Theoretical Integration and the Psychology of Sport Injury Prevention

Derwin King-Chung Chan

University of Nottingham, UK

Martin S. Hagger

Curtin University, Australia

Author Note

Derwin K.-C. Chan, Personality, Social Psychology, and Health Research Group, School of Psychology, University of Nottingham, Nottingham, UK; Martin S. Hagger, School of Psychology and Speech Pathology, Curtin University, Perth, Australia.

Correspondence concerning this article should be addressed to Derwin K.-C. Chan, Personality, Social Psychology, and Health Research Group, School of Psychology, University of Nottingham, University Park, Nottingham, Nottinghamshire, NG7 2RD, United Kingdom, email: lpjdkcc@nottingham.ac.uk or kc.derwin@gmail.com, tel +44 07531626672 fax +44 115 9515324

Abstract

Integrating different theories of motivation to facilitate or predict behavior change has received an increasing amount of attention within the health, sport, and exercise science literature. A recent review article in *Sports Medicine*, by Keats, Emery, and Finch presented an integrated model using two prominent theories in social psychology, self-determination theory (SDT) and the theory of planned behavior (TPB), aimed at explaining and enhancing athletes' adherence to sport injury prevention. While echoing their optimistic views about the utility of these two theories to explain adherence in this area and the virtues of theoretical integration, we would like to seize this opportunity to clarify several conceptual principles arising from the authors' integration of the theories. Clarifying the theoretical assumptions and explaining precisely how theoretical integration works is crucial not only for improving the comprehensiveness of the integrated framework for predicting injury prevention behaviors, but also to aid the design of effective intervention strategies targeting behavioral adherence. In this article, we use the integration of SDT and TPB as an example to demonstrate how theoretical integration can advance the understanding of injury prevention behavior in sport.

Keywords: autonomous motivation; attitude; subjective norm; perceived behavioral control; adherence; injured athletes; safety violation

1. Introduction

The growing number of psychological theories and models applied to the promotion of health related-behavior has increased the complexity and sophistication of theory-based behavior-change interventions in the last decade.^[1-5] The innovative review paper by Keats, Emery, and Finch^[6] has extended this trend to the context of sport injury prevention. In their paper, Keats and co-workers attempted to bring together the variables from the self-determination theory (SDT)^[7, 8] and the theory of planned behavior (TPB)^[9, 10] to explain athletes' adherence to sport injury prevention behavior (e.g., neuromuscular training). We appreciate the authors' creativity and efforts in this regard because such theoretical development has the potential to enhance the comprehensiveness and predictive power of psychological models aimed at explaining the processes underpinning sport injury prevention, a relatively new area of research.^[11] Nevertheless, theoretical integration is not simply a mixture of psychological variables from multiple theories, rather, it is a systematic and evidence-based process that aims to highlight the essential psychological variables and mechanisms of predicting and explaining health behaviors^[1, 5], so we feel that some clarification is needed regarding the basis of their approach as potential questions concerning the utility of theoretical integration may be raised. In this article we aim to highlight that evidence-based theoretical integration can offer a comprehensive and effective model to help explain sport injury prevention. Consistent with the theoretical framework adopted by Keats and colleagues^[6], we use the integration of SDT^[7, 8] and TPB^[9, 10] to illustrate our ideas.

2. Rationale for Theoretical Integration

A number of social psychological theories have been applied to explaining the complex processes involved in health-related behavior^[3, 4]. SDT^[7, 8] and the TPB^[9, 10] have been prominent in the health-related literature and research applying these theories has demonstrated that they are each effective in explaining unique variance in health behaviors,

particularly physical activity.^[12-14] Although the psychological antecedents of sport injury presents a comparatively new area of research, researchers and practitioners may benefit from the application of these well-evidenced theoretical approaches to delineate the psychological factors related to injury reduction and prevention.^[11, 15, 16]

A recent trend in the literature on the application of social psychological theories to predict and explain health behavior is the adoption of an integrated approach that involves the adoption of multiple theories that provide complementary explanations of behavior.^[1-4, 17] A recent report also documents an intervention study (iPlay)^[18] that applies both the TPB and social learning theory^[19] to prevent sport injury among primary school students, thus showing that the trend has been extended to sport injury prevention. A key reason for adopting an integrated, multi-theory approach is that research frequently demonstrates that a substantial amount of the variance in health behavior remains unexplained by single-theory approaches.^[20, 21] Furthermore, the predictive ability of the theories has been found to be attenuated when past behavior is taken into account.^[12] The inclusion of variables from multiple theories tends to offer a solution to these shortcomings. Research adopting multi-theory approaches often leads to better prediction, in terms of variance explained, of health behavior but, most importantly, demonstrates how one theory may assist in addressing the shortcomings of another and reveal a more effective and comprehensive explanation of the processes that lead to health behavior. Given the success of such integrated approaches in the prediction of health-related behavior and the complexity of the interacting effects between external and internal factors on sport injury prevention^[11], the adoption of an integrated approach may also be useful for the prediction of sport related injury prevention.^[22-24]

Despite the advantages of theoretical integration, it is important to note that theoretical integration must be performed systematically; researchers aiming to use theoretical integration need to pay keen attention to remaining true to the hypotheses of the component

theories and to base their integration on evidence and logical derivation. Simply combining the concepts of from different theories presents an element of risk of including overlapping constructs or potential dissonance between the constructs from the component theories.^[1] It is important that researchers and practitioners fully articulate the theoretical assumptions and evidence for the integration of theories so that the integrated model offers a more precise and complete understanding of the motivational process of the health behavior.^[1, 23] This is one of the key prerequisites for successful theoretical integration.^[1, 5] The integration of SDT and TPB in the context of sport injury prevention is no exception and it is important that the precise processes for integration are clearly delineated as part of the conceptual development of the integrated model.

3. The Integration of SDT and TPB

Hagger and coworkers^[25-27] have established a strong theoretical foundation to support the theoretical integration of SDT and the TPB in health-related contexts based on their theoretical reviews and supporting empirical tests. They have provided a clear rationale for their integrated model with due consideration paid to the assumptions, limitations, and strengths of the component theories and their integration. In the next sections we outline the important tenets of the component theories, the shortcomings and limitations of the theories, the rationale for integration based on overcoming the limitations, and how such an integrated model would be effective in explaining sport injury prevention.

3.1 Self-Determination Theory

Self-determination theory^[7] is recognized as a leading approach for the explanation of motivated behavior in health-related contexts, including sport injury^[28, 29], and has demonstrated efficacy in identifying the motivational factors that underpin social behavior and how social factors in the environment (e.g., support for self-determined motivation by

significant social agents) may give rise to these factors. However, SDT has been proposed to be limited in two ways.^[26] First, the theory does not explicitly illustrate the proximal effect of some important belief-based social cognitive factors like the impressions, social norm, and controllability of the behavior perceived by the individuals.^[25, 26, 30] Second, action plans and commitment play a major role on the actual execution of future behaviors^[31], but these processes have not been specifically addressed in SDT. Although the original outline of SDT made reference to social cognitive factors as mediators of the effects of self-determined motivation and support for self-determined motivation on intention and behavior, these specific processes have not been formally outlined within the theory nor have they been tested empirically within the framework of SDT.

3.2 The Theory of Planned Behavior

The TPB, on the other hand is explicit in identifying and explaining the processes by which key belief-based social cognitive variables like attitudes, subjective norms, and perceptions of control, influence intentions to perform a given behavior in the future and actual behavior. In particular, according to the TPB^[9, 10], intention (the effort one plans to invest toward engaging in a particular behavior in the future) is regarded as the most proximal predictor of future behavior, but it is also proposed to be a function of three belief-based factors: attitudes (subjective evaluations of the behavior), subjective norms (perceived social appropriateness of the behavior), and perceived behavioral control (PBC; confidence and ability toward engaging in the behavior). However, a limitation of the TPB highlighted in previous research^[26] is that, the origins (i.e., social and psychological antecedents) of attitude, subjective norm, and PBC are not clearly detailed within the TPB framework.^[32]

3.3 The Basis of the Theoretical Integration

Integrating constructs from both theories may combine the strengths and compensate for the weaknesses of both theories. However, the integrated model does not posit that all of these variables form direct relationships with behavior. Hagger and colleagues hypothesized a nested hierarchical relationship between the SDT constructs and the TPB variables.^[25-27] In particular, it was hypothesized in the integrated model that self-determined forms of motivation from SDT act as distal factors that exert their effects on behavior through the mediation of the proximal factors from the TPB (i.e., attitude, subjective norm, PBC, and intention; see Figure 1). In other words, the integration formalizes the hypotheses of SDT with respect to the pathways by which self-determined motivation impacts beliefs regarding future behavioral engagement, and utilizes the TPB to make the role of the social cognitive mediators explicit in the relationship between self-determined motivation and intentional behavior. Such motivational consequences may improve the comprehensiveness and precision of the prediction by charting the exact pattern of effects involved in the relationships between variables from SDT and the TPB. However, the utility of the proposed integrated model to explain behavior in a specific context (e.g., sport injury prevention) will require further research to be validated.

4. Evidence for the Theoretical Integration

While there is a dearth of research testing integrated models of SDT and the TPB, and also other psychological and behavioral theories and models,^[11] in sport injury prevention, there is a considerable amount of evidence supporting the utility of each theory individually in predicting behavior in other health contexts areas such as sport injury rehabilitation and such research might pave the way for the adoption of integrated approaches. For example, SDT and the TPB have been independently applied to predicting and understanding rehabilitation adherence, the pivotal behavioral outcome in the prevention of re-injury in sport.^[33] Studies of recreational and professional athletes have illustrated that self-determined

motivation is positively correlated with adherence to home-based physiotherapy^[29], intentions to attend rehabilitation sessions^[28], and adherence to the prevention of sport injuries.^[34]

Similarly, a few studies have provided supporting evidence for the application of the TPB to explain individuals' behavior in safety and injury prevention in sport. For instance, attitude, subjective norm, and PBC have been shown to exert positive effects on intentions to wear safety gear among skaters^[35], and the future behavioral adherence to using cycling-helmets^[36-38]. A recent study among female junior netball players found that their intention to learn correct safe landing techniques could be significantly predicted by attitude and subjective norm.^[39]

Despite evidence from a single theoretical perspective, the potential efficacy of developing and applying an integrated model, based on the premises of SDT and the TPB, in a sport injury prevention context has been informed by corresponding research in other health contexts. In particular, Hagger and Chatzisarantis^[25] meta-analyzed the results of 37 studies that integrated these theories in various health-related contexts, including exercise, dieting, breast-feeding, and condom-use. Results showed that self-determined motivation from the SDT exerted significant effects on attitude, subjective norm, PBC, and intention from the TPB. Furthermore, the relationship between self-determined motivation and intention was fully mediated by attitude, subjective norm, and PBC.^[25] Cross-cultural studies have also supported the generalizability of the pattern of effects in integrated SDT and TPB models in data from numerous national groups.^[40, 41]

The integrated model has also received preliminary support within injury prevention contexts, including elite sport^[22] and occupational^[24] contexts. For example, a cross-sectional study on police officers revealed that the positive effect of self-determined motivation on intention for injury prevention was fully mediated by attitude, subjective norm, and PBC as hypothesized.^[24] The motivational effects were confirmed in a follow-up study among

professional athletes.^[22] Overall, research adopting integrated SDT and TPB models support the proposed pattern of effects from many health-related contexts, and the recent cross-sectional studies by Chan and associates^[22, 24, 28] suggest that the model appears to be promising in the explanation of sport injury prevention.

5. From Theory to Practice

The theoretical evidence is important to theorists as it provides useful information on the psychological processes leading to motivated behavior in health contexts.^[2, 3, 5] It is also very meaningful to sport practitioners^[3, 4], particularly for promoting compliance to safety or injury prevention behaviors in sport and exercise^[11, 42]. For instance, a careful theoretical integration may verify, unify and simplify concepts from multiple theories to avoid excessive, contradictory, or non-evidence based information being delivered to sport practitioners. Thus, the model could be very useful in informing coaching practice through the development of intervention strategies to foster athletes' adaptive motivation and beliefs with respect to injury prevention, and, in turn, affect behavioral adherence. An evidence-based theoretical integration approach like the integrated model of the SDT and the TPB, therefore, may inform the application of intervention mapping^[3, 4, 43] in sport injury prevention. The mapping process aims to systematically identify the determinants of health behaviors and the associated techniques that will change these determinants from multiple theories to produce interventions that are most effective on changing behavior.^[44]

In particular, integrated models are advantageous in helping the development of more effective interventions by providing numerous pathways and strategies that are likely to have effects on intentions and behavior.^[45-48] In the integrated model of SDT and TPB, interventions that target change in the constructs from both theories that have been shown in empirical research to have significant direct or indirect effects on intentions to engage in sport

injury prevention behaviors are more likely to be met with success. Clearly, the cross-sectional research using the integrated approach has identified pervasive effects of self-determined forms of motivation from SDT and attitudes and perceived behavioral control from TPB on injury prevention intentions and behavior.^[22, 24] This means that hybrid interventions with strategies that promote autonomous motivation (e.g., autonomy supportive behaviors by the coach or physiotherapist), attitudes (e.g., promoting the advantages of doing the behaviors important to the sample), and perceived behavioral control (e.g., providing experiences of success with rehabilitation exercises and helping overcome barriers) in a single intervention will lead to changes in all of the variables linked to intention change. In accordance with the integrated model, changes in these variables as a result of the interventions will have a knock-on effect in increasing intentions to engage in injury preventive behaviors in the future and, as a consequence, a concomitant change in the target behavior.

A 'hybrid' intervention would include components targeting constructs from both behavioral-change theories (SDT and TPB) which would act in modifying behavior through the differing motivational processes. Furthermore, the techniques to change the variables from each component theory are quite different. SDT intervention techniques to promote autonomous motivation usually involve the style of presentation and language chosen by social agents involved in helping athletes prevent injury (e.g., coaches, trainers, physiotherapists). Such agents would use techniques such as avoiding controlling language (words like 'should' or 'must') when describing preventive techniques (e.g., safe landing), offering athletes with opportunities for choice and to ask questions, providing a clear and unambiguous rationale related to personally-held values, and providing competence-related feedback.^[49] In contrast, TPB interventions usually involve the provision of content that targets salient personal (attitudes) and control-related (perceive behavioral control) beliefs

about the behaviors and actions surrounding injury prevention. This would involve information targeting the advantages of performing the behavior (e.g., not get injured, recover quicker) and how it can be done effectively (e.g., demonstrating technique, dispelling barriers). The techniques can be integrated in a single intervention by presenting the belief-related information in conjunction with the SDT techniques like choice and rationale. This has been successfully achieved in previous interventions in a physical activity context^[50]. However, it is important that such hybrid interventions are implemented in a sport injury prevention context, particularly using fully-factorial, randomized controlled designs so that the efficacy of the intervention arm using the hybrid approach is found to be effective in changing behavior than the effects of the intervention arms using techniques from each component theory alone.

A word of caution should be offered when applying the integrated model to inform practice because the cross-sectional evidence (or findings from case-control studies) means that we are unable to draw definite conclusions with respect to the causal effects and temporal sequence of the variables within the integrated model.^[51, 52] Adopting longitudinal designs (e.g., a cross-lagged panel design or a cohort study), and experimental designs (e.g., randomized controlled trials) manipulating each of the variables within the integrated model are possible solutions for testing these causal and temporal effects, but they will present real challenges for the future research.^[47] Longitudinal research is challenging because of the need to collect data at multiple time points from the same participants without a prohibitively large attrition rate; experimental research is difficult given the need to carefully manipulate the target variables while holding other variables constant and collecting data from sufficient control groups while bearing in mind potential artifacts of error such as non-compliance^[5], intervention fidelity^[53], mere-measurement effects^[54], and a number of personal (e.g., injury history, sensation seeking, and personality) and external (e.g., injury risk, safety resources,

and the effectiveness of intervention delivery) confounding factors of injury prevention behaviors. Last but not the least, evidence gathered from elite athlete samples might limit our ability to generalize the integrated model to recreational-level athletes, so researchers and practitioners should be aware of the competitive level and sporting context of the participants when utilizing the model for future research or developing interventions.

6. Conclusions

The integration of multiple theoretical concepts into a unified model presents a new research horizon for sport scientists to provide a comprehensive explanation of the process by which personal, social, and environmental factors of athletes' behaviors contribute to the reduction of sport injury. Using an integrated model of SDT and the TPB, we have demonstrated that theoretical integration may provide more comprehensive explanations of behavior in sport injury prevention contexts by addressing the shortcomings or gaps in the research that adopts either of the theories alone. Such an endeavor is also promising in the development of effective theory-based interventions delivered by significant others such as coaches and physiotherapists that will lead to successful adherence to sport injury prevention behaviors. We hope our analysis will have raised researchers' and practitioners' awareness of the benefits of adopting integrated theoretical approaches in the context of sport injury prevention. We also hope researchers will be inspired to adopt integrated approaches in their research and approach this endeavor with critical but open mindsets toward a vision of a more comprehensive understanding of athletes' adherence to injury prevention behaviors.

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Figure Legends

Figure 1. The integrated model of the self-determination theory and the theory of planned behavior.