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Applied Psychology of Sport Injury:  
Getting to—and Moving Across—The Valley of Death

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Submitted 9th July, 2021

Resubmitted 21<sup>st</sup> October, 2021

### Abstract

25  
26 Areas of science in which policy and practice lag behind research evidence are known as “valleys of  
27 death” (Reis et al., 2008). It can be argued that sport injury psychology has not yet reached, let alone  
28 crossed, its own valley of death. In this paper, we consider what developments in the evidentiary  
29 base are required to reach and cross the valley of death to advance the application of psychology to  
30 sport injury prevention and rehabilitation over the next 10 years. To that end, we reflect on the  
31 current research landscape and application-readiness of several subareas of sport injury psychology,  
32 highlight some of the strengths and limitations of sport injury psychology research, consider what is  
33 required to increase the likelihood that findings from empirical sport injury psychology research will  
34 be applied as part of future preventive and rehabilitation practice to cross the valley of death, and  
35 how this can be achieved. Finally, we identify what we consider to be some of the most pressing  
36 questions for sport injury psychology researchers to address to help enhance the quality of future  
37 research and practice.

38 **Keywords:** intervention, prevention, rehabilitation

39

### 40 Lay Summary

41 In the paper, we reflect on the current research landscape in the psychology of sport injury  
42 prevention and rehabilitation and what is required of future research to close the research-practice  
43 gap.

44

### 45 Implications for Practice

- 46 • The applications-readiness of findings could be increased by using a participatory approach  
47 to the design and implementation of interventions, ensuring interventions are responsive to

48 constituent needs and environmental demands, and can be implemented by users other than  
49 sport psychology consultants.

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51 **Applied Psychology of Sport Injury:**  
52 **Getting to—and Moving Across—The Valley of Death**

53 Sport psychology is an inherently applied discipline. The mere existence of this journal,  
54 however, attests to the fact that some investigations in sport psychology—and, by extension, sport  
55 injury psychology—are more applied than others. From humble beginnings more than a half-century  
56 ago, sport injury psychology has evolved into a thriving academic field with a rich, varied, and ever-  
57 expanding scholarly literature on theory, research, and practice pertaining to the topic. Despite the  
58 scientific progress that has been made, the impact of that progress on the application of psychology  
59 to sport injury has been extremely modest. Few interventions or protocols originating in sport injury  
60 psychology research have become standard practice in the delivery of services to athletes before or  
61 after injury. In this article, we examine the application-readiness of the research base in several  
62 subareas of sport injury psychology and consider what can be done to increase the likelihood that  
63 findings from investigations of psychological phenomena in the context of sport injury will be  
64 applied. First, however, we introduce the notion of the “valley of death” to facilitate a discussion of  
65 targets for the application of research findings in sport injury psychology, types of research  
66 questions that need to be answered to enable application, and approaches for translating research  
67 findings into practice.

68 **The Valley of Death**

69 Also known as the “research-practice gap,” the term “valley of death” has been applied to  
70 areas of science in which policy and practice lag behind research evidence (Reis et al., 2008).  
71 Before the valley can be crossed, it first must be reached with relevant, meaningful, application-  
72 ready research findings in hand, a firm understanding of the constituencies most likely to implement  
73 the products of research investigations, and strong foundational knowledge of those products. To

74 cross the valley and achieve widespread application, various implementation strategies can be used  
75 to hasten the journey.

### 76 **Reaching the Valley**

77 For research findings to be maximally useful for the constituencies most likely to apply  
78 them, it is important the findings have direct implications for application expressed in concrete  
79 terms. Being able to frame research findings in “If  $x$ , then  $y$ ” language, where  $x$  refers to a particular  
80 injury-related situation (e.g., poor adherence to recommendations to restrict certain physical  
81 activities) and  $y$  refers to a specific course of action (e.g., a particular intervention) may provide an  
82 indication of the direct applicability of those findings. Results of studies in which interventions,  
83 diagnostic procedures, and assessment instruments are examined may be especially likely to have a  
84 direct course of action associated with them. With regard to interventions, for example, it is vital for  
85 investigators to document support for the efficacy (i.e., success under controlled experimental  
86 conditions), efficiency (i.e., ability of a design to achieve the objective of the study with minimal  
87 expenditure of resources such as time and money), and effectiveness (i.e., success under naturalistic,  
88 real-world conditions) of the interventions (Gledhill et al., 2018). When such information has been  
89 obtained, along with details pertaining to the safety, side effects, contraindications, dose-response  
90 relationships, best- and worst-case scenarios, acceptability, and adherence rates, the interventions  
91 may be well-positioned for dissemination, implementation, and evaluation in real-world practice  
92 settings and, accordingly, to cross their respective valleys of death.

93 To ensure the applicability of diagnostic procedures and assessment instruments, information  
94 is needed beyond the regular sort of psychometric data required for research. For example,  
95 information about the sensitivity and specificity of the instruments and procedures are required for  
96 decision-making purposes. Ideally, self-report instruments should be calibrated with “real-world”  
97 sport injury variables to facilitate interpretation and action (Andersen et al., 2007). For example, a

98 given score on a self-report measure of adherence to rehabilitation should provide a concrete  
99 indication of an athlete's actual rehabilitation behavior (e.g., the numerical frequency of a given  
100 rehabilitation activity should be obtained instead of a Likert-style rating of the frequency of the  
101 behavior). As with interventions, once the requisite information has been obtained, the diagnostic  
102 and assessment instruments and procedures may be ready to begin the journey toward widespread  
103 application.

104 For decades the sport psychology literature has been replete with calls for researchers to  
105 address “significant,” “novel” research questions that address “unknowns” that can inform practice  
106 (e.g., Hardy et al., 1996; Vealey, 1994). In the context of sport injury research, there have also been  
107 calls for transdisciplinary and idiographic research to foster useable knowledge (Hess et al., 2019;  
108 Leggat, 2020)—the latter implicitly grounded in a quantitative-qualitative debate, the former in the  
109 need for “users” and practitioners to be integral to the design and implementation of research that  
110 addresses their specific practice needs. Although theoretical advances continue to be important, to  
111 enhance the application-readiness of research findings, it is necessary to build on and extend the  
112 current body of intervention research through targeted systematic lines of enquiry to address  
113 significant research questions that can have greater direct practical application. To this end, it would  
114 be beneficial to extend existing knowledge and understanding of the efficacy of strategies that can  
115 be used by practitioners and end users as part of their current prevention and treatment regimens in  
116 practice settings. Research studies along these lines need to evoke confidence in the utility and  
117 effects of the strategies on the prevention and/or treatment of sport injury by meeting the highest  
118 standards of methodological rigor and ensuring that there is sufficient detail in the application of the  
119 interventions to be directly transferable to training and practice environments (e.g., to specify the  
120 appropriate “dose” of the intervention). Although there is a place for different study designs and  
121 both idiographic and nomothetic approaches (Ivarsson & Andersen, 2016), randomized designs that

122 implicitly include a control group remain the gold standard for examining the efficacy of specific  
123 strategies and their effects. Studies with randomized, controlled designs arguably offer the greatest  
124 potential for reaching the valley of death, particularly if they can address calls for larger sample  
125 sizes and randomization across conditions (Ivarsson, 2021; Ledingham et al., 2020). They will also  
126 have greatest impact if they are aligned to the needs of and environments in which application is  
127 likely to occur, providing the basis for the subsequent assessment of their effectiveness. For  
128 example, strategies that can be readily used by coaches in training environments might have greatest  
129 practical utility in injury prevention, whereas those that can be readily implemented by athletic  
130 trainers and physiotherapists for use in clinic- and home-based treatment environments might be  
131 better suited to injury response and rehabilitation (Brewer & Redmond, 2017; Ivarsson, 2021;  
132 Ledingham et al., 2020). Further, strategies and designs that can evidence time-sensitive  
133 intervention effects (e.g., brief and single-session interventions) may have particular merit, as they  
134 may be perceived as less burdensome than those of longer duration and/or frequency by those  
135 delivering and receiving the interventions.

136 An enduring question in sport injury psychology is who (i.e., individuals of which discipline  
137 or profession) should deliver psychological interventions to athletes in the context of sport injury  
138 (Brewer & Redmond, 2017). Despite longstanding and repeated calls for the involvement of sport  
139 psychology consultants (SPCs) in addressing psychological aspects of sport injury as part of a  
140 multidisciplinary treatment team (Arvinen-Barrow & Clement, 2015, 2017; Heil, 1993), such  
141 arrangements are rare (Clement & Arvinen-Barrow, 2021). Only infrequently are SPCs directly  
142 involved in the prevention and treatment of sport injury. Consequently, coaches, sports healthcare  
143 professionals (SHPs), and athletes constitute the primary targets for the application of psychology in  
144 the context of sport injury, and, where appropriate should be an integral part of the research design  
145 process. Accordingly, it is essential that at least a portion of the sport injury psychology research

146 agenda is aligned with this reality and generates findings of direct relevance for stakeholders who  
147 may vary widely in their knowledge of and interest in applying psychology in the context of sport  
148 injury.

### 149 **Crossing the Valley**

150 Born out of a recognition of the valley of death, implementation science (IS) offers a  
151 considered and theoretically-grounded approach to increasing the likelihood research products in  
152 sport injury psychology that have reached the valley of death are able to navigate the challenging  
153 landscape on the way to application in practical, real-world settings (Butler, 2008). IS is the  
154 “scientific study of methods to promote the systematic uptake of research findings and other  
155 evidence-based practices into routine practice, and, hence, to improve the quality and effectiveness  
156 of health services and care.” (Eccles & Mitman, 2006, p.1).

157 Over the last 15 years, in their efforts to reduce the research-practice gap, implementation  
158 scientists have proposed a number of theories, frameworks and models to guide the translation of  
159 research into practice, elucidate what influences implementation outcomes, and evaluate the  
160 implementation. Five categories of theoretical approaches that aim to elucidate factors that influence  
161 implementation outcomes have been delineated: process models, determinant frameworks, classic  
162 theories, implementation theories, and evaluation frameworks. Although not always recognized as  
163 separate types of approaches and in some cases having considerable overlap between them, this  
164 taxonomy of categories and the different assumptions, aims and characteristics associated with them  
165 can help guide researchers in their implementation efforts (Nilsen, 2015; Nilsen & Bernhardsson,  
166 2019). Ultimately, the goal of IS and its various theories, frameworks and models is to reduce the  
167 research-practice gap through an emphasis on: (a) understanding the context in which the practices  
168 will be implemented and the attitudes, skills and capabilities of those implementing them; (b)  
169 developing implementation approaches that target the factors that may accelerate or hinder



170 implementation; and (c) conducting pragmatic trials to test these implementation approaches  
171 (Stirman & Beidas, 2020).

172         **Understanding the context.** IS acknowledges the importance of understanding the context  
173 in which evidence-based practices and principles are implemented and how these contextual factors  
174 contribute to their success or failure. These contextual factors include the knowledge, skills, beliefs,  
175 and attitudes of those likely to implement the strategies, such as coaches, athletic trainers,  
176 physiotherapists, and sport psychologists, as well as the broader organizational and environmental  
177 context. Thus, IS involves investigating multiple levels of context, because failure to account for  
178 context may limit the generalizability of specific study findings to different settings and  
179 circumstances and prevent concomitant improvements in implementation outcomes (Bauer &  
180 Kirchner, 2020; Flottorp et al., 2013; Nilsen & Bernhardsson, 2019). An important prerequisite in  
181 relation to context, however, is that the strategies and practices have a strong, established evidence-  
182 base to enable a move beyond the study of efficacy and effectiveness to that of implementation. This  
183 presents sport injury psychology with two challenges: First, to create a strong evidence-base to  
184 support the efficacy and effectiveness of the interventions. Second, to ensure that these interventions  
185 meet efficiency requirements (i.e., show clear economic cost-benefit) and account for: (a) the  
186 context (e.g., training, performance and rehabilitation environments) in which they will be  
187 delivered; (b) the attributes of those who will deliver them (e.g., coaches, athletic trainers,  
188 physiotherapists, sport psychologists); and (c) environmental and organisational constraints (e.g.,  
189 time, resources) that may influence implementation outcomes.

190         **Developing implementation approaches.** IS also emphasizes the importance of developing  
191 approaches that target the factors that may accelerate or hinder implementation. A large number of  
192 contextual factors, dimensions or determinants have been identified in the IS literature including the  
193 knowledge, skills, beliefs, and attitudes of those likely to implement the strategies, such as coaches,

194 athletic trainers, physiotherapists, and sport psychologists, as well as the broader organizational,  
195 financial, leadership, social relations and support, and environmental context (Nilsen &  
196 Bernhardsson, 2019). Although it is difficult to account for all potentially influential factors on  
197 implementation outcomes, not least because different determinants affect different types of context  
198 and practice changes, an understanding of the key factors and their effects is likely to be integral to  
199 closing the research-practice gap (Flottorp et al., 2013; Nilsen & Bernhardsson, 2019). The crux of  
200 implementation science, therefore, is to (a) identify the barriers and facilitators to uptake across  
201 multiple contextual levels (e.g., patients, providers organizations and stakeholder groups), and (b)  
202 develop and apply implementation strategies that overcome the barriers and enhance the facilitators  
203 to increase uptake of evidence-based interventions (Bauer & Kirchner, 2020). Although a wealth of  
204 systematic and narrative reviews have identified and classified the existing and emerging  
205 implementation theories and models that populate the literature, as well as the barriers and  
206 facilitators associated with them, those that are becoming more dominant espouse a “community-  
207 based” participatory approach and the co-production of the design and implementation of  
208 interventions (Damschroder, 2020; Kothari & Wathen, 2017). Such an approach can help maximise  
209 the utility of evidence-based interventions by helping stakeholders to: (a) identify the needs,  
210 preferences, capabilities, and limitations of the people who will use the interventions; (b) assess  
211 individual, organizational, and environmental barriers and facilitators of intervention  
212 implementation; (c) tailor the interventions to the unique needs of the individuals and settings where  
213 they will be implemented; and (d) enable interventions to continue to be delivered, even if the  
214 resources to do so diminish after initial implementation (Orengo-Aguayo et al., 2020).

215         Given that SHPs may be increasingly called upon to implement psychological interventions  
216 with injured athletes, it is heartening to note that there is a sizable literature dating back more than  
217 30 years (e.g., Gordon et al., 1991; Wiese et al., 1991) in which SHPs have been surveyed and/or

218 interviewed about their perceptions, knowledge, and use of psychological interventions in  
219 connection with sport injury (for systematic reviews on the topic, see Alexanders et al., 2015; Driver  
220 et al., 2017; and Heaney et al., 2015). As a first step, when planning psychological interventions for  
221 SHPs to implement (or facilitate) in sports healthcare settings, it would be wise to take this body of  
222 research into account. The central tenets of IS are not completely new to the sport injury domain,  
223 most notably in injury prevention research. The six-step TRIPP (Translating Research into Injury  
224 Prevention Practice) model outlined by Finch (2006) and the more general RE-AIM (Reach,  
225 Effectiveness, Adoption, Implementation, Maintenance; Glasgow et al. 1999) model are but two of a  
226 number of models that have been proposed to address the research-practice intervention gap and  
227 provide researchers with frameworks to guide the practical utility of their intervention endeavors.  
228 Use of frameworks such as these in the context of sport injury prevention (Barden et al., 2020;  
229 Donaldson et al., 2021; Finch, 2006; Richmond et al. 2020; Vriend et al., 2015) through, in some  
230 instances, co-production, provides an indication as to why injury prevention is not only the closest  
231 area of sport injury psychology to reaching the valley of death, but is also likely to be the first to  
232 cross it. They also provide researchers with illustrative examples of how implementation studies can  
233 be conducted in the injury domain.

234       **Conducting pragmatic and implementation trials.** To have practical value, interventions  
235 must be both efficacious (i.e., successful under controlled experimental conditions) *and* effective  
236 (i.e., successful under naturalistic, real-world conditions). Whereas efficacy trials can furnish an  
237 indication of the potency of interventions and demonstrate proof-of-concept, effectiveness trials can  
238 provide an assessment of how well interventions are likely to fare when administered amidst the  
239 extraneous influences present in real-world settings. Once efficacy has been demonstrated for a  
240 given intervention, it is incumbent on investigators to conduct effectiveness trials to ensure that the  
241 intervention will translate to actual practice, recognizing that the magnitude of the beneficial effects

242 of the intervention may be diminished when subjected to real-world influences (Brewer et al., 2021).  
243 Interestingly, the concept of effectiveness is central to implementation frameworks and evaluation  
244 theories such as TRIPP (Finch, 2006) and RE-AIM (Glasgow et al., 1999). Implementation trials  
245 can then build upon efficacy and effectiveness trials by testing strategies to increase intervention  
246 uptake and sustainability in routine practice. Although the population and context may be similar to  
247 effectiveness trials, implementation research is likely to involve more stakeholders (including  
248 organizations), be more multi-source, and include both quantitative and qualitative data. In terms of  
249 the data, however, reducing respondent burden to retain participants who are less research tolerant  
250 may be paramount. To this end, outcome measures need to become briefer and study protocol  
251 potentially simpler in implementation research (Bauer et al., 2105; Bauer & Kirchner, 2020).  
252 Existing injury-related implementation studies and commentaries can help guide researchers in their  
253 efforts in this regard, as well as in alternative ways of disseminating research findings (e.g., Acland,  
254 2016; Benjaminse & Verhagen, 2021; Donaldson et al., 2017; Richmond et al., 2021).

### 255 **Current Status and Future Directions in the Application of Sport Injury Psychology**

256 It is safe to say that there are no areas of sport injury psychology research that have arrived  
257 at and are ready to cross the valley of death. Nevertheless, some lines of research are closer to  
258 getting to the valley than others. In this section, we examine the progress of several representative  
259 sport injury psychology topics toward reaching their respective valleys of death. Specifically, we  
260 consider examples pertaining to sport injury prevention, psychological responses to sport injury  
261 (e.g., cognitive and emotional responses to sport injury, adherence to sport injury rehabilitation),  
262 and return to sport after injury rehabilitation.

### 263 **Sport Injury Prevention**

264 Conservatively, there is empirical support for over 20 different types of intervention  
265 strategies across the sport injury prevention literature, including the use of personal protective

266 equipment, rule changes, and training and conditioning programs (Gledhill et al., 2018; Ivarsson et  
267 al., 2016; Tranaeus et al., 2015 Vriend et al., 2017). Use of psychological strategies, however, has  
268 lagged behind other approaches to injury prevention. Nevertheless, built on a strong foundation of  
269 theory and research on the psychosocial antecedents of sport injury (Andersen & Williams, 1988;  
270 Ivarsson et al., 2016; Tranaeus et al., 2015; Williams & Andersen, 1998), psychological  
271 interventions aimed at preventing sport injury are sport injury psychology’s leading example of a  
272 line of inquiry that has the valley of death within its sights. Guided by well-documented positive  
273 associations of both negative life event stress and stress responsivity with the occurrence of sport  
274 injury, a variety of intervention approaches that have stress management at their core have been  
275 shown to reduce the risk of sport injury (Ivarsson et al., 2016; Tranaeus et al., 2015). There are,  
276 however, several vital issues that require resolution before preventive psychological interventions  
277 are ready for widespread adoption and impact. Foremost of these issues is the content of the  
278 interventions. Although the interventions are generally focused on the management of stress through  
279 cognitive-behavioural means, the specific approaches of the interventions (e.g., autogenic training,  
280 mindfulness, self-regulation techniques, sport psychology) are heterogeneous, albeit sometimes  
281 overlapping across studies.

282       Clarity also needs to be achieved with respect to the dose-response relationship for the  
283 interventions. The “dose” of the interventions that have been administered has varied widely,  
284 ranging from 2 to 24 hours over the course of 1 to 36 sessions over 1 to 32 weeks (Ivarsson et al.,  
285 2016; Tranaeus et al., 2015). Although the injury-preventive “response” to the interventions has also  
286 varied widely across studies (Ivarsson et al., 2016; Tranaeus et al., 2015), the magnitude of the  
287 effect does not seem to increase with the number of intervention sessions (Tranaeus et al., 2015).  
288 Further, it is necessary to translate the medium effect size obtained for preventive psychological  
289 interventions across studies (Ivarsson et al., 2016) into real-world terms by giving prospective

290 adopters of the interventions an indication of how many injuries (and associated injury-related time  
291 loss) they could expect a given intervention to prevent. Although adverse side effects of stress  
292 management interventions for sport injury prevention have not been reported, their potential for  
293 favourable effects on sport performance has been documented (e.g., Davis, 1991; DeWitt, 1980).  
294 Along with the results of a cost-benefit analysis, in which the monetary value of an intervention is  
295 assessed relative to its costs (e.g., Swart et al., 2014), information about the probable injury-  
296 reducing effects of interventions is critical to helping coaches, SHPs, and sport administrators  
297 decide on the extent to which they will allocate monetary and human resources toward the  
298 implementation of those interventions. Ensuring that interventions can easily be incorporated into  
299 practice and training environments will also be critical to their adoption (Ivarsson, 2021) and, in  
300 research studies, could help safeguard larger sample sizes, thereby establishing stronger evidence for  
301 their injury-preventive effects.

302         To ensure that well-validated preventive psychological strategies can cross the valley of  
303 death and be readily implemented in the target environment (e.g., training, competition), the  
304 interventions will undoubtedly need to: (a) be incorporated in conjunction with and as part of other  
305 preventive measures (e.g., protective equipment, neuromuscular training, rule changes); (b) have  
306 “end-users” as integral to their design and implementation; (c) reflect the context in which they will  
307 be applied; (d) have a clear cost-benefit evidentiary base; and, (e) be adaptable such that they can be  
308 implemented by users other than sport psychology consultants. A physical intervention that meets  
309 most of these conditions and has potential implications for the implementation of preventive  
310 psychological interventions is embedding neuromuscular training within a dynamic warmup routine  
311 that athletes perform prior to training sessions. Neuromuscular warmups such as the Fédération  
312 Internationale de Football Association (FIFA) 11+ injury prevention program, are efficacious, cost-  
313 effective, and widely-implemented physical training interventions that do not require expensive

314 equipment or specialized personnel to apply (Al Attar et al., 2021; Marshall et al., 2016; Rössler et  
315 al., 2019; Sadigursky et al., 2017; Thorborg et al., 2017). Although originally designed for football  
316 (soccer) players, neuromuscular warmup interventions have been implemented with athletes in other  
317 sports as well (LaBella et al., 2011; Pasanen et al., 2008). Essentially, neuromuscular warmup  
318 interventions do “triple duty,” simultaneously preparing athletes physically for the session that lies  
319 ahead, enhancing their neuromuscular and motor performance (Barengo et al., 2014), while also  
320 engaging them in injury-preventive activities. Adopting the logic and approach of neuromuscular  
321 warmup interventions to preventive psychological applications, stress-reducing material could be  
322 embedded within a brief “mental warmup” that athletes have deemed acceptable to repeat prior to  
323 training and competition (Brewer et al., 2019; Van Raalte et al., 2019). If validated for the purposes  
324 of injury prevention (and that’s a big “if”), such an approach would require no specialized  
325 professionals to administer—it can be implemented by coaches and/or the athletes themselves (see  
326 [www.supportforsport.org/mentalwarmup/index.html](http://www.supportforsport.org/mentalwarmup/index.html))—and would also do triple duty,  
327 simultaneously preparing athletes mentally for the upcoming session, enhancing their self-regulatory  
328 skills, and engaging them in a “microdose” of injury-preventive material.

### 329 **Psychological Responses to Sport Injury**

330 As described in a review of the literature (Brewer, 2017), a wide variety of cognitive,  
331 emotional, and behavioral responses to sport injury have been documented across numerous  
332 qualitative and quantitative studies. Among the cognitive responses to sport injury are recurrent,  
333 intrusive, distress-provoking, injury-related thoughts and images, decreased self-esteem, decreased  
334 identification with the athlete role, impaired cognitive processing, and perceptions of injury-related  
335 benefits (Brewer, 2017). Although not inevitable and likely to fluctuate over the course of  
336 rehabilitation, negative emotions such as anger, confusion, depression, fear, frustration,  
337 helplessness, and shock have also been documented after sport injury (Brewer, 2017). Among the

338 reported behavioral responses to sport injury are those that involve active attempts to cope with the  
339 situation (e.g., vigorous pursuit of rehabilitation, learning about the injury, recruiting social  
340 resources), attempts to avoid experiencing negative emotions (e.g., watching television, keeping  
341 busy), and less potentially adaptive reactions (e.g., attempting suicide, consuming drugs and/or  
342 alcohol, eating in a disordered manner) (Brewer, 2017). In addition, researchers have proposed and  
343 explored the veracity of a number of conceptual models and theoretical frameworks to examine the  
344 antecedents and predictors of cognitive, emotional, and behavioral responses to sport injury  
345 (Brewer, 2017). That said, few, if any, of the models have been examined in their entirety, and many  
346 of the mechanisms underpinning the reported effects remain poorly understood.

347         Among the correlates of psychological responses to sport injury, social support has emerged  
348 as a factor of particular importance. Not only do low levels of social support confer on athletes  
349 increased vulnerability to injury under conditions of high life stress (e.g., Hardy et al., 1991;  
350 Patterson et al., 1998; Petrie, 1992), they also place athletes at increased risk for postinjury  
351 psychological distress (Brewer et al., 1995; Green & Weinberg, 2001; Malinauskas, 2010; Manuel  
352 et al., 2002; Rees et al., 2010) and poor adherence to rehabilitation (Byerly et al., 1994; Duda et al.,  
353 1989; Fisher et al., 1988; Johnston & Carroll, 2000; Levy, Polman, & Borkoles, 2008; Levy,  
354 Polman, & Clough, 2008).

355         After sustaining an injury, athletes highly value social support and seek it out from friends,  
356 family members, coaches, teammates, and SHPs (for a review, see Griffin et al., in press). One  
357 recommendation to emerge from research on social support and sport injury is to keep athletes  
358 involved with their sport during injury rehabilitation. Such involvement is thought to enhance the  
359 athletes' motivation to pursue rehabilitation vigorously, prevent athletes from becoming isolated,  
360 help athletes stay connected with potential sources of social support, ensure that athletes feel valued,  
361 maintain athletes' sense of belonging, and assist athletes in staying apprised of team techniques and



362 strategies (Bianco, 2020). Although issued with caveats, such as cautions against keeping athletes  
363 involved with their team when doing so is distressing or filled with activities that are not meaningful  
364 (Bianco, 2007), the recommendation has become “conventional wisdom” in some constituencies.  
365 Indeed, keeping athletes involved with their team is listed on the most widely used questionnaire for  
366 assessing the use of psychological techniques in athletic training (Larson et al., 1996) and  
367 physiotherapy (Hemmings & Povey, 2002). Ultimately, however, both the recommendation and the  
368 caveats lack an evidentiary basis, as there have been no experimental, quasi-experimental, cross-  
369 sectional, or retrospective studies in which athletes who stayed involved with their team during  
370 rehabilitation were compared with athletes who did not on relevant psychological responses,  
371 rehabilitation processes, and/or rehabilitation outcomes. Clearly, extensive further research is  
372 needed before reaching the valley of death on this issue. Such inquiry could include examination of  
373 other potential situations in which keeping athletes involved with their team is contraindicated, such  
374 as when doing so would be temporally burdensome or go against team or sport culture, or simply be  
375 against the wishes of the athletes.

376         Largely predicated on its potential for influencing recovery outcome (sparse empirical  
377 support notwithstanding), rehabilitation adherence is considered integral to athletes’ successful  
378 recovery from injury (Brewer, 2017). Despite the reported challenges of measuring rehabilitation  
379 adherence (e.g., self-report versus objective assessment, clinic-based versus home-based activities),  
380 a variety of factors grounded in an array of different theoretical frameworks have been associated  
381 with, or predictive of, adherence to rehabilitation programs—including sociodemographic,  
382 social/contextual, and psychological factors (e.g., Brewer et al., 2003; Brewer & Redmond, 2017;  
383 Levy et al., 2008). This research points to the potential for a whole host of strategies to positively  
384 influence athletes’ rehabilitation adherence, including, not surprisingly, goal-setting. Given that  
385 goal-setting has the potential to influence a number of factors associated with adherence (e.g., self-

386 motivation, perceptions of control and autonomy) and is commonly used by athletic trainers and  
387 physiotherapists as part of their treatment regimens (Ninedek & Kolt, 2000; Stiller-Ostrowski &  
388 Hamson-Utley, 2010), one could be forgiven for thinking that goal-setting interventions have not  
389 only reached but successfully crossed the valley of death. To date, however, only two  
390 experimentally-controlled studies have reported the effects of goal-setting on adherence (Evans &  
391 Hardy, 2002; Penpraze & Mutrie, 1999), with two additional nonexperimental studies providing  
392 some additional tangential support for its beneficial effects (Evans et al., 2000; Shapiro & Etzel,  
393 2018). How has goal-setting achieved widespread implementation in the rehabilitation of sport  
394 injuries without the empirical evidence needed to cross the valley of death? It appears that the  
395 intervention took a shortcut *around* rather than *across* the valley. Because goal-setting in sport  
396 injury rehabilitation has its modern origins in the Problem-Oriented Medical Record and the SOAP  
397 (subjective, objective, assessment plan) note approach to documenting patient care (Weed, 1968), its  
398 vast application cannot be attributed to research findings in sport injury psychology.

399         So what of the psychology of sport injury research? Unfortunately, the limited research base  
400 on the effects of goal-setting on sport injury rehabilitation adherence falls short of providing  
401 evidence that can be readily translated into practice and tells us little about what type of goals  
402 should be used, when, in what ways, and to what effect, let alone the mechanisms through which  
403 they might exert these effects. As a result, practical application of the current findings has as much  
404 potential to result in the use of goals that have adverse, as opposed to beneficial, effects, in trying to  
405 foster adherence and favourable recovery outcomes.

406         In general, a stronger evidence base is required, initially for the efficacy and subsequently  
407 the effectiveness, of intervention strategies (including goal-setting), on psychological responses to  
408 injury, rehabilitation processes (e.g., adherence), and rehabilitation outcomes, such that they can be  
409 readily applied by SHPs (and by athletes themselves) in rehabilitation environments as part of their

410 existing treatment and rehabilitation regimens. This recommendation is grounded in SHPs being the  
411 main delivery mechanism in most, if not all, injury rehabilitation environments (the possible  
412 exception being elite and professional sport, where sport psychologists may also be part of the  
413 rehabilitation team). Interventions need to be designed to: (a) meet the highest possible standards of  
414 methodological rigor; (b) use a participatory approach that is responsive to constituent needs, and  
415 environmental demands; (c) explore alternative approaches to intervention design and delivery (e.g.,  
416 brief and single-session interventions, remote internet-based interventions); and, (d) have SHPs at  
417 the forefront of intervention delivery such that intervention strategies are readily adaptable and  
418 useable as part of their current treatment and practice protocols.

419         Based on the existing evidence base, some strategies are clearly more intervention  
420 effectiveness-ready than others (e.g., goal-setting vis-à-vis social support). Although there are a  
421 number of empirical studies and reviews that can guide researchers in the design and  
422 implementation of interventions that examine the *efficacy* of different strategies on variables of  
423 interest (see Ledingham et al., 2020 and Schwab Reese et al., 2012), there are comparatively fewer  
424 studies that can guide researchers in exploring postinjury intervention *effectiveness*. In one such  
425 study (Brewer et al., 2021), the effectiveness of a cognitive-behavioral multimedia intervention with  
426 patients undergoing ACL surgery and rehabilitation was examined. The interactive multimedia  
427 intervention, which included educational information (in text, video, and graphic formats), patient  
428 stories, practical tips, and several psychological interventions (e.g., relaxation and guided imagery,  
429 goal setting, modelling), formed the basis of a cost- and time-effective adjunct to ACL health care  
430 provision before and after ACL surgery. Results indicated that compared to participants who  
431 received standard care, participants who received the multimedia program reported greater  
432 preoperative confidence in their ability to cope, lower postoperative pain and kinesiophobia, and  
433 greater use and perceived utility of patient education materials. The findings supported the promise

434 of a multimedia intervention “as an economical and effective means of educating and delivering  
435 psychological interventions to people experiencing ACL surgery and rehabilitation” (p.18), which  
436 could be extrapolated to other injured populations and contexts. The multimedia content is  
437 accessible online in its entirety at [www.supportforsport.org/ACL/index.html](http://www.supportforsport.org/ACL/index.html). Future effectiveness  
438 research should look to build on research such as this to advance the evidentiary intervention  
439 efficacy and effectiveness base to reduce the existing research-practice gap.

#### 440 **Return to Sport after Injury Rehabilitation**

441 Determining athletes’ readiness to return to sport upon completion of injury rehabilitation  
442 has been conceptualized as a process that includes consideration of their health status, the risks  
443 associated with their participation in sport, and situational/contextual factors that may influence  
444 tolerance of the risks involved in returning to sport (Ardern et al., 2016; Creighton et al., 2010).  
445 With psychological states deemed part of athletes’ health status (Creighton et al., 2010) and among  
446 the factors thought to affect the level of risk associated with returning to sport (Ardern et al., 2016),  
447 the topic of psychological readiness to return to sport after injury rehabilitation has attracted  
448 substantial interest from investigators over the past 20 years. The logical targets for application  
449 pertaining to this topic are development of protocol to assess psychological readiness to return to  
450 sport and, subsequently, interventions to enhance psychological readiness to return to sport and,  
451 presumably, return-to-sport outcomes.

452 Although various self-report inventories purported to assess psychological readiness to  
453 return to sport (and related constructs) are available (for summaries, see Barber-Westin & Noyes,  
454 2019; Brewer & Redmond, 2017), this area of inquiry is far from reaching the valley of death for  
455 several main reasons. First, there is no consensus as to what psychological states constitute  
456 readiness to return to sport. Confidence and/or (a lack of) anxiety are the factors assessed most  
457 frequently in measures of psychological readiness to return to sport (Brewer & Redmond, 2017), but

458 there is evidence that attentional (Christakou et al., 2012), motivational (Podlog et al., 2015), and  
459 cognitive (Podlog et al., 2015) factors may also figure prominently in being psychologically ready  
460 to return to sport. Second, extant measures of psychological readiness to return to sport after injury  
461 rely on self-report. Given that there are potential motives for athletes to conceal a lack of  
462 psychological readiness to return to sport (e.g., financial incentives, perceived pressure from coach,  
463 perceived obligation to team/teammates), readiness assessment protocols need to include aspects  
464 that are less susceptible to deception than self-report (Brewer & Redmond, 2017; Forsdyke et al.,  
465 2017). Third, none of the measures of psychological readiness to return to sport after injury have  
466 been validated to the extent that scores corresponding to insufficient readiness to return to sport  
467 have been determined. Only once the probabilities of achieving various return-to-sport outcomes  
468 given specific scores on psychological readiness to return to sport inventories are known can  
469 evidence-based decisions be made on the basis of psychological readiness assessment protocols.  
470 Further, only after these obstacles to reaching the valley of death have been resolved can a potential  
471 attempt to cross the valley of death be considered.

#### 472 **Conclusion**

473 The scientific and public health responses to the recent global Covid-19 pandemic has  
474 illustrated very starkly how in extraordinary circumstances and with extensive motivation and  
475 investment of monetary and human resources, research can be translated into practice and the  
476 research-practice gap can be quickly closed to cross the valley of death. This is, however, clearly the  
477 exception, not the rule. The reality is that in most domains of healthcare research and application  
478 contexts, even those involving interventions to treat potentially fatal conditions, the time required to  
479 translate research into practice can be measured in decades rather than months or years (Morris et  
480 al., 2011). The situation is further compounded in the traditional mode of communicating research  
481 findings, by publication lag, which even in the context of the current paper will be close to 18

482 months from submission to publication. Consequently, along with intentionality and diligence,  
483 patience will be needed to bring applications from sport injury psychology to and across the valley  
484 of death. Such efforts, which include demonstrating the efficacy, efficiency, and effectiveness of  
485 interventions and protocols/assessments, tailoring applications to the environments where they will  
486 be implemented, and adopting proactive approaches to implementation, have the potential to enable  
487 professionals in multiple fields to better serve the athletes with whom they work. Collectively, the  
488 focussed efforts of researchers, stakeholders and practice communities could therefore help reduce  
489 the adverse effect of psychosocial factors on the occurrence of, and athletes' subsequent responses  
490 to injury, helping to further harness the benefits of sport and physical activity for all involved.

491

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