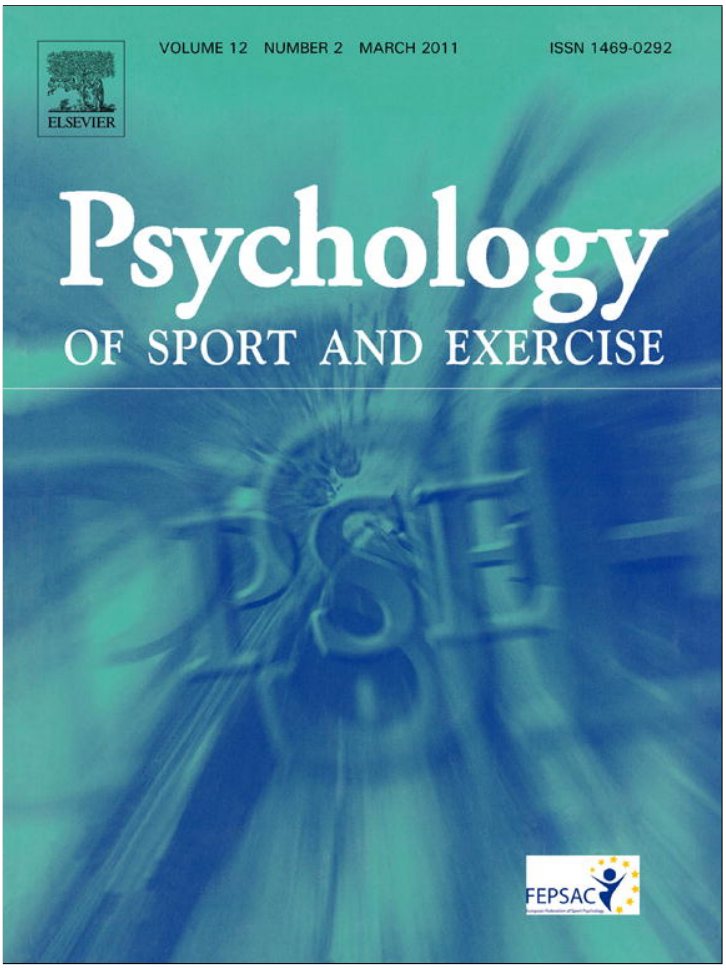

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Treatment motivation for rehabilitation after a sport injury: Application of the trans-contextual model

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ABSTRACT

Objectives: Two studies employed the trans-contextual model (TCM) to understand the relationships between sport motivation, treatment motivation, and autonomy support. Study 1 tested TCM among recreational athletes, while Study 2 examined the effects of causality orientations and autonomy support from coaches in the TCM among professional athletes.
Methods: In Study 1, recreational athletes ($N = 115$) with ruptured anterior cruciate ligaments completed questionnaires measuring sport motivation, autonomy support from physiotherapists, and treatment motivation for injury rehabilitation. In Study 2, professional athletes ($N = 206$) with experiences of moderate to severe sport injury completed questionnaires assessing sport motivation, general causality orientation, autonomy support from coaches and physiotherapists, and treatment motivation and treatment intention based on a hypothetical injury scenario.
Results: In Study 1, autonomous sport motivation and controlled sport motivation formed positive associations with autonomous and controlled treatment motivation, when controlling for the effect of autonomy support from physiotherapists. In Study 2, the relationship between sport motivation and treatment motivation corroborated findings of Study 1. In addition, autonomy orientation formed positive associations with autonomous sport and treatment motivation and autonomy support from coaches and physiotherapists. Controlled orientation positively predicted controlled sport and treatment motivation. Autonomy support from physiotherapists, instead of that from coaches, positively predicted autonomous treatment motivation.
Conclusion: The TCM is effective in explaining the transfer of motivation between sport and treatment contexts. Athletes with higher autonomous motivation in sport may be more likely to be autonomously motivated in their rehabilitation when injured.

Sport injury (e.g., musculoskeletal and soft tissue injuries) appears to be a fact of life that frequently occurs in sport participants of all levels of expertise (Conn, Annest, & Gilchrist, 2003; Schneider, Seither, Tonges, & Schmitt, 2006). Such injuries not only lead to time-out from sport but also increase the likelihood of re-injury (Knowles et al., 2006). Proper rehabilitation therefore is essential to enhance recovery and prevent further injury. However, not all sport participants with injuries completely adhere to prescribed treatment by rehabilitation specialists such as physiotherapists and sport injury experts. Poor treatment adherence and dropout from treatment protocols among sports participants who require clinic-based or home-based physical therapy have often been reported (Bassett & Prapavessis, 2007; Sluijs, Kok, & van der Zee, 1993). While an increasing amount of evidence suggests that motivation to undertake rehabilitation is a critical factor to determine the treatment adherence of outpatients (Chan, Lonsdale, Ho, Yung, & Chan, 2009; Hagger, Chatzisarantis, Griffin, & Thatcher, 2005; Ryan, Patrick, Deci, & Williams, 2008; Williams, 2002), very few studies have examined the motivational factors in the context in which the injury has taken place. Therefore, the current study aims to apply a theory-based integrated model of motivation, the trans-contextual model (Hagger, Chatzisarantis, Barkoukis, Wang, &

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Baranowski, 2005), to examine the relationships between sport motivation, treatment motivation, and treatment adherence.

The trans-contextual model

The trans-contextual model (TCM) is an integrated social cognitive and motivational theory that explains the transfer of motivation from one context (e.g., physical education (PE) context) to another (related) context (e.g., leisure-time physical activity Chatzisarantis & Hagger, 2009; Hagger, Chatzisarantis, Barkoukis, et al., 2005; Hagger, Chatzisarantis, Culverhouse, & Biddle, 2003; Hagger, Chatzisarantis, Griffin, et al., 2005). It is fundamentally based on a contemporary theory of motivation, *self-determination theory* (SDT; Deci & Ryan, 1985a, 1985b), which posits that humans' behaviour is governed by the reasons individuals assign to actions. These reasons are known as motives, or *behavioural regulations*. When an action is executed because it is felt as self-initiated, personally important, and coherent with one's deeply-rooted values, according to SDT, the action is regulated by self-determined or *autonomous* motivation. In contrast, SDT also identifies non-self-determined or *controlling* forms of motivation which are generally characterized by performing behaviours for reasons perceived as external to the individual. Individuals who cite these kinds of reasons for acting feel coerced or pressured by interpersonal or intrapsychic forces to act. Autonomous motivation is important because it is linked to optimal self-regulation of behaviour (Hagger, 2010, in press; Hall & Fong, in press). Individuals with high autonomous motivation toward a particular behaviour or activity are more likely to evidence adaptive behavioural responses (e.g., persistence) and psychological well-being as it is coherent with humans' active nature and the tendency toward growth and development (Deci & Ryan, 1985b; Ryan & Connell, 1989). This is very important for those interested in promoting individuals to persist with behaviour and supporting self-regulation in the absence of persuasion or external contingencies (e.g., Chatzisarantis, Hagger, Smith, & Phoenix, 2004; Hagger, Wood, Stiff, & Chatzisarantis, 2009, 2010; Orbell, 2004; Orbell & Hagger, 2006), such as coaches and physiotherapists trying to get their athletes to adhere to treatment and promote their return to sport.

The primary hypothesis of TCM is that the perceived autonomy support from a significant social agent (e.g., a PE teacher) exerts an influence on an individual's autonomous motivation in one context, but also indirectly on the autonomous motivation in another related context (Hagger & Chatzisarantis, 2009b; Hagger, Chatzisarantis, Barkoukis, et al., 2005; Hagger, Chatzisarantis, et al., 2003). This trans-contextual influence of perceived autonomy support is established by the association between autonomous motivation toward two closely-related actions, or a single behaviour, in the two contexts. The TCM received initial support in research among high school PE students in the UK (Hagger, Chatzisarantis, et al., 2003), confirming the associations between autonomy support from the PE teacher, students' autonomous motivation in PE and autonomous motivation in leisure-time physical activity. Recently, further evidence in PE from Singapore, Estonia, Hungary, Finland, and Greece supports the robustness of the TCM across different countries from diverse cultures (Hagger, Chatzisarantis, Barkoukis, et al., 2005; Hagger, et al., 2009). The model has been replicated in sport and physical education contexts (Barkoukis & Hagger, 2009; Barkoukis, Hagger, Lambropoulos, & Torbatzoudis, in press; Pihu, Hein, Koka, & Hagger, 2008; Wallhead, Hagger, & Smith, in press), including laboratories independent of the original researchers (Mata et al., 2009; Shen, McCaughtry, & Martin, 2007, 2008). The cross-cultural validity of the TCM and other strong supporting evidence leads us to speculate that the principles of TCM apply in other related areas. We speculate that the TCM may also be applicable in explaining the relationship between sport motivation and treatment motivation for sport injury.

Operationalization of the TCM

The TCM is not applicable only to PE and leisure-time physical activity contexts, but also to others such as rehabilitation of sport injury, and the reasons can be revealed by understanding the mechanism behind the model. According to Hagger, Chatzisarantis, et al. (2003), the trans-contextual process of motivation is derived from the *hierarchical model of motivation* proposed by Vallerand (1997, 2000). Vallerand's model proposed that motivational dynamics are represented within individuals at three inter-connected levels of generality: global, contextual, and specific. The connections between these three levels provide explanations for the mechanisms underlying the transfer of motivation between two contexts (Hagger, Chatzisarantis, Barkoukis, et al., 2005; Hagger, Chatzisarantis, et al., 2003).

Motivation at the specific level refers to the motivation toward a specific behaviour in a given context and time. For instance, if an individual exercises for the enjoyment of physical activity, it is quite likely that the exercise behaviour of this individual is driven by autonomous motivation from time to time (i.e., when physically injured). However, exercise, to him/her, may be decomposed into many sub-components, such as warm-up, strength training, and recovery, in which the motivation for these sub-components is also likely to be autonomous. In that sense, if effective rehabilitation after sport injury is considered as a way to continue doing sport in the future, the association of motivational constructs between sport and rehabilitation may be established because treatment behaviour is considered a sub-component of physical activity, and so the motivational constructs in both contexts are likely account for the formation of treatment intention in the TCM.

Motivation at the contextual level refers to how people regulate behaviour in a given context, so it is heavily influenced by perceptions of autonomy support in that context. Thus, the transfer of motivation could be instigated by significant others who exert consistent autonomy support in both contexts in the TCM. In other words, if a sport participant perceives significant social agents in the sport environment (e.g., coaches, trainers) are autonomy supportive, not only are they likely to have high levels of autonomous motivation toward their sport, but they are also likely to have high autonomous motivation in a related context such as rehabilitation from injury. This is clearly adaptive as autonomous motivation in a rehabilitation context will likely assist injury recovery and prevention and facilitate continued participation in sport, a context in which the athlete gains satisfaction and enjoyment. This effect would be independent of the effect of autonomy support from significant others in the rehabilitation context. Apart from these possibilities, the link between motivation in sport and rehabilitation contexts can also derive from motivation at the global level.

The apex of Vallerand's hierarchical model represents the *global level* of motivational determinants, which reflects individuals' generalized disposition to behave or perceive actions and environments as autonomous across a number of contexts (Hagger, 2009; Hagger, Biddle, Chow, Stambulova, & Kavussanu, 2003). Motivation at this global level is consistent with the generalized trait characteristic proposed by SDT (Deci & Ryan, 1985a) known as *general causality orientations*. According to Deci and Ryan (1991), individuals who rate autonomy orientation highly have a tendency to adopt self-determined reasons for action and behave according to their personal goals and interests. Individuals who rate controlled orientation highly are prone to adopting non-self-determined reasons for action and tend to behave because they feel obliged to or

due to external demands (e.g., salary, deadlines). As a result, these orientations exert dispositional and distal influences on self-determined motivation in different contexts. Such motivational orientations affect motivation at the contextual level for a number of different behaviours. As suggested in the previous section, causality orientation may also influence people's autonomous motivation (Deci & Ryan, 1991). Therefore, an autonomous causality-oriented athlete who perceives his/her coach to be autonomy supportive, may also be likely to perceive his/her physiotherapist to be autonomy supportive when injured, resulting in the adoption of similar self-determined motivation in sport and rehabilitation contexts.

Research on treatment motivation

Research findings in previous studies are consistent with the TCM in the view that autonomy support and autonomous motivation are strongly linked to treatment adherence in a number of health care contexts, such as smoking cessation programs (Williams et al., 2006), treatment of chest pain (Williams, Gagné, Mushlin, & Deci, 2005), drug-addiction (Zeldman, Ryan, & Fiscella, 2004), weight management (Williams, Grow, Freedman, Ryan, & Deci, 1996), rehabilitation for cancer survivors (Milne, Wallman, Guilfoyle, Gordon, & Courneya, 2008), and exercise programs for heart disease patients (D'Angelo, Reid, & Pelletier, 2007). A recent study by Chan et al. (2009) also yielded consistent findings in the context of home-based physiotherapy treatment among sport-injured patients. The results suggested that when patients perceived their physiotherapists to be autonomy supportive they were autonomously motivated with respect to their rehabilitation and were more likely to adhere to their treatment. However, these studies only investigated the influence of autonomy support and motivation within a single context. No attempt has been made to test the influence of autonomy support and motivation from another context related to treatment adherence.

Nevertheless, a few studies have examined the influence of patient's causality orientation on treatment motivation. Autonomy orientation has been positively linked to autonomous treatment motivation of overweight patients (Williams et al., 1996), and completion of treatment among chest pain patients (Williams, Gagné, et al., 2005). However, these studies did not formally examine the nested relationships between causality orientation, perception of autonomy support, and treatment motivation.

The present study

In summary, the current literature on rehabilitation from sport injury has not tended to provide a comprehensive account of the mechanisms by which motivation between contexts and levels of generality are inter-connected in the context of treatment and rehabilitation from sport injuries. The present investigation aims to apply the TCM to understand the motivational dynamics of rehabilitation for physical injury among people who had been injured in sport for various reasons. In the two studies presented here, we recruited samples of participants involved in recreational and professional sport whose reasons and motives for doing sport were likely to be substantially different. For example, we expected the professional sports performers to exhibit more extrinsic motives due to the heightened extrinsic rewards system and external pressures that are present in professional sport (Hagger & Chatzisarantis, 2005). We contend that the TCM for treatment motivation would hold regardless of individual differences in sport expertise and participation level and background.

In Study 1, we examined the effect of sport motivation on treatment motivation (i.e., the trans-contextual process) among recreational sport participants who ruptured their ligaments in sport. This initial study was carried out as an attempt to explore the relationship between sport motivation and treatment motivation while controlling for the effect of autonomy support from physiotherapists. It was hypothesized that autonomous sport motivation would form a positive association with autonomous treatment motivation with an equal or higher magnitude of that of autonomy support from physiotherapist, whereas sport controlled motivation was expected to form a positive association with controlled treatment motivation.

In Study 2, we tested the effects of causality orientation and autonomy support from significant others on the trans-contextual transfer of motivation among professional sport participants who had experienced a variety of sport injuries. It was hypothesized that autonomy orientation would form positive relationships with autonomous sport motivation, autonomous treatment motivation, and autonomy support from significant others (physiotherapist and coach). In contrast, controlled orientation was expected to be positively associated with controlled sport motivation and controlled treatment motivation, and negatively related to, or have a non-significant relationship with, autonomy support from significant others (physiotherapist and coach). We also proposed another hypothesis based on the proposition that autonomy support from coach would form positive relationships with autonomous sport motivation and treatment motivation. In addition, we further tested the effects of treatment motivation on treatment intention using a hypothetical injury scenario related to professional athletes. Based on the findings of Chan et al. (2009), it was hypothesized that intentions to engage in treatment for injury would be positively predicted by autonomous treatment motivation and negatively predicted by controlled treatment motivation.

Study 1

Method

Participants

A total of 115 recreational-level athletes who ruptured their anterior cruciate ligaments (ACL) in sport were recruited from an orthopaedic clinic of a local hospital in Hong Kong. The sample consisted of 94 males (mean age = 27.05, $SD = 3.99$) and 21 females (mean age = 23.38, $SD = 4.01$). They completed ACL reconstruction and were subsequently undergoing rehabilitation for more than six months (range = 0.50–3.00 years; mean interval = 1.77, $SD = 0.80$ years). Before their ACL injuries, athletes participated in a variety of sports such as association football (54.40%), basketball (28.10%), volleyball (4.30%), and athletics (4.40%), for an average of 8.48 years ($SD = 6.91$), and they experienced ACL ruptures during training or competition. They only had ACL reconstruction once and did not receive any follow-up or subsequent surgical treatment on their knees.

Procedures

Ethical approval was obtained from The Chinese University of Hong Kong's Research Ethics Committee (REC) prior to data collection. Participants were fully informed of the procedures of the study and their rights (i.e., voluntary nature of participation, confidentiality of data, and freedom of withdrawal). They signed the consent form to indicate they understood these points before completing a 15-min long questionnaire concerning their sport motivation, treatment motivation, and the perceived autonomy support from their physiotherapists. The items and instructions of the questionnaires were translated in to Chinese under the guidelines developed by the International Test Commission (Hambleton, 2005).

Measures

Sport motivation

The Behavioural Regulation in Sport Questionnaire (BRSQ; Lonsdale, Hodge, & Rose, 2008) was used to assess participants'

sport motivation. BRSQ is a 24-item questionnaire comprising three dimensions for autonomous motivation (intrinsic motivation, integration, identification) and three dimensions for controlled motivation (introjection, external motivation, amotivation).[3] Participants were asked to reflect on how the items corresponded to their reasons for doing sport and give their responses on seven-point Likert scales with anchors ranging from 7 (very true) to 1 (not true at all). The Cronbach's alphas of the six dimensions ranged from .74 to .90, and the alphas for the aggregate autonomous ($\alpha = .93$) and controlled sport motivation ($\alpha = .89$) scales were high, supporting the internal reliability of BRSQ (see Appendix A for example items for each dimension of BRSQ).

Autonomy support from physiotherapist and treatment motivation

To assess autonomy support from physiotherapists, we used the Health Care Climate Questionnaire (HCCQ; Williams et al., 1996). The HCCQ is a unidimensional questionnaire that measures the degree to which patients perceive their specific medical care providers are autonomy supportive (Williams et al., 1996). The full version (15 items) HCCQ ($\alpha = .93$) was used in this initial study. The Treatment Self-Regulation Questionnaire (TSRQ; Williams et al., 1996) measures self-determined motivation to start or continue health promoting behaviours (e.g., Williams, Gagné, et al., 2005; Williams et al., 1996; Williams, McGregor, Sharp, Kouides, et al., 2006; Williams, McGregor, Sharp, Levesque, et al., 2006; Williams et al., 2005). In this study, we adopted the version used by Williams et al. (1996) to measure the motivation to follow a long term rehabilitation program. The questionnaire measures two dimensions: autonomous regulation ($\alpha = .73$; 5 items) and controlled regulation ($\alpha = .81$; 8 items). Both scales showed adequate internal reliability in this study, as they did in previous studies (see Appendix A for example items from the TSRQ and the physiotherapy-version HCCQ).

Data analysis

In order to test the hypothesized relationships between sport motivation and treatment motivation, structural equation modeling (SEM) was conducted using the EQS 6.1 computer program (Bentler, 2004). Two incremental fit indices, the comparative fit index (CFI) and Tucker-Lewis index (TLI, also known as non-normed fit index), and two absolute fit indices, the root-mean square error of approximation (RMSEA) and standardized root-mean square residual (SRMR), were adopted to evaluate the goodness-of-fit of the proposed model to the data. Values greater than .90 for the CFI and TLI are usually considered acceptable (Bentler, 1990), but Hu and Bentler (1999) proposed a more stringent .95 criterion, so we considered this value as an indicator of good fit. Values of .08 or less for the RMSEA and SRMR indicate adequate fit (Hu & Bentler, 1999). SEM analysis typically requires a relatively large sample size to yield acceptable statistical power (.80), so we estimated the statistical power for all of the SEM models (MacCallum, Browne, & Sugawara, 1996). For this initial study, the hypothesized model is depicted in Fig. 1. In the model, autonomous treatment motivation and controlled treatment motivation were the two endogenous latent factors predicted by the (exogenous) latent factors of autonomous sport motivation, controlled sport motivation, and autonomy support from physiotherapists. Additionally, we freely estimated the correlations between the disturbances of the two endogenous variables and between the three exogenous variables.

[3] Following Ryan and Connell's (1989) suggestion that behavioural regulations could be categorized into two styles of motivation (autonomous and controlled), we averaged one item from the intrinsic motivation, integration, and identification scales of the BRSQ to form an indicator of autonomous motivation, and then averaged one item from the introjection, external motivation, and amotivation scales to form an indicator of controlled motivation. As each dimension of BRSQ has four items, we were able to compute four composite indicators for each of autonomous sport motivation and controlled sport motivation using this procedure.

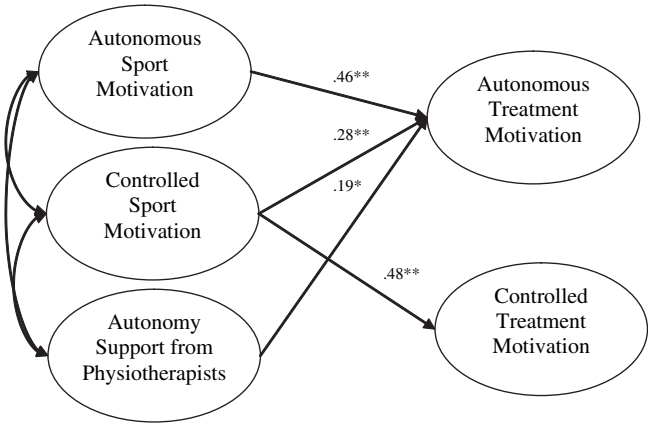

Fig. 1. Path estimates in the model from Study 1. Non-significant paths, indicators and disturbances (D) of the latent variables, and the correlations between Ds are not shown in this figure. The omitted paths, autonomous sport motivation → controlled treatment motivation ($\beta = .03$), autonomy support from physiotherapists → controlled treatment motivation ($\beta = -.06$), were not significant $p > .05$ for a one-tailed test. $^*p < .05$ for a two-tailed test, $^{**}p < .01$ for a two-tailed test.

Results

Mardia's normalized kurtosis coefficient, an indicator of multivariate non-normality was 6.23, higher than the criterion figure recommended by Byrne (1994). Therefore we used a robust maximum likelihood estimation method for our SEM analysis to protect the model from any violations of the assumption of multivariate normality (Satorra & Bentler, 1988). Goodness-of-fit indices revealed that the proposed model fit the data well (Satorra–Bentler $\chi^2 = 80.418$, df = 55; CFI = .960; TLI = .944; RMSEA = .086; SRMR = .062) and obtained very good statistical power of .95.

In line with our hypotheses, autonomous sport motivation ($\beta = .46$, $p < .01$) and controlled sport motivation ($\beta = .48$, $p < .01$) formed positive associations with autonomous treatment motivation ($R^2 = .45$) and controlled treatment motivation ($R^2 = .26$), respectively, after controlling the effects of perceived autonomy support from the physiotherapist. Moreover, perceived autonomy support from physiotherapists predicted autonomous treatment motivation positively ($\beta = .19$, $p < .05$), with a magnitude lower than sport autonomous motivation, but did not predict controlled treatment motivation. In contrast with predictions, the effect of controlled sport motivation on autonomous treatment motivation ($\beta = .28$, $p < .01$) was significant, although the magnitude was smaller than that of autonomous sport motivation (see Fig. 1).

Discussion

Consistent with our hypothesis, results revealed that sport motivation was closely related to treatment motivation after the occurrence of a severe sport injury. Individuals who reported more autonomous reasons for doing sport were more likely to undergo treatment for sport injury because they personally viewed treatment as important, beneficial to recovery, and a challenge they would like to accomplish. In contrast, those who reported more controlled reasons in sport were more likely to undertake treatment of physical injuries because they felt that the treatment was compulsory and *must* be done. The positive association between controlled sport motivation and autonomous treatment motivation may be because sport participants who regulate their sporting behaviour for controlled reasons are also highly motivated to participate in sport, so they are therefore more likely to consider the treatment of sport injury as important and meaningful in order for them to return to their sport.

Study 2

Method

Participants

Full time athletes ($N = 298$) from Sichuan province of China voluntarily participated in this study. As the study was concerned with personal rehabilitation experiences of moderate to severe sport injuries, data from the athletes who had experienced sport injuries with less than two weeks of recovery were excluded from the study. The final sample comprised 206 elite athletes (males, $n = 98$; females, $n = 108$; mean age = 24.75, $SD = 4.13$) from a wide range of sports including athletics (32%), football (19.4%), basketball (9.2%), volleyball (8.3%), swimming (7.3%), canoeing (5.3%), and others (18.5%; e.g., cycling, gymnastics). Athletes were regional-level (31.1%), national-level (61.6%), or international-level (3.9%) performers who received professional training for an average of 6.88 ($SD = 3.97$) years. Regarding their personal experience of the most severe sport injury, they reported having a history of either muscular injury (19.4%), skeletal injury (29.1%), ligament injury (30.6%), and other types of injuries (14.7%) from sports with recovery periods ranging from 3 weeks to 25 months (mean = 2.71 months, $SD = 3.82$). Injured athletes consulted regularly with a personal physiotherapist (mean years spent with the athlete = 3.24, $SD = 2.88$) responsible for providing them with physiotherapy treatment. We followed identical REC approval, informed consent, and translation procedures to those implemented in Study 1.

Procedures and measures

Six months preceding the National Games of China, participants were asked to complete a questionnaire which consisted of BRSQ (sport motivation) used in Study 1, and a battery of psychological measures.

Personality. The General Causality Orientation Scale (GCOS; Deci & Ryan, 1985a) was used to assess the autonomy orientation and controlled orientation of individuals. The original scale has three subscales (autonomy, controlled, and impersonal orientations) and consists of 12 vignettes and 36 items. Participants rated the degree to which they felt the three responses in the hypothetical social situation of each vignette, corresponding to the three types of motivational orientations, were typical for them, on seven-point Likert scales with "very unlikely" (1) and "very likely" (7) as anchors. This scale yielded satisfactory internal reliability and test-retest reliability in the original validation study of Deci and Ryan (1985a). The psychometric properties of the Chinese version of GCOS were also supported in a study among Taiwan Chinese athletes (Wu & Hwang, 2000). In the present study, we only included the items of autonomy orientation ($\alpha = .73$) and controlled orientation ($\alpha = .69$), and their internal reliabilities were both satisfactory (see Appendix A for example items of the GCOS used in Study 2).

Autonomy support and treatment motivation. The TSRQ and the short version of HCCQ (6 items) used in Study 1 were used to measure participants' treatment motivation and perceived autonomy support from their coach and physiotherapist respectively. The items for autonomy support from the coach had the same stem as the HCCQ for the physiotherapist, but the subject of each item was replaced by 'coach'. Previous studies adopting the HCCQ to measure autonomy support in the contexts of exercise have reported good internal reliability (Hagger, Chatzisarantis, et al., 2003). The internal reliability for the HCCQ for the coach ($\alpha = .90$) and physiotherapist ($\alpha = .85$) was also satisfactory (see Appendix A for example items of the coach-version HCCQ).

Treatment intention. Two items were developed based on a previous study of rehabilitation adherence after sport injury (Chan et al., 2009) to measure the degree to which participants intended or planned to follow the prescribed rehabilitation recommendation in the forthcoming month according to the hypothetical sport injury scenario. The item construction followed Ajzen's (1985, 2002) guidelines for the measurement of behavioural intention from the Theory of Planned Behaviour. The participants responded to the following items: "I intend to carry out the rehabilitation exercises recommended by my physiotherapist over the forthcoming month" and "I will try to exert effort in doing the rehabilitation exercises recommended by my physiotherapist over the forthcoming month" using seven-point Likert scales with anchors ranged from "strongly agree" (7) to "strongly disagree" (1). The inter-item correlation was .82 supporting the internal reliability of the scale.

Injury scenario. Participants first completed the HCCQ and GCOS, and were then asked to respond to the TSRQ and treatment intention items based on a hypothetical sport injury situation. The athlete (in the scenario) was injured in a training session one month before an important competition and experienced an increasing sensation of pain due to the injury over time (see Appendix B for the script). The athlete was recommended by his/her physiotherapist to suspend all training and begin treatment and rehabilitation. The scenario was carefully designed to tap participants' experiences based on typical sport injury narratives which commonly occur in elite athletes.

Analysis. Consistent with Study 1, SEM using a robust maximum likelihood method was employed to examine the fit of the proposed model and generate path estimates among the variables in Study 2. Based on the findings of Chan et al. (2009) and our first study, we built our hypothesized model as follows (see Fig. 2).[4] First, treatment intention was predicted by autonomous and controlled treatment motivation. Second, the two-treatment motivational constructs were predicted by autonomous and controlled sport motivation, and autonomy support from physiotherapists. Third, the two sport motivational constructs were predicted by autonomy support from coaches. Finally, autonomous and controlled orientation predicted autonomy support from the physiotherapist and coach, sport motivation, and treatment motivation. We freely-estimated correlations among the disturbances of autonomy support from physiotherapists, autonomous sport motivation and controlled sport motivation, and between the latent factors of autonomous and controlled orientation. Furthermore, we performed a series of mediation analyses (Baron & Kenny, 1986) to test if mediation effects were present in our hypothesized relationships between causality orientations, autonomy support, sport motivation, treatment motivation, and treatment intention.[5]

Results

The proposed SEM yielded acceptable indices of fit (Satorra–Bentler $\chi^2 = 562.633$, df = 350; CFI = .934; TLI = .924; RMSEA = .057; SRMR = .046). Despite its complexity, the model obtained a statistical power of .81, which indicated the sample size was statistically acceptable to limit the possibility of type-II errors.

[4] Please refer to introduction section under the subheading "The Present Study" for the direction (i.e., positive and negative) of the hypothesized effects in the model.

[5] 5 According to Baron and Kenny (1986), full mediation is shown if (i) the direct effects of the independent variable (IV) and the mediator on the dependent variable (DV) are significant, and (ii) the strength of the relationship between the IV and DV becomes non-significant after controlling for the effect of the mediator. Partial mediation is shown if the reduced relationship between the IV and DV remains significant. Therefore, we tested the mediation effects by adding the paths which showed direct effects of IV → DV or fixing the paths of mediator → DV to zero in the structural model.

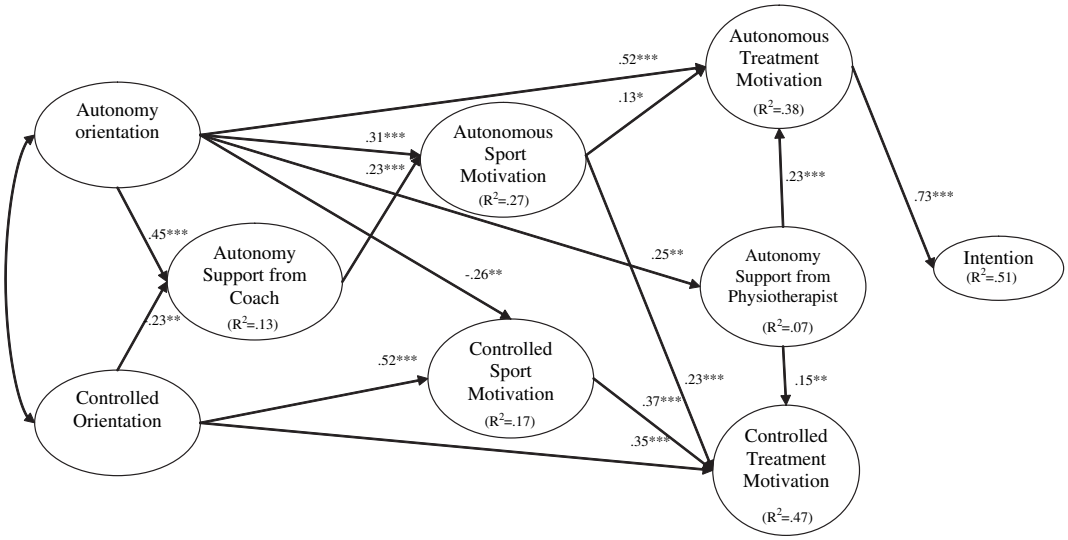

Fig. 2. Paths estimates in the model from Study 2. Non-significant paths, indicators and disturbances (D) of the latent variables, and the correlations between Ds are not shown. The omitted paths, autonomy orientation → controlled treatment motivation ($\beta = -.12$), controlled orientation → autonomous sport motivation ($\beta = .14$)/autonomous treatment motivation ($\beta = -.15$)/autonomy support from physiotherapist ($\beta = .02$), autonomy support from coach → controlled sport motivation ($\beta = -.05$), controlled sport motivation → autonomous treatment motivation ($\beta = .01$), controlled treatment motivation → treatment intention ($\beta = -.04$), were not significant $p > .05$ for a one-tailed test. *$p < .05$ for a two-tailed test, **$p < .01$ for a two-tailed test, ***$p < .001$ for a two-tailed test.

The path estimates generally supported the findings of Study 1. Autonomous treatment motivation was positively predicted by autonomous sport motivation ($\beta = .13$, $p < .05$), autonomy support from the physiotherapist ($\beta = .23$, $p < .01$), and autonomy orientation ($\beta = .52$, $p < .01$). On the other hand, controlled treatment motivation was predicted positively by controlled sport motivation ($\beta = .37$, $p < .01$) and controlled orientation ($\beta = .35$, $p < .01$) as expected, but it was also predicted positively by both autonomous sport motivation ($\beta = .23$, $p < .01$) and autonomy support from the physiotherapist ($\beta = .15$, $p < .05$) (see Fig. 2).

In line with our hypotheses, autonomy orientation was positively associated with autonomy support from the coach ($\beta = .45$, $p < .05$), autonomy support from the physiotherapist ($\beta = .25$, $p < .05$), autonomous sport motivation ($\beta = .31$, $p < .05$), and autonomous treatment motivation ($\beta = .52$, $p < .05$). In addition, it was negatively related to controlled sport motivation. Similarly, controlled orientation formed positive relationships with controlled sport motivation ($\beta = .52$, $p < .05$) and controlled treatment motivation ($\beta = .35$, $p < .05$), and showed a negative relationship with autonomy support from the coach ($\beta = -.23$, $p < .05$), but its relationship with autonomy support from the physiotherapist was not significant.

Autonomy support from the coach formed a positive association with autonomous sport motivation ($\beta = .23$, $p < .05$) as expected, but, inconsistent with our hypothesis, the expected relationship between coaches' autonomy support and autonomous treatment motivation was not significant. Regarding our last hypothesis, treatment intention was positively predicted by autonomous treatment motivation ($\beta = .73$, $p < .05$) as expected, but its proposed negative relationship with controlled treatment motivation was not significant. Therefore, this hypothesis was partially supported.

Results from the mediation analyses are reported in Table 1 which gives the direct and combined effects of all the independent variables in the study. The effect of autonomy orientation on autonomous treatment motivation was partially mediated by autonomous sport motivation and autonomy support from physiotherapists. Further, the effect of controlled orientation on controlled treatment motivation was partially mediated by controlled sport motivation. The effect of autonomy orientation on treatment intention was fully mediated by the motivational sequence proposed in the model. In addition, autonomous treatment motivation fully mediated the effects of autonomous sport motivation and autonomy support from coaches and physiotherapists on treatment intention.

Discussion

In Study 2, we provided initial evidence to support the effect of causality orientation on the TCM. Not only does causality orientation influence how people perceive the autonomy support of significant

Table 1
Results from the mediation analyses of Study 2.

Paths	Mediator(s)	Direct Effect	Combined Effects	Mediation Type
AS-Co→ATx	ASM	.00	−0.02	None
AO→ATx	AS-Phy, ASM, CSM[a]	.78**	.52**	Partial
CO→CTx	AS-Phy[b], ASM[b], CSM	.62**	.35**	Partial
AO→Inten	ATx, CTx[a,b]	.54**	0.03	Full
CO→Inten	ATx, CTx	−.06	−.02	None
AS-Phy→Inten	ATx, CTx[a]	.31*	−0.02	Full
AS-Co→Inten	ASM, CSM[b], ATx, CTx[a]	.20*	−0.03	Full
ASM→Inten	ATx, CTx	.26*	−0.08	Full
CSM→Inten	ATx, CTx	−0.07	−0.06	None

Note: AO = Autonomy Orientation; CO = Controlled Orientation; ASM = Autonomous Sport Motivation; CSM = Controlled Sport Motivation; AS = Autonomy Support; Co = Coach; Phy = Physiotherapist; ATx = Autonomous Treatment Motivation; CTx = Controlled Treatment motivation; Inten = Intention. *$p < .05$ at 2-tailed, **$p < .01$ at 2-tailed.

[a] This variable was not a significant mediator because it did not significantly predict the dependent variable.

[b] This variable was not a significant mediator because it was not significantly predicted by the independent variable.

others, but it also has strong effects on the level of self-determination of behaviours in both sport and treatment contexts. It is, therefore, an important component of the trans-contextual effect. However, autonomy support from coaches was only related to sport motivation and not treatment motivation. This suggests that the trans-contextual effects of motivation were unlikely to be due to coaches providing autonomy support in both contexts.

General discussion

In order to utilize the trans-contextual model to understand the relationship between motivation in sport and rehabilitation contexts (Hagger, Chatzisarantis, Barkoukis, et al., 2005; Hagger, Chatzisarantis, et al., 2003), we carried out two independent studies in groups of sport participants with different backgrounds and level of expertise and experience. Study 1 tested the TCM in accordance with a recent ACL rupture experience among recreational-level sport participants, while Study 2 tested the TCM in a sample of professional athletes who placed higher occupational demands on sport than the recreational sport participants. Results from both studies supported the trans-contextual processes of motivation between sport and rehabilitation of sport injury and were in line with previous studies of the TCM (Barkoukis & Hagger, 2009; Barkoukis et al., in press; Hagger & Chatzisarantis, 2009b; Pihu et al., 2008; Wallhead et al., in press). Moreover, the results were consistent with previous findings (i.e., Chan et al., 2009, Williams et al., 1996) and SDT (Deci & Ryan, 1985b) with respect to the adaptive role of autonomous treatment motivation and autonomy support.

The transfer of motivation

Unlike previous studies adopting the TCM which used a single composite score (the relative autonomy index) to represent the overall autonomous and controlled sport motivation of participants (e.g., Hagger, et al., 2009; Hagger, Chatzisarantis, Griffin, et al., 2005; Hagger, Wood, et al., 2009, 2005), we intended to test the precise trans-contextual processes of motivation by making a clear distinction between the two opposing forms of motivation. Although highly consistent results were revealed in both studies in the current research regarding the associations between sport and treatment motivation, our investigation still presented some contradictory findings which are worthy of discussion. In Study 1, controlled sport motivation unexpectedly formed a positive association with autonomous treatment motivation, but interestingly, we did not find the same pattern in Study 2.

According to SDT, humans have an active nature and a tendency toward development, both of which enable individuals to gradually internalize their controlling behaviours into more autonomously-motivated actions (Deci & Ryan, 1985b). Compared with the most severe sport injuries reported by the participants in Study 2, the reported injury (ACL rupture) of participants in Study 1 was generally more serious and required more time for recovery. Participants in Study 1 may therefore have had more time to internalize their controlled treatment motivation into autonomous treatment motivation. The participants in Study 2 responded according to a hypothetical sport injury scenario rather than actual current experience with a real injury, so their response patterns may not have necessarily revealed the effects of internalization. In addition, recent SDT research in sport suggests that the maladaptive effects of controlled sport motivation can be compensated by autonomous sport motivation (Gillet, Vallerand, & Rosnet, 2009). The recreational sport participants in Study 1 had apparently fewer external demands and more volitional participation in sport (Hagger & Chatzisarantis, 2005). In that sense, their potentially heightened autonomous sport motivation may be able to protect them against the negative influence of controlled sport motivation, leading to greater autonomous treatment motivation for a sport injury.

The role of causality orientation

As expected, causality orientations not only influenced perceptions regarding the autonomy support from coaches and physiotherapists, but also athletes' behavioural regulations in both sport and treatment contexts. This pattern indicated that the causality orientation of athletes could make a substantial contribution to the trans-contextual process of motivation. Although causality orientations have a very important influence on treatment motivation and intention, it is important to include the mediators of these relationships such as sport motivation and autonomy support from physiotherapists.

These mediators fully or partially mediated the effects of causality orientations on treatment motivation and intention in Study 2. We hypothesized that the independent variables (i.e., causality orientation) and the mediators (i.e., sport motivation and autonomy support from physiotherapists) would both exert direct influences on the dependent variable. In other words, a highly autonomously-oriented athlete is likely to have high autonomous treatment motivation when injured. However, when the physiotherapist does not adequately support the needs of the athlete or provide appropriate treatment options and proper explanations regarding rehabilitation, the resulting treatment motivation of the athletes may still be impaired. In contrast, athletes who have high-controlled orientation may have a predisposition toward highly-controlling treatment motivation perceptions, a style of treatment motivation that was found to be maladaptive with respect to treatment adherence for sport injury (Chan et al., 2009). Importantly, however, autonomy support from physiotherapists may foster their autonomous treatment motivation for sport injury, which would further lead to enhanced intention to continue the treatment in the future.

The role of significant others

Autonomy support from coaches predicted autonomous sport motivation, but did not have any significant association with autonomous treatment motivation. Instead, both studies demonstrated that autonomy support from physiotherapists had a significant effect on treatment motivation, thus revealing that physiotherapists may be more important than coaches in fostering an adaptive psychosocial environment for injured athletes to recover. It is important to discuss why coaches' autonomy support was only influential on sport motivation and not treatment motivation. A possible reason could be that athletes do not identify coaches as medical figures or experts in injury rehabilitation when they get injured. In comparison to coaches, physiotherapists are likely perceived as more clinically based and proficient in handling sport injuries. Nevertheless, during the recovery process, it is important for injured sport participants to be autonomously motivated to return to their sport, as this autonomous sport motivation was suggested to be related to optimistic perspectives regarding future sport participation after sport injury (Podlog & Eklund, 2007). Thus, autonomy support from coaches is essential to help injured athletes prepare psychologically to return to their sport.

Limitations and future directions

In spite of the theoretical and pragmatic insights obtained from this study, a number of limitations should be addressed and future research directions should be discussed to advance the understanding of the TCM. First, the data of the study relied exclusively on self-report measures that tend to be more vulnerable to contamination from common method variance and social desirability. Future studies should attempt to assess other-reported autonomy support and treatment adherence and use alternative behavioural measures such as rehabilitation attendance to obtain more objective and reliable behavioural data on the motivational dynamics of injured

athletes. Second, the correlational design of the study precludes definitive conclusions regarding the causal and temporal relationships between autonomy support, sport motivation, and treatment motivation. Stronger evidence could be provided by studies with intervention designs such as randomized control trials and reciprocal effect models with longitudinal designs (Hagger & Chatzisarantis, 2009a; Marsh & Perry, 2005). Finally, although the samples of the two studies involved athletes with a variety of sport levels and sport injury experience, we cannot conclude that the TCM would consistently hold for athletes for all sport-related injuries. In addition, similar injuries to those experienced by the athletes in the present investigation also occur among employees in the working environment who would also require proper treatment for recovery. Further studies should examine the framework of the TCM among patients who sustain injuries in occupational settings.

Conclusion

The TCM may be a useful framework to explain the processes by which sport motivation is transferred into treatment motivation for sport injury. Injured athletes, who enjoy sport, and consider it a meaningful and important aspect of their lives, in contrast to those who experience pressure or coercion to engage in their sport, are more likely to be autonomously-motivated toward their rehabilitation from injury. From a practical perspective, it seems that the onus is on coaches and physiotherapists to promote self-determined or autonomous forms of motivation in their athletes. In particular, autonomous motivation in sport will transfer to autonomous motivation to seek and adhere to rehabilitation should athletes get injured. In this case, the coach can provide an optimal social environment that fosters increased self-regulation among athletes when it comes to performing behaviours alone and in the absence of external contingencies. Numerous techniques to foster autonomous motivation have been well cited in the sport and exercise psychology literature, and include providing rationale, giving choice, promoting self-referenced goals, acknowledging conflict, and providing experiences of competence and mastery in practice and training (Chatzisarantis & Hagger, 2009; Gagne, Ryan, & Bargmann, 2003; Taylor, Ntoumanis, & Standage, 2008).

Appendix A. Example items for the constructs used in Studies 1 and 2

Construct (Cronbach's Alpha)	Sub-Dimension (Cronbach's Alpha)	No. of Items	Example Item	Scoring
Behavioural Regulation in Sport Questionnaire				
Autonomous sport motivation ($\alpha = .93$)	Intrinsic motivation ($\alpha = .74$)	4	I participate in my sport because I enjoy it	1 = not at all true, 7 = very true
	Integrated motivation ($\alpha = .72$)	4	I participate in my sport because it's a part of who I am	1 = not at all true, 7 = very true
	Identified motivation ($\alpha = .72$)	4	I participate in my sport because I value the benefits of my sport	1 = not at all true, 7 = very true
	Extrinsic motivation ($\alpha = .67$)	4	I participate in my sport because I feel pressure from other people to play	1 = not at all true, 7 = very true
Controlled sport motivation ($\alpha = .89$)	Introjected motivation ($\alpha = .78$)	4	I participate in my sport because I would feel guilty if I quit	1 = not at all true, 7 = very true
	Amotivation ($\alpha = .73$)	4	I participate in my sport but I question why I continue	1 = not at all true, 7 = very true
Treatment Self-Regulation Questionnaire				
Autonomous treatment motivation ($\alpha = .75$)	–	5	I have remained in treatment and carry out rehabilitation exercise because I feel like it's the best way to help myself	1 = not at all true, 7 = very true
Controlled treatment motivation ($\alpha = .82$)	–	8	I have remained in treatment and carry out rehabilitation exercise because others would have been angry at me if I didn't	1 = not at all true, 7 = very true
Health Care Climate Questionnaire				
Physiotherapist-version ($\alpha = .85$)	–	15	My physiotherapist encourages me to ask questions	1 = not at all true, 7 = very true
Coach-version ($\alpha = .90$)	–	6	My coach listens to how I would like to do things	1 = not at all true, 7 = very true
General Causality Orientation Scale			*Instruction: You are embarking on a new career. The most important consideration is likely to be:*	
Autonomy orientation ($\alpha = .75$)	–	12	How interested you are in that kind of work	1 = very unlikely, 7 = very likely
Controlled orientation ($\alpha = .82$)	–	12	Whether there are good possibilities for advancement	1 = very unlikely, 7 = very likely
Theory of Planned Behaviour				
Treatment intention ($\alpha = .82$)	–	2	I will try to exert effort in doing the rehabilitation exercises recommended by my physiotherapist over the forthcoming month	1 = strongly disagree, 7 = strongly agree

Appendix B

The script of the hypothetical sport injury scenario used in Study 2 "Imagine you have an important competition in a month, but unfortunately you have been injured in training. You can continue to train at the moment, but you feel that the injury seems to be getting worse and worse. The feeling of pain increases and the injured area swells more after each training session. Your physician suggests that you should stop training and undertake physiotherapy until you recover completely, but he/she suggests that the rehabilitation might take up to a month or more. You want to perform very well in the competition, but following the prescribed rehabilitation is incompatible with the pre-event training you require to get you in the best possible shape for the competition. This dilemma may be similar to a previous experience you have had with sport injury, and there are good reasons on both sides whether to follow or not to follow the rehabilitation program. Please put yourself into the situation and answer the following items according to how you would feel about the scenario. There are no right or wrong answers, so please respond to each question according to your own thoughts".

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