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1 Sport Injury Prevention In-School and Out-Of-School? A Qualitative Investigation of The Trans-  
2 Contextual Model

3

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**Abstract**

Objective: To investigate junior secondary school students' experiences and perspectives of in-school and out-of-school sport-safety, with a particular focus on the meaning and content that they applied to the motivational and social cognitive factors of sport injury prevention.

Design: Focus-group interview

Method: Participants were 128 junior secondary school students (Form 1 to Form 3) aged between 12 and 16 years from two secondary schools. We organised focus-group interviews by class (group size = six to nine students). Seventeen groups completed semi-structured interviews regarding their experience, beliefs, and motives for injury prevention in-school and out-of-school. We analysed data by thematic content analysis using a typological approach.

Results: Higher order themes (N = 7) including in-school and out-of-school motives and social cognitive factors and associated lower-order themes (N = 16), emerged from the analysis corresponding to constructs from trans-contextual model tenets.

Conclusions: The current study is the first qualitative study to explore junior secondary school students' experience and perspectives on sport injury prevention, using trans-contextual model as a framework for investigation. The findings contribute to a better understanding on their motivational and social cognitive factors in adopting sport injury prevention. The content of the theme behavior also indicated the inadequacy of students' knowledge of effective sport injury prevention techniques, and underscored the importance of sport safety education.

*Keywords:* Injury PE students; integrated behavioural change model; self-determination theory; theory of planned behaviour; health education; the trans-contextual model; qualitative approach

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41 Contextual Model

42 Sport injury is one of the leading causes of injury in young people [1-3]. Not only may  
43 injury lead to temporary impairment of sport performance and absence from sport and school,  
44 but it could also result in prolonged pain, higher risk of re-injury, early retirement from  
45 competitive sport, and lower future commitment to physical activity for health [4-6]. Emery and  
46 Tyreman [1] reported that over 60% junior high school students (aged 12-15 years) suffered at  
47 least one sport injury in the past year. They also found that few injuries occurred during physical  
48 education (PE) classes. Most occurred in a game (39.3%) or recreational setting (26.9%), such as  
49 informal sport play in community parks. It therefore appears that sport injuries occur most often  
50 in out-of-school contexts.

51 Sport injury prevention includes static stretching, warm-up before and cool down after  
52 exercise, strength and conditioning [7], landing technique [8], and correct application of  
53 protective equipment (e.g., helmet) [9]. Sport injury prevention programs are provided for youth  
54 both in-school [10] and out-of-school [11]. Yet, the prevention of sport injury is a behavior that  
55 requires motivation and perseverance to maintain [12-14], particularly when students are  
56 unsupervised in out-of-school contexts (e.g., playing physically active games, leisure sport  
57 events). It is therefore important to understand why and how students learn sport safety in-school  
58 (PE lessons) and apply sport injury prevention in out-of-school contexts. In the current study, we  
59 employed a qualitative investigation guided by the trans-contextual model (TCM) [15-17] to  
60 explore and gain a rich understanding of the psychological processes underpinning students'  
61 learning and application of sport safety principles. For the in-school context, we are referring to  
62 the PE lesson; out-of-school refers to both supervised and unsupervised physical activities.

63           The TCM integrates three important social psychological theories: including self-  
64   determination theory (SDT) [18, 19], the theory of planned behavior (TPB) [20], and the  
65   hierarchical model of intrinsic and extrinsic motivation (HMIEM) [21]. The pattern of  
66   motivation posited in TCM is classified generally by three forms of motivation and their sub-  
67   types defined by SDT [18, 19]. Autonomous form of motivation is an inherent drive to engage  
68   particular behaviors. Individuals are autonomously motivated when they are performing  
69   behaviors under intrinsic (e.g., acting for fun and pleasure), integrated (e.g., acting for behavior  
70   that is synthesis with own self) and identified (e.g., acting for achieving personally valued goal)  
71   motivation. In contrast, behaviors driven by externally-referenced reasons are known as  
72   controlled motivation which comprises introjected (e.g., acting to satisfy pride and ego, and  
73   avoid shame and guilt) and external (e.g., acting for compliance and to avoid punishment)  
74   regulation. Last but not least, amotivation refers to the absence of the motivation (e.g. acting for  
75   behaviors without any reason). The fundamental premise within the TCM is that the quality and  
76   quantity of motivation (i.e., autonomous, controlled motivation, and amotivation) based on tenets  
77   within SDT can be transferred from one context (e.g., taking PE lesson) to another related  
78   context (e.g., leisure-time physical activity), leading to changes in the social cognitive factors  
79   (i.e., attitude, subjective norm, perceived behavioral control (PBC), and intention from the TPB)  
80   that relate to intention, and actual behavioral participation. The proposition of TCM regarding  
81   the transferability of motivation is built on the assumption derived from the HMIEM [21]. The  
82   HMIEM proposes that forms of motivation from SDT operate at the three levels of generality  
83   (i.e., specific, contextual, and global) and are hierarchically related to each other. The  
84   motivational and behavioral patterns in one context are then expected to activate similar  
85   motivational patterns in allied behaviors in related contexts [22].

86           The original application of the TCM lies within transferring motivation between PE and  
87 leisure-time physical activity [15]. It was found that when students endorsed autonomous forms  
88 of motivation (i.e., identified regulation, and intrinsic motivation) rather than controlled forms of  
89 motivation (i.e., introjection and external regulation) in PE, they were more likely to be  
90 autonomously motivated toward leisure-time physical activity. Autonomous forms of motivation  
91 in leisure-time physical activity then predicted intention and self-reported physical activity via  
92 the mediation of the social cognitive factors. This pattern of results has been shown to be  
93 consistent across 12 countries, supporting the cross-cultural invariance of the original application  
94 of the TCM in PE and physical activity contexts [16, 17]. Therefore, promoting autonomous  
95 motivation of students in PE (e.g., PE teachers who support the psychological needs of students  
96 and their volitional engagement with PE activities; [16, 17] might be meaningful not only to the  
97 motivational pattern in an in-school context, but also to the motivational and social cognitive  
98 process associated with the behaviors in an out-of-school context.

99           Researchers have extended the potential of the TCM model to other behaviors, including  
100 rehabilitation [23], occupational injury prevention and rehabilitation [24], in-school and after-  
101 school learning [25], anti-doping in sport [26] and elite athletes' sport injury prevention [27].  
102 The trans-contextual process of motivation tested in these studies explains how motivation at  
103 work, school, or sport can be transferred into motivational, social cognitive and behavioral  
104 patterns of a related behavior in an allied context (e.g., rehabilitation for occupational injury,  
105 learning in out-of-school, sport injury prevention). In support of the tenets within TCM in the  
106 context of sport injury prevention, Chan and Hagger [27] found that elite athletes who possessed  
107 high autonomous motivation in sport tended to hold higher autonomous motivation for sport  
108 injury prevention. Autonomous motivation for sport injury prevention is a predictor of a wide

109 range of behavioral outcomes of sport safety or injury prevention, such as adherence and  
110 commitment to injury prevention, prioritization and fatalism towards safety, and communication  
111 barrier and worry towards sport injury [27, 28]. Aligned with TCM predictions, the relationship  
112 between autonomous motivation for sport injury prevention and intention has been shown to be  
113 mediated by social cognitive variables [28, 29]. The TCM has been used to explain motivation  
114 and social cognitive process of human behaviors, including sport injury prevention, yet research  
115 has predominantly used quantitative methods to test the model. To date, extant work has not  
116 formally examined if the model is well-placed to explain students' learning and application of  
117 sport safety in-school and out-of-school contexts. Somehow, it would not be comprehensive to  
118 understand students' experience and perspectives in learning sport safety by using quantitative  
119 data only [30]. Hence, we proposed to adopt qualitative methodology to supplement existing  
120 research findings predominantly based on quantitative data.

### 121 **The Present Study**

122 In the present study, we employed qualitative methods to investigate junior secondary  
123 school students' experiences and perspectives of in-school and out-of-school sport-safety, with a  
124 particular focus on the meaning and content that they applied to the motivational and social  
125 cognitive factors of sport injury prevention. The purpose of the present study was to explore the  
126 applicability and provide a holistic view of the TCM in secondary school students learning sport  
127 safety. Our study targeted junior secondary school students (Secondary 1 to Secondary 3,  
128 typically aged 12 to 16 years) because it is the beginning stage of secondary school education, a  
129 time in which sport safety is especially important for reducing the risk of sport injury in the later  
130 stages of PE [31, 32]. We conducted semi-structured focus group interviews with students to  
131 explore the content of the psychological variables in the TCM. We also examined number of

132 codes identified respectively for autonomous motivation, controlled motivation, and amotivation.  
133 We were particularly interested to explore 1) the applicability of adopting TCM to explain  
134 secondary school students' psychological factors underpinning sport safety; and 2) what are the  
135 realistic psychological processes of students learning sport injury prevention (e.g. particular  
136 reasons of adopting sport injury prevention, feelings or beliefs toward the prevention exercises)  
137 in-school and out-of-school. These analyses led to the first qualitative investigation of the TCM  
138 on sport safety in a junior secondary school setting. The results that obtained from the qualitative  
139 study would be useful to advance the understanding of TCM constructs in the context of sport  
140 safety for secondary school students, and the findings might inform the development of theory-  
141 driven interventions for sport injury prevention in school settings.

## 142 **Method**

### 143 **Participants**

144 Upon ethical approval from the first author's institution [approval number =  
145 EA1604014], we conducted 17 focus-group interviews (6 to 9 participants per group)  
146 corresponding to a total number of 128 junior (Form 1 to Form 3 which are equivalent to 7<sup>th</sup> to  
147 9<sup>th</sup> grade in US) secondary school students (69 males and 59 females; age = 12 to 16 years old;  
148 mean-age = 13.76, *SD* = 1.50) from two secondary schools in Hong Kong. Participants attended  
149 two mandatory PE lessons per teaching week. Most participants reported a history of sport injury  
150 (52.80%) such as a scrapes, sprained ankle, strained muscle, ligament rupture, or bone fractures.  
151 Some participants had experienced a sport injury in the last 6 months (18.75%). The variation in  
152 participants' background in terms of age, gender, sport participation and injury experience



153 enabled diverse perspectives of sport safety for enriching interview conversation [33]. The  
 154 characteristics of each focus group are shown in Table 1.

155 **Table 1**

156 *Focus Group Characteristics*

Groups	School	Form	Age	N	Gender
1	A	F1	Range = 12-13 ( $M_{age} = 12.50$ , $SD_{age} = .50$ )	28	Male = 13 Female = 15
2					
3					
4					
5	A	F2	Range = 13-15 ( $M_{age} = 13.69$ , $SD_{age} = .54$ )	28	Male = 14 Female = 14
6					
7					
8					
9	A	F3	Range = 14-15 ( $M_{age} = 14.60$ , $SD_{age} = .51$ )	35	Male = 20 Female = 15
10					
11					
12					
13	B	F2	Range = 13-16 ( $M_{age} = 13.94$ , $SD_{age} = 1.89$ )	18	Male = 10 Female = 8
14					
15	B	F3	Range = 14-15 ( $M_{age} = 14.50$ , $SD_{age} = .94$ )	17	Male = 11 Female = 6
16					
17					

157 *Note.* The two local schools are marked as A and B to protect confidentiality and anonymity. M  
 158 = mean; *SD* = standard deviation.

159

160 **Procedure**

161 Secondary school students (Form 1 to Form 3) aged between 12 to 16 who attend regular  
 162 PE lessons were invited to the study. Eligible students and their parents/guardians provide  
 163 informed consent before the study. Students were asked to complete a short demographic  
 164 questionnaire (e.g., age, gender, sport and sport injury experience) before joining the focus group  
 165 interview. To foster a friendly environment in which students would freely interact with their  
 166 peers, each focus group interview was formed by students within the same class, used the mother

167 language of participants (i.e., Cantonese, the primary Chinese dialect in Hong Kong) as the  
168 medium of communication, and was moderated by one of the five Cantonese-speaking  
169 interviewers, including the first and second author, and three research assistants trained to follow  
170 the study protocol and moderate the interview according to the interview schedules. To enhance  
171 the quality and consistency of interview delivery, five interviewers ran 2 practice trials among  
172 themselves before the data collection.

173         At the beginning of the focus groups, interviewers raised questions about sports  
174 experience and motivation to play sports to establish rapport with the participants. Interviewers  
175 then provided a clear definition of sport injury (i.e., ‘any unintentional or intentional damage to  
176 the body resulting from participation in sport [34]’ and examples (e.g., abrasion, sprain,  
177 dislocation, or bone fracture), before leading the main topic of discussion to sport injury.  
178 Interviewers would then explore students’ sport safety knowledge by asking “What do you  
179 normally do to prevent sport injury in-school/out-of-school?”. The main part of the interview  
180 centered on questions about students’ motivation and social cognitive factors of sport injury  
181 prevention in-school and out-of-school. Examples of questions included “Why do you prevent  
182 sport injury in-school/out-of-school?”, “What are the pros and cons of doing sport injury  
183 prevention?” and “Under what circumstances, is sport injury prevention more difficult/ easy?”.  
184 The whole interview schedule is presented in S1 Appendix. The interviewers facilitated the  
185 discussion by (1) encouraging every group member to be active in contributing to, but not  
186 dominating, the interview, (2) asking for clarification and elaboration on certain points, (3)  
187 providing probing questions (e.g., “How do you feel”, “What do you think?”) to stimulate  
188 reflection of thoughts and feelings. At the end of the interview, participants were asked to  
189 discuss any additional issues that came to their mind about safety and injury prevention in sport.

190 The focus group interviews lasted for 35 to 50 minutes with audio recordings transcribed  
191 verbatim.

## 192 **Data Analysis**

193 We adopted and followed Keegan and colleagues' key analytical procedures [35, 36] in  
194 our qualitative data analysis, including (1) transcribing of interview content into 65 pages of  
195 single-lined text with 11 font size; (2) reading the transcript and listening to the interview  
196 recordings multiple times to increase familiarity; (3) conducting a thematic content analysis with  
197 typological approach [37] using ThematiCoder version 1.0 [38], and quotes could be coded into  
198 multiple themes; (4) checking consistency of all the coding with agreement of 96% between two  
199 coders; (5) paraphrasing and restating participants' responses to ensure correct understanding  
200 and precise transcription of the data; (6) adopting a 'critical friend' approach to allow the two  
201 coders to critically review and challenge each other's coding, categorization, organization,  
202 reflection, and interpretation of qualitative findings [39, 40], and (7) conducting a peer debriefing  
203 session among the research team members about the analysis. The essence of the thematic  
204 content analysis in this study was to systematically organize the lower-order themes that  
205 emerged inductively into higher order themes based on motivational and social cognitive factors  
206 of the TCM, so deductive data analysis would progressively take place until theoretical  
207 saturation was reached. Chi-square tests of independence examine if the frequency (i.e., the code  
208 counts) of the three forms of motivations were consistent or different between in-school and out-  
209 of-school contexts.

## 210 **Results**

211           The theoretical components within the TCM, including motivation in-school and out-of-  
 212 school contexts, the three social cognitive factors (attitude, subjective norm, PBC), and intention,  
 213 emerged as higher-order themes in the thematic analysis. In general, most of the students  
 214 understood sport injury prevention as doing warm-up, such as running laps and stretching. Few  
 215 students mentioned cool down as a preventive measure. The details and English translations of  
 216 quotations of the higher-order themes and their corresponding lower-order themes are presented  
 217 in Table 2. Where quotations are provided, the participants' reference is presented for gender (F  
 218 = female and M = male) and group (G1-G17 = Group 1 - Group 17).

219 **Table 2**220 *Themes and Sub-Themes*

Main theme	Sub-themes	Examples of Quotations	Code Count
<b>Motivation</b>			
1. Motivation in-school	Autonomous	“I do it (warm-up) to prevent injury” (M, G7) “Lower the chance of getting injury” (F, G11)	40
	Controlled	“Only do it when teacher ask us to do it” (F, G13) “Warm-up, absolutely will not be self-initiated” (M, G8)	83
	Amotivation	“I just do it (warm-up) but never questioned why” (F, G1)	6
2. Motivation out-of-school	Autonomous	“To relax the muscle” (F, G17) “(I do warm-up) because If you are injured, you cannot play in competition” (M, G4)	44
	Controlled	“The coach outside (school) will ask me to do it” (M, G7) “If my father is not around, I don't need to do it” (F, G2)	20
	Amotivation	“When it comes to my mind/ attention I do it (warm-up)” (F, G2)	8
<b>Social cognitive factors</b>			
3. Attitude	Affective	Positive: “[interviewer: how do you feel about doing sport injury prevention?] It is	34

		quite okay... You feel comfortable after doing it” (F, G16) Negative: “(stretching) is painful, I don’t want to do it” (F, G17)	
	Instrumental	Positive: “To improve performance” (M, G9) Negative: “It is the same whether you do it (warm-up) or not” (F, G9)	125
4. Subjective norms	Injunctive norms	Positive: “(people think that you are) very cool and professional to do stretching” (M, G14) Negative: “If you do it outside, people will look at you” (F, G5) No idea: “No one care about doing warm-up” (F, G1)	241
	Descriptive norms	Positive: “Nothing special, people next to me also do it (warm-up)” (F, G10) Negative: “You go out to play, people will not do it (warm-up) as well” (M, G7)	53
5. PBC	Positive	“if we have more time, we can do more; less time, we cannot not do it” (M, G12)	84
	Negative	“No confidence, if no one does it together, it is difficult” (F, G10)	53
6. Intention	Intention	“Yes, I injured my arm before, so I will need to stretch it” (M, G16)	45
	No intention	“No, why will I do it?” (F, G8)	41
7. Behaviors	In-school	“Jog for two laps” (M, G7) “Yes, we stretch every single time before doing sports (PE lessons)” (F, G2)	94
	Out-of-school	Positive: “I do a warm-up in swimming pool” (F, G1) Negative: “I start to play right away” (M, G7)	104

221

222

## 223 Motivation

224 **Motivation In-School.** This theme refers to the motivation that students endorsed toward

225 in-school sport injury prevention measures. The three main emergent subthemes were

226 *autonomous motivation, controlled motivation, and amotivation.* Students reported being

227 autonomously motivated to prevent in-school sport injuries when they self-endorsed the values  
228 or benefits of warm-up activities or exercises. They viewed warm-up exercises as preventing  
229 muscle pain, stiffness, sprain, sport injury or enhancing sport performance: “I want to protect  
230 myself” (M, G16), “(Why will you do sport injury prevention?) It is good to my body” (M,  
231 G11). Controlled motivation refers to the external demands, pressure, and pride satisfaction of  
232 doing sport injury prevention. Many students reported that they experienced controlled motivated  
233 to carry out the preventive measures in-school: “I do it (warm-up) only when teachers ask us to  
234 do it” (M, G9), “Sometimes it (warm-up) is compulsory, and so you need to do some to avoid  
235 being scolded (by teachers)” (F, G1). Sometimes, students did not know the reasons they  
236 engaged in sport injury prevention in-school. These quotes are under the themes of amotivation:  
237 “(What are the reasons that you do injury prevention in PE lesson?) No reason we just do it” (M,  
238 G17), “I do it (warm-up) because I have nothing else to do” (F, G4).

239 ***Motivation Out-Of-School.*** This theme specifically represents students’ motives to  
240 prevent sport injury in out-of-school context. *Autonomous motivation, controlled motivation, and*  
241 *amotivation* emerged as sub-themes. For the autonomous motivation, similar responses could be  
242 found in-school and out-of-school contexts. “I really want to do better in the competition” (F,  
243 G1), “(I want) to prevent cramping (in swimming)” (F, G5). Outside of school, students also  
244 attempted to prevent sport injury because of external reasons (controlled motivated): “Yes, I will  
245 do (preventive measures), I have training during summer, I do it when coach asks me to do it”  
246 (M, G13), “When my father is around I definitely need to do (a warm-up)” (F, G2). For  
247 amotivation, some of the students’ responses showed absence of motivation towards sport injury  
248 prevention out-of-school: “(So do you know why you do sport injury prevention?) I really don’t  
249 know” (M, G6).

250 **Social Cognitive Factors**

251 *Attitude.* Attitude refers to the personal evaluation of sport injury prevention. This theme  
252 encompasses two sub-themes, *affective attitude* and *instrumental attitude*. Affective attitude  
253 represents whether the students enjoy performing the preventive measures. It is further  
254 subdivided into positive and negative affective attitude. Students used “Refreshing”, “Relaxing”  
255 (M, G6) and “Comfortable” (M, G16) to describe the positive feelings of warming-up. However,  
256 other students had different ideas: “(Doing a warm-up is) very boring” (M, G3), “That was very  
257 annoying is doing leg split” (F, G1).

258 Instrumental attitude refers to students’ assessment of the benefits of doing sport injury  
259 prevention. Many students did not consider preventive measures to be beneficial to them: “It is  
260 the same whether you do it (warm-up) or not” (M, G15), other terms like “Waste of time”,  
261 “Waste of energy” and “Useless” (M, G16) were also reported. In other cases, students believed  
262 injury prevention can “Reduce (muscle) pain”, “Reduce the chance of injury” and “Relax your  
263 muscle” (F, G5). A handful of students highlighted warm-up exercises can enhance their sport  
264 performance: “You will be more concentrated after warming-up”, “Improve competition  
265 performance” (M, G12).

266 *Subjective Norms.* This theme refers to the perception of social appropriateness of sport  
267 injury prevention. *Injunctive norm* and *descriptive norm* emerged as lower-order themes.  
268 Injunctive norms referred to the perception of others’ approval or encouragement on preventing  
269 sport injury. Most students could not determine whether their significant others cared about their  
270 injury preventive behaviors (i.e., “No idea”): “My family members have no opinion (on whether  
271 I do warm-up)” (F, G2). Some felt that teachers, coaches and family members approved their

272 behaviors: “If you do a lot (of warm-up exercises), people think that you are professional” (F,  
273 G9). Only a small number of students reported their social groups disapproved them to do sport  
274 injury prevention. They perceived others viewed them as “Pretending to be professional”, “Very  
275 weird” (M, G14), when they carried out the safety measures. Descriptive norms represented  
276 whether students’ significant others prevented sport injury or not. Both positive and negative  
277 descriptive norms were reported by the students: “Yes, they (parents) are the one to lead (the  
278 warm-up)” (F, G2), “Family members don’t do (warm-up exercises)” (M, G11).

279 **PBC.** This theme refers to students’ perceived ease or difficulty of adopting sport injury  
280 prevention. The two main emergent sub-themes were *positive PBC* and *negative PBC*. The  
281 majority of the students were confident in doing preventive measures: “It (doing warm-up  
282 exercises) is always easy” (M, G17). However, some students found it more difficult, “Very  
283 difficult, we need to do leg split” (F, G1). Environment was also reported to be a determinant of  
284 PBC, “It is easier to do if we have a mat”, “(It is easier to do), if we can turn on air conditioner”  
285 (F, G1). Students had negative PBC on injury prevention when the “Weather is hot”, “Not  
286 enough space” (M, G9).

287 **Intention.** Intention emerged as a higher order theme that refers to the students’ intention  
288 to engage in sport injury prevention. This theme was further divided into *intention* and *no*  
289 *intention*. Some students reported they are intended to participate in sport injury prevention:  
290 “Yes I will do some stretching after exercises” (M, G12), “I will do it in the training session in  
291 coming Thursday” (M, G5). For students who had no intention, they said “I will not do it” (F,  
292 G1), “No, why will I do it?” (F, G8).

293 **Behavior**



294 Behavior was a higher-order theme that referred to the adoption of sport injury  
295 prevention in-school and out-of-school. All of the groups reported they needed to do warm-up  
296 exercises before PE class and a few students highlighted they do cool-down exercises. The  
297 warm-up in-school normally consisted of “standard stretching” (F, G2) and “Jogging for few  
298 laps” (M, G4). Besides doing warm-up exercises, PE teachers also taught “the correct  
299 techniques” (F, G6) and asked students to use safety equipment: “Knee pad” (M, G13) and “Shin  
300 guard” (M, G3). When students were out-of-school, approximately half of them said they would  
301 engage in sport injury prevention: “I do it (stretching) before swimming” (F, G5) and “Bring  
302 helmet and do warm-up before skating” (M, G6). The other half of the sample reported they  
303 would not do injury prevention out-of-school: “I jump right into to the swimming pool to swim”  
304 (M, G12), “I don’t think of putting on a helmet before cycling” (M, G4).

### 305 **Pattern of Motivation Between In-School and Out-of-School**

306 The code counts for in-school autonomous motivation, controlled motivation, and  
307 amotivation were respectively 40, 83, and 6; that for out-of-school were respectively 44, 20, and  
308 8 respectively. A 2 x 3 chi-square test of independence ( $\chi^2 = 28.84, p < .01$ ) indicated that  
309 patterns of motivation were different between the in-school and out-of-school contexts. Follow-  
310 up 2x2 chi-square tests indicated that controlled motivation was mentioned more often regarding  
311 in-school than out-of-school contexts (controlled and autonomous motivation x contexts:  $\chi^2 =$   
312 22.33,  $p < .01$ , odds ratio = 4.57; controlled motivation and amotivation x contexts:  $\chi^2 = 9.64, p$   
313  $< .01$ , odd ratio = 5.53). However, the frequency of autonomous motivation and amotivation were  
314 relatively consistent between the two contexts (autonomous motivation and amotivation x  
315 contexts:  $\chi^2 = .11, p = .74$ , odds ratio = 1.21).

316

## Discussion

317           The purpose of the current study was to explore junior secondary school students'  
318 experience and perspectives of sport safety in-school and out-of-school context, with a particular  
319 focus on the meaning and content they applied to the psychological factors of sport injury  
320 prevention under the TCM [15-17]. The higher-order and lower-order themes emerged from  
321 thematic content analysis generally aligned with the motivational and social cognitive constructs  
322 of the model, but the pattern of motivation in-school and out-of-school context did not entirely  
323 support the proposition of the TCM as the patterns of controlled motivation did not appear to be  
324 consistent (or transferrable) between the two contexts. These results yet may provide information  
325 about the mechanisms underlying the process of trans-contextual transfer of motivation [12, 27-  
326 29].

## 327 Motivation

328           The current data are supportive the presence of autonomous and controlled motivation,  
329 and amotivation for sport injury prevention among junior secondary school students [24, 27, 29].  
330 However, when investigating the content of the quotes for autonomous motivation, we did not  
331 observe intrinsic motivation for sport injury prevention in either in-school or out-of-school  
332 contexts. This phenomenon may indicate that autonomously motivated students may participate  
333 in sport injury prevention because they think that it is useful or beneficial, rather than because it  
334 is fun. While "Having fun" has been regarded as an important factor that determines individuals'  
335 adherence to sport injury prevention [14], and researchers also proposed that injury prevention  
336 programs should be more game-like [41] our current data suggest that students are not  
337 intrinsically motivated to participate in injury preventive measures. Although the absence of

338 intrinsic motives for sport injury prevention is somewhat in line with the operationalization of  
339 autonomous motivation in the sport injury prevention version [24, 29] of treatment self-  
340 regulation questionnaire [42], our findings may raise further questions about the necessity,  
341 applicability, effectiveness, and practicality of promoting intrinsic motivation for sport injury  
342 prevention. Nevertheless, workshops and interventions can be provided to PE teachers and  
343 coaches, introducing ways to develop enjoyable sport injury prevention programme (e.g. jogging  
344 with a football, rotating leadership in leading dynamic stretching). Another effective strategy  
345 would be to enhance other autonomous forms of motivation, such as identified regulation. This  
346 would mean a focus on identifying the internally valued outcomes of injury prevention (e.g.,  
347 being able to continue participating in exercise, avoiding lengthy rehab or visits to the  
348 physiotherapist), rather than promoting enjoyment of the exercises themselves.

349         Another noteworthy finding in this study concerns about content of amotivation for sport  
350 injury prevention. Amotivation, compared to autonomous and controlled motivation, was a  
351 theme that received less mention (expressed via codes), but its expressions in the quotations did  
352 not always appear to be maladaptive as it was described within SDT [19]. In this study,  
353 amotivated students were not aware of the reasons behind why they sported injury prevention,  
354 and they did not feel pressured to do so. However, follow-up questions about why indicated that  
355 (1) some students believed that it was easier to follow what it was told or what everyone else was  
356 doing, (2) or they just did it automatically or habitually when time allowed. The former case was  
357 more prevalent for in-school amotivation, and might reflect lack of true intention towards sport  
358 injury prevention, thus more vulnerable to dropout and low-awareness to sport injury prevention  
359 in some circumstances (e.g., unsupervised out-of-school conditions). It might also explain why  
360 the latter case (i.e., automaticity and habit) was more commonly found out-of-school

361 amotivation. Such content related to amotivation might somewhat reflect concepts such as  
362 implicit attitude, implicit motivation, and habit, that growing amount of research have used them  
363 for the explanation of health behaviors [43-46]. Existing literature regarding the role of  
364 amotivation on sport injury prevention has been scarce, so it would be worthwhile for future  
365 studies to incorporate amotivation, and even other related factors (e.g., habit, implicit attitude)  
366 into the TCM [47].

367         The role of controlled motivation is another interesting observation. Our data indicated  
368 that students felt obliged to participate in safety measures, and felt that sport injury prevention  
369 was compulsory because they had to follow significant others' (e.g., PE teachers in-school  
370 context, and coaches and parents in out-of-school context) instructions or comply with safety  
371 regulations. It seemed that students may not necessarily know the rationale behind performing  
372 sport injury prevention activities. Such a scenario is not ideal for behavioral adherence because  
373 in the absence of external demands or social pressure, individuals driven by controlled  
374 motivation are less likely than autonomous motivated individuals to adhere to sport injury  
375 prevention [19, 48], making them more vulnerable to behavioral dropout in out-of-school  
376 context. In the focus-group interview, there were several students who possessed in-school  
377 controlled motivation, but not out-of-school controlled motivation, and they also reported  
378 behavioral non-compliance in out-of-school context "I don't do warm-up [outside school]". This  
379 might be why the students were less likely to report controlled motivation for out-of-school  
380 injury prevention compared to in-school injury prevention.

381         Rates of autonomous motivation and amotivation (but not controlled motivation) for  
382 injury prevention were highly comparable between in-school and out-of-school contexts. These  
383 findings were in line with the tenets of TCM [15-17], it might provide implications for the trans-

384 contextual transfer of motivation in the injury prevention context [23, 27, 28, 49]. Autonomous  
385 motivation and amotivation appeared to be more prevalent by participants than controlled  
386 motivation in the out-of-school context, so that might suggest that the transferability of  
387 autonomous motivation and amotivation is more effective than controlled motivation. Our data  
388 might, therefore, offer an explanation as to why some previous studies adopting the TCM  
389 reported non-significant [26] or relatively weaker association between controlled forms of  
390 motivation across contexts, as compared to that of autonomous forms of motivation [15, 50].  
391 Yet, the answer has not been fully revealed as majority of the studies applying the TCM often  
392 use a composite score for motivation types from SDT (e.g., the relative autonomy index) rather  
393 than differentiated constructs [16, 51]. It might be important for future studies to examine the  
394 independent transferability of each type of motivation from SDT.

395         Our findings were consistent with previous studies examining the TCM in injury  
396 prevention regarding the transferability of autonomous motivation across contexts [23, 27].  
397 According to SDT [18, 19] and prior studies in injury management [23, 27], autonomous  
398 motivation could be facilitated by satisfying individuals' psychological needs of autonomy  
399 (feeling of choices and freedom), competence (feeling of being able to do what you want) and  
400 relatedness (feeling of being accepted, connected and cared for) [28, 52, 53]. However, questions  
401 remain on how PE teachers can provide the best support for satisfying students' psychological  
402 needs in the injury prevention contexts, and answering this question require further analysis of  
403 PE teachers' behaviors.

404 **Social Cognitive factors**

405           The current study provided evidence on students' beliefs in sport injury prevention with  
406 themes consistent with the theoretical concepts of the social cognitive variables from the TCM,  
407 including attitude, subjective norms, and PBC [24, 29]. The sub-themes indicated there were  
408 positive and negative beliefs that governed students' decision-making process for sport injury  
409 prevention. Our findings may be useful for understanding or even modifying the salient beliefs  
410 associated with students' commitment to sport safety guidelines. Researchers and sport medicine  
411 practitioners should try to alter negative beliefs, such as affective (e.g., "painful feeling") and  
412 instrumental (e.g., "waste of time") attitudes, injunctive (e.g., "it makes me look weird in front of  
413 others"), descriptive norms (e.g., "None of my friends do it"), and PBC (e.g., "no time and  
414 space") to try to draw students' attention to the positive ones. For example, one common  
415 negative instrumental attitude is about the effectiveness of sport injury prevention. It refers to a  
416 misconception that sport injury is inevitable regardless of prevention, and previous studies have  
417 reported this belief was negatively related to self-determined (i.e., more autonomous, less  
418 controlled) motivation of injury prevention [27, 28]. Resolve this maladaptive belief by restating  
419 the evidence about the effectiveness of sport injury prevention on reducing the risk and severity  
420 of sport injuries [54]. A prior study in promoting helmet use among school-aged cyclists  
421 disseminated leaflets with persuasive messages constructed based on the TPB [20] successfully  
422 enhanced future helmet use by promoting change in the social cognitive variables [55]. Besides  
423 the three social cognitive variables, intention emerged as an independent theme in the present  
424 study, but the content regarding students' future engagement in sport injury prevention rarely  
425 specified specific injury preventive behaviors, and when and how they would be performed. This  
426 finding might be due to the well-documented intention-behavior 'gap' in which intentions cannot  
427 fully predict behaviors because people do not act according to their intentions [56, 57]. Our data

428 may imply that enriching the specification of intention that students formed for sport injury  
429 prevention might bridge the intention-behavior gap, and this could be done by fostering better  
430 action control, implementation planning, action/recovery self-efficacy [56-59]. Several  
431 behavioral change strategies have been proposed by the literature to tackle these variables, for  
432 example the “if, then” approach proposed by Chapman, Armitage [60]. Future studies could  
433 investigate the feasibility of applying these evidence-based behavioral change strategies in sport  
434 injury prevention contexts.

### 435 **Behaviors**

436 Injury preventive behavior reported by junior secondary school students reported many  
437 strategies related to sport safety. However, pre-exercise warm-up and stretching dominated the  
438 content of this theme. Stretching during pre-exercise warm-up might not necessarily be the most  
439 appropriate method for sport injury prevention [61]. Some studies even suggested stretching  
440 could have negative effects on performance [62], and might have a non-significant impact on  
441 injury prevention [63]. Other types of preventive methods, such as neuromuscular training (e.g.  
442 FIFA 11+, iSPRINT) [54, 64, 65], eccentric strength training [66], resistance training [67]  
443 received increasing amount of evidence in supportive to their effectiveness on sport injury  
444 prevention. Our findings may imply that besides fostering better behavioral adherence,  
445 enhancing the knowledge of sport injury prevention among students and PE teachers (e.g., sport  
446 safety workshop, education seminar) might be critical to reducing the risk of sport injury,  
447 particularly in out-of-school unsupervised situations [10, 68].

### 448 **Limitations and Future Directions**

449           A few limitations of the current study should be addressed to identify the boundaries of  
450 the study and stimulate further research. Our study adopted a qualitative approach focusing on  
451 the content of the psychological factors of TCM, and the frequency salient themes [69]. The  
452 cross-sectional nature of the study and qualitative data mean that we cannot draw causal  
453 inference on transfer of motivation, and the change in psychological variables within the TCM.  
454 A longitudinal study with cross-lagged panel design could examine the temporal relationship by  
455 testing the changes of TCM variables over time [70]. Another noteworthy limitation is related to  
456 the study sample. Although our study sample was recruited from only two local secondary  
457 schools in Hong Kong, the variation of participants' personal backgrounds, school environment,  
458 sport culture, and region of residence could be restricted, so it might affect the generalizability of  
459 the findings to other populations. Future studies should replicate this line of work with diverse  
460 samples with participants from different backgrounds, and more importantly, in other behavioral  
461 contexts (e.g., physical activity, occupational injury prevention, rehabilitation, and education)  
462 where qualitative studies of the TCM have yet to be employed.

## 463 **Conclusion**

464           The current study is the first qualitative study to explore junior secondary school  
465 students' experience and perspectives on sport injury prevention, using TCM as a framework for  
466 investigation. Themes emerged from 17 focus group interviews were consonant with the  
467 constructs of the TCM, including in-school motivations, and out-of-school motivations, social  
468 cognitive factors, intention, and behavior regarding sport injury prevention. The frequency of  
469 codes for motivation could be explained by the tenets of the TCM's regarding the transferability  
470 of motivation across contexts. The frequency of autonomous motivation and amotivation was  
471 highly consistent across the two contexts, but that of controlled motivation was significantly



472 reduced in out-of-school context. The content of behavior also indicated the inadequacy of  
473 students' knowledge of effective sport injury prevention techniques, and underscored the  
474 importance of sport safety education. Based on the findings of prior studies on the TCM in other  
475 behavioral contexts (e.g., occupational injury prevention), making goal-oriented safety  
476 objectives, promoting the pros of preventing sport injury, encouraging everyone to participate in  
477 injury prevention (including students' family) and removing students' barriers to do sport injury  
478 prevention (e.g. uneven surface, hot weather and time limit), might be possible solutions to  
479 enhance students' adherence to engage in sport injury prevention [12, 28]. Future quantitative  
480 research is warrant to test the effectiveness of these strategies on students' behavioral adherence  
481 towards sport injury prevention.

482

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667

Insert S1 Appendix here. Interview Schedule

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