380 self-determination for sport may also predict adoption of preventive behaviours during  
381 competition. Concerning practical implications, our findings can provide a valuable  
382 contribution to injury prevention in marathon. While aerobic exercise has many health  
383 benefits, marathon running is also quite constraining for the body with a yearly incidence  
384 rates for injury reported to be as high as 90% in those training for marathons (Fredericson &  
385 Misra, 2007). By adopting self-determined motivations, runners can reduce their amount of  
386 risky behaviors and in turn the likelihood to be injured. A strength of self-determination  
387 theory is to consider motivation as depending on contextual factors, which may improve

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388 one's feelings of self-determination in sport. For example, by acting in an autonomy  
389 supportive way, the coach and the relatives can lead the runner to focus more on the personal  
390 benefits of running (e.g., in terms of health) and the satisfaction and pleasure experienced  
391 during the race (see Mageau & Vallerand, 2003). These strategies may be used in a promising  
392 manner in the domain of injury prevention in competitive sports.  
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482 Table 1

483 *Descriptive Statistics and Correlations Among the Variables (Study 1)*

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Perceived susceptibility to injury	2.43	1.09	-											
2. Intrinsic Motivation Knowledge	4.03	1.36	-.05	-										
3. Intrinsic Motivation Achievement	5.17	1.09	-.02	.64***	-									
4. Intrinsic Motivation Stimulation	5.23	1.16	-.01	.45***	.64***	-								
5. Identified Regulation	3.63	1.21	.04	.53***	.48***	.48***	-							
6. Introjected Regulation	3.70	1.34	.06	.30***	.33***	.41***	.49***	-						
7. External Regulation	2.79	1.36	.11*	.28***	.23***	.25***	.52***	.57***	-					
8. Amotivation	1.69	0.95	.12*	.04	-.13*	-.08	.19***	.28***	.36***	-				
9. Autonomous Motivation Index	13.25	2.92	-.01	.81***	.82***	.76***	.83***	.49***	.43***	.04	-			
10. Controlled Motivation Index	6.63	2.58	.13*	.18***	.05	.11*	.40***	.61***	.67***	.90***	.27***	-		
11. Self-determination Index	6.62	3.34	-.11*	.57***	.67***	.58***	.41***	-.05	-.15**	-.66***	.67***	-.54***	-	
12. Sex	-	-	-.01	.07	.11*	.10	.09	.04	.02	.11*	.03	.08	-	-

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485 *Note.* Sex was coded as follows: male = 1, female = 2. \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .



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Table 2

*Descriptive Statistics and Correlations Among the Variables (Study 2)*

Variable	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
1. Perceived susceptibility to injury	1.98	0.73	-										
2. Intrinsic Motivation	5.70	1.15	-.03	-									
3. Identified Regulation	5.54	1.16	-.04	.82***	-								
4. External Regulation	2.97	1.39	.02	.13*	.29***	-							
5. Amotivation	1.90	1.21	.09††	-.19**	-.15**	.44***	-						
6. Autonomous Motivation Index	16.94	3.32	-.03	.98***	.92***	.19***	-.18**	-					
7. Controlled Motivation Index	6.77	3.28	.08	-.08	.01	.75***	.93***	-.05	-				
8. Self-determination Index	10.18	4.79	-.08	.73***	.63***	-.38***	-.76***	.73***	-.72***	-			
9. Susceptibility to adopt a risky behaviour	2.71	1.40	.30***	-.04	-.06	.11*	.08	-.05	.10†	-.10†	-		
10. Past experiences of injury	0.66	0.97	.37***	.05	.07	.07	-.02	.06	.02	.03	.15**	-	
11. Sex	-	-	.09††	.15**	.15**	.04	-.13*	.16**	-.07	.16**	-.05	-.00	-

*Note.* Sex was coded as follows: male = 1, female = 2. ††  $p < .10$ ; †  $p < .06$ ; \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ .