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The Main and Interactive Effects of Immediate and Reflective Attributions upon Subsequent Self-Efficacy

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Abstract

This study examined the effects of immediate and reflective attributions upon subsequent self-efficacy. At Time 1 (Day 1), 117 participants, mean age 25.77 (*s* = 8.45) years, completed a measure of attributions after performance (*immediate* attributions). At Time 2 (Day 4), participants completed the same measure of attributions (*reflective* attributions). At Time 3 (Day 7, 8, or 9), participants completed a measure of self-efficacy relating to an up-coming performance. Immediately after more successful performances, global attributions were associated with higher levels of subsequent self-efficacy; upon reflection, stable, and/or global, and/or personal attributions were associated with higher levels of subsequent self-efficacy. Immediately after and upon reflection of less successful performances, controllable attributions were associated with higher levels of subsequent self-efficacy; an interaction for controllability and stability demonstrated that when causes are perceived as likely to recur, higher levels of controllability are associated with higher levels of subsequent self-efficacy. Results suggest that following more successful performances, analysis of reflective assessments of attributions may help to further understanding of the relationships between attributions and outcomes such as self-efficacy. This study serves as a stimulus for future research to examine relationships between attributions assessed across time and outcomes such as self-efficacy, as well as examining interactions among attribution dimensions.

Introduction

Attributions are explanations about why particular behaviours occurred, and explanations enhance people's ability to predict and control events in the future (Anderson & Riger, 1991). In sport psychology, the majority of attribution research has assessed attributions immediately (e.g., within 10 minutes, Gernigon & Delloye, 2003) after performance. Assessed in this manner, attributions are distant from future outcomes, and Biddle (1999) suggested that this may explain the difficulty researchers have had in demonstrating the effects of attributions upon future outcomes.

A central premise within attribution research is that there is a dimensional structure underlying the explanations people give for events, and by categorising explanations into dimensions, one can better understand those explanations. Reviewers of attribution research in sport psychology have suggested that controllability (whether the cause is controllable or uncontrollable) is a key attribution dimension upon which attention should be focused (e.g., Biddle, 1993; Biddle, Hanrahan, & Sellars, 2001; Hardy, Jones, & Gould, 1996; Rees, Ingledew, & Hardy, 2005). Controllability is also considered the most important attribution dimension in the general social psychology research of Anderson and colleagues (e.g., Anderson & Riger, 1991). Attributing an event to a controllable cause leads to expectations of control over events in the future. With particular reference to controllability attributions, Bandura and Wood (1989) reported that participants who managed a simulated organisation under a belief that organisations were not easily controllable had low self-efficacy even when standards were within easy reach; participants who believed that organisations were controllable had high self-efficacy. Within sport, only a few studies have examined the attributions–self-efficacy link. In a study with 81 golfers, Bond, Biddle, and Ntoumanis (2001) reported main effects for stability (whether the

cause will or will not change over time) upon self-efficacy; with 62 national level sprinters, Gernigon and Delloye (2003) reported main effects for controllability and stability attributions upon self-efficacy.

To our knowledge, no research has examined the effects of attributions assessed at multiple time points upon self-efficacy, even though attributions may well change/develop over time. Indeed, Anderson and colleagues (e.g., Anderson, Krull, & Weiner, 1996; Anderson & Lindsay, 1998) have suggested that some attributions are generated rapidly and automatically, while others take time, effort, and explicit gathering and processing of information. To form an immediate attribution, an individual may use perceptual cues and/or accessible knowledge structures (Anderson et al., 1996). Perceptual cues provide information on the temporal order of events (e.g., causes come before effects), the temporal and spatial contiguity of events (e.g., an athlete's "current" joy is more likely to be influenced by a recent win, than by one from the distant past), and the similarity of causes and events (e.g., Taylor, 1982, noted that people generally assume that big effects are produced by big causes). Accessible knowledge structures refer to the prior knowledge individuals have about why events occur, and an immediate attribution may, therefore, be generated from the retrieval of a stored explanation (Fiske & Taylor, 1991).

If an event is of little interest to an individual, or if the immediate attribution is deemed satisfactory, then the individual may feel no need to further analyse the event (Weiner, 1985). Alternatively, if an individual has sufficient time and cognitive resources, and is motivated to explain the event further, then a more effortful, problem-based explanation process is initiated (Anderson & Lindsay, 1998; Fiske & Taylor, 1991). The latter scenario is more likely to the extent that the event is unexpected (Weiner, 1985; Wong & Weiner, 1981), and/or the event is

important (Kruglanski, 1989), and/or the amount of information to be considered is either too difficult or too substantial for individuals to generate satisfactory immediate explanations (Anderson et al., 1996). The problem-based attribution process consists of two discrete stages: problem formation and problem resolution (Anderson & Lindsay, 1998). The purpose of the problem formation stage is to identify what additional information would help towards explaining an event. The purpose of the problem resolution stage is to integrate the various pieces of information collected during the problem formation stage and form a "best" explanation (Anderson & Lindsay, 1998).

Coupled with the importance of examining attributions across time (Biddle, 1999), in a recent paper, Rees et al. (2005) proposed that researchers should examine the main effects of controllability, together with the interactive effects of controllability and the three generalisability dimensions of stability, globality, and universality upon outcomes. In other words, although controllability may be the primary dimension to focus upon, the interactive effects of controllability and the generalisability dimensions may ultimately influence self-efficacy. Globality refers to whether the cause affects a wide range of situations with which the person is faced (i.e., a global attribution) or a narrow range of situations (i.e., a specific attribution); universality refers to whether the cause is common to all people (i.e., a universal attribution) or unique to the individual (i.e., a personal attribution) (cf. Abramson, Seligman, & Teasdale, 1978). Stability, globality, and universality deal with the *generalisability* of the cause of the event. That is, does the cause generalise across time (stability), situations (globality), and/or all people (universality)?

Anderson and Riger (1991) also noted that the effects of controllability upon outcomes may be moderated by other attribution dimensions. For instance, attributing failures to

uncontrollable causes may only lead to lower levels of self-efficacy when causes are also stable (unlikely to change), or global (likely to affect a wide range of situations), or personal (unique to the individual) (Rees et al., 2005). Although main effects for attribution dimensions upon self-efficacy have been reported (e.g., Gernigon & Delloye, 2003), only a few studies (e.g., Ingledew, Hardy, & Cooper, 1996) have examined their interactive relationships (see Carver, 1989). Such interactions may be of great relevance to sport. For example, a golfer who perceived his/her performance to be very poor might say, "There was nothing I could do about it" (an uncontrollable attribution), together with "and this will never change" (a stable attribution), or "and this affects a lot of situations I find myself in" (a global attribution), or "and this only happens to me" (a personal attribution). In this instance, the golfer might well be expected to experience low levels of self-efficacy for subsequent performance. Conversely, higher levels of self-efficacy would be expected if the golfer were to combine his/her uncontrollable attribution with "but this will change" (an unstable attribution), and/or "however, this only affects a few situations I find myself in" (a specific attribution), and/or "but this affects everyone, not just me" (a universal attribution). According to Carver, this style of thinking is consistent with the testing of interactive effects of attribution dimensions, rather than main or additive effects.

The aim of the present study was to examine the main and interactive effects of immediate and reflective controllability and generalisability attributions upon subsequent self-efficacy. For this study, there was thus a requirement for a measure of controllability and the three generalisability dimensions. The most widely used state attribution measure is the revised Causal Dimension Scale (CDSII: McAuley, Duncan, & Russell, 1992). The CDSII assesses the dimensions of locus of causality (whether the cause is internal or external), stability, and controllability; the measure does not assess the generalisability dimensions of globality and

universality. A number of problems have been levelled at the CDSII. Using confirmatory factor analysis**,** Crocker, Eklund, and Graham (2002) and Ingledew et al. (1996) reported poor fits for the CDSII with an individual sport sample and with hospital workers in a failure condition, respectively. These results suggest that there is cause for concern regarding the factor structure of the CDSII. It has also been noted that respondents of the CDSII have considerable problems understanding some items and the interpretation of scale anchors (see, e.g., Biddle et al., 2001). Within attribution research, there have been recent calls (Crocker et al., 2002) for further instrument development.

In the present study, it was predicted that there would be differential effects of immediate and reflective attributions upon subsequent self-efficacy. It was also predicted that controllable attributions would lead to higher levels of subsequent self-efficacy. As we have suggested, however, the effects of controllability might be moderated by generalisability attributions. Exploratory tests, therefore, were conducted to examine the interactive effects of controllability and the three generalisability dimensions of stability, globality, and universality upon subsequent self-efficacy.

Method

Participants

Sampling was opportunistic, with participants recruited at the site of competitions. Participants were 117 (mean age 25.77, s = 8.45 years) male (n = 97) and female (n = 20) athletes, competing in cycling (n = 51), football (n = 15), field hockey (n = 22), rugby (n = 16), swimming (n = 10), and tennis (n = 3) competitions. The competitive level of participants ranged from club (n = 10) through county (n = 16), regional (n = 44), national (n = 24), and international (n = 23) level.

Measures

Attributions. A 16-item measure (Coffee & Rees, 2008) assessing the four attribution dimensions of controllability, stability, globality, and universality was used to assess participants' attributions for their performance. Each subscale is assessed using four items. In relation to their reason for performance, participants are asked "In general, to what extent is your reason something that . . ." with response options ranging from 1 (*not at all*) to 5 (*completely*). Higher values represent attributions that are more controllable, stable (except for the item "fluctuates across performances," which is reverse scored), global, and universal. The controllability items are: "you could control in the future;" "in the future, you could exert control over;" "in the future, you could change at will;" and, "you could regulate in the future." The stability items are: "remains stable across time," "you feel remains constant over time," "fluctuates across performances" (reverse scored), and, "stays consistent across time." The globality items are: "affects a wide variety of outcomes for you," "relates to a number of different situations you encounter," "influences the outcomes of new situations you face," and, "influences all situations you encounter." The universality items are: "is a common cause of performance for other athletes," "is a cause of performance that other athletes relate to," "can be used to explain the performances of other athletes," and, "is a cause of performance for other athletes as well." Coffee and Rees confirmed the factor structure of the measure with an athletic sample across both least successful (e.g., $\chi^2_{98} = 129.88$, $P = 0.02$; RMSEA = 0.04 , $P = 0.81$; SRMR = 0.04; and, CFI and NNFI = 0.98) and most successful (e.g., $\chi^2_{98} = 129.49$, $P = 0.02$; RMSEA = 0.04, $P = 0.91$; SRMR = 0.05; CFI = 0.98; and, NNFI = 0.97) conditions; coefficient alpha reliabilities for the four scales ranged from 0.79 to 0.91. In the present study, coefficient alpha reliabilities were satisfactory (i.e., ≥ 0.70, Nunnally, 1978) for all scales apart from

globality immediately after (0.68) and upon reflection (0.53) of more successful performances, and stability immediately after (0.56) and upon reflection (0.65) of less successful performances. Nunnally suggested that scale items should have a minimum inter-item average correlation of r = 0.30. The average inter-item correlation across the four conditions was above r = 0.30 for globality (r = 0.43) and stability (r = 0.31), suggesting that in general, the items in the scales have variance relating to what the items have in common.

Self-efficacy. In relation to the up-coming match or competition, participants completed a 6-item measure of self-efficacy. Self-efficacy is defined as the "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). Based upon this definition, items were developed that reflected components of sport performance reported in the literature (Gould, Dieffenbach, & Moffett, 2002; Mahoney, Gabriel, & Perkins, 1987; Orlick & Partington, 1988). For example, the item "perform well, even if things get tough" reflects Gould et al.'s findings that successful athletes are, in part, characterised by mental toughness/resiliency. As self-efficacy is an assessment of perceived capability, items were phrased in terms of *can do* rather than *will do*, and references were made to challenges (e.g., stay calm, *despite the pressure*) to successful performance (see Bandura, 1997). Items are preceded by the statement, "With reference to today's performance, to what extent do you feel confident that you can . . ." with response options ranging from 1 (*not at all*) to 5 (*completely*). The items are: "stay calm despite the pressure;" "stay focused on the most important parts of your performance;" "mobilise all your resources for this performance;" "perform well, even if things get tough;" "raise the level of your performance if you have to;" and, "stay motivated throughout your performance." The mean score of the six items was taken to indicate

participants' levels of self-efficacy for their subsequent performance. In the present study, coefficient alpha reliabilities for the self-efficacy measure ranged from 0.75 to 0.81.

Procedure

Ethical approval was granted by the university ethics committee and participants provided informed consent. Data were collected at three time points between two successive performances. At Time 1 (Day 1), immediately (up to half an hour to give participants a chance to physically recover from competition) after that day's performance, participants were asked, "To what extent was this performance successful for you?" with response options ranging from 1 (*not at all*) to 5 (*completely*). If participants had performed within a team, they were asked to reflect upon their own personal performance, rather than the team's performance. An open-ended statement required participants to write down the single most important reason for how they performed. In relation to this reason, participants completed the attributions measure developed by Coffee and Rees (2008); this was regarded as participants' *immediate* attributions. At Time 2 (Day 4) participants were asked to reflect on their performance at Time 1 and were then asked to write down the single most important reason to explain their performance. In relation to this reason, participants again completed the attributions measure developed by Coffee and Rees; this was regarded as participants' *reflective* attributions. Three days was considered an appropriate amount of time for participants to have reflected upon their performance. This study is the first to assess attributions at multiple time points, and therefore, no research exists to inform an appropriate time-frame for reflective assessments of attributions. At Time 3 (Day 7, 8, or 9), one hour prior to that day's performance (to allow participants time to prepare for performance), participants completed a 6-item measure of self-efficacy relating to an up-coming performance. Data were collected in person at Times 1 and 3. At Time 2, the first author was available over the

telephone for questions from participants as they completed the same attributions measure that was used at Time 1; the measure was collected from participants at Time 3.

Analyses

In general, attribution research has focussed upon attributions following positive and negative events (Weiner, 1985), and in sport, subjective perceptions of success rather than outcome (winning and losing) have been used to distinguish between positive and negative events (e.g., Bond et al., 2001; McAuley, 1985). Therefore, before examining the effects of attributions upon self-efficacy, the data were split into more and less successful performance groups based upon participants' responses to the question "To what extent was this performance successful for you?" Following this procedure, two MANOVAs were conducted to examine whether there were differences in the scores of participants on the attribution dimensions between the more and less successful groups at Times 1 and 2. Eight dependent t-tests (four analyses for each group) were also conducted to examine whether there were differences in the scores of participants across immediate and reflective assessments of the attribution dimensions.

Moderated hierarchical regression analyses (Jaccard, Turrisi, & Wan, 1990) were used to examine the effects of attributions upon self-efficacy. The theoretical perspective of this paper is that sport attribution researchers should examine the main effects of controllability attributions, together with the interactive effects of controllability and generalisability attributions upon outcomes. In the moderated hierarchical regression analyses, therefore, the dependent variable was subsequent self-efficacy and the independent variables were entered in a three-step process. First, controllability was entered; second, stability, globality, and universality, collectively representing *generalisability* were entered; third, the interaction terms for controllability and stability, controllability and globality, and controllability and universality were entered (cf. Rees,

2007). The significance of increments in explained variance (ΔR^2) in subsequent self-efficacy over and above the variance accounted for by those variables already entered into the equation, as well as the sign of the regression coefficients (*b*), was then assessed at each step. In the case of a significant increment in explained variance, the significance values of the regression coefficients were used to identify salient variables. Jaccard et al. emphasised that the independent variables should be centred prior to the formation of product terms. In this study's analyses all the independent variables were standardised, thereby centring them, before any product terms were computed, and the unstandardised solution was then examined.

Lastly, observed variable path analysis using LISREL 8.30 (Jöreskog & Sörbom, 1996) was used, where appropriate, to determine if immediate and reflective attributions were associated with independent effects upon subsequent self-efficacy, or whether reflective attributions mediated the effect of immediate attributions upon subsequent self-efficacy. The significance of a mediated effect was tested by examining the unstandardised path coefficients and their standard errors according to Sobel's (1982) test. An alpha level of 0.05 was used for all statistical tests.

Results

Based upon the frequency data for the question "To what extent was this performance successful for you?" (median = 3), participant responses of 4 and 5 ($n = 51$, mean = 4.49) were considered high, and participant responses of 1 and 2 were considered low (hereafter termed *less successful*). Participants with a score of 3 ($n = 20$) were omitted from the study. Two MANOVAs indicated that there were no significant differences for immediate attributions (Wilks' $\Lambda = 0.93$, $F_{4, 90} = 1.62$, $P > 0.05$, $\eta_p^2 = 0.07$, observed power = 0.48) and for reflective attributions (Wilks' $\Lambda = 0.91$, $F_{4, 90} = 2.23$, $P > 0.05$, $\eta_p^2 = 0.09$, observed power = 0.63) in the

scores of participants on the attribution dimensions between the more successful and less successful groups. Dependent t-tests indicated a significant difference between immediate and reflective universality for the more successful group (t_{50} = -2.01, $P < 0.05$) and for the less successful group (t_{45} = -2.12, $P < 0.05$). Means, standard deviations, coefficient alpha reliabilities, and intercorrelations for all scales are presented in Tables 1 and 2.

Assumptions were tested and satisfied for all regression analyses. Across analyses, standardised residuals were less than 3 and values for Cook's distance were less than 1 suggesting that there were no cases that substantially differed from the main trend of the data and that no cases exerted an undue influence over the parameters of the model (Field, 2005, Stevens, 2002). Across analyses, the assumption of no multicollinearity was satisfied: intercorrelations between independent variables were not greater than .8, variation inflation factor values were below 10, and tolerance values were above .2 (Stevens, 2002).

Results for the More Successful Group

Immediate attributions. There was no significant main effect for controllability upon subsequent self-efficacy (Table 3). Over and above the variance accounted for by controllability (R^2 = 0.07), there was a significant effect for the generalisability dimensions upon subsequent self-efficacy (ΔR^2 = 0.27, $P < 0.01$), primarily attributable to globality (b = 0.37, $P < 0.01$). There were no significant effects for the interactive terms upon subsequent self-efficacy. These results suggest that immediately after performance, global causes for performance were associated with higher levels of subsequent self-efficacy.

Reflective attributions. There was no significant main effect for controllability upon subsequent self-efficacy. Over and above the variance accounted for by controllability (R^2 = 0.03), there were significant effects for the generalisability dimensions upon subsequent self-

efficacy ($\Delta R^2 = 0.27$, $P < 0.01$) attributable to all three dimensions (stability: $b = 0.16$, $P < 0.05$; globality: $b = 0.27$, $P < 0.05$; and, universality: $b = -0.27$, $P < 0.05$). There were no significant effects for the interactive terms upon subsequent self-efficacy. These results suggest that upon reflection of performance, stable, and/or global, and/or personal causes for performance were associated with higher levels of subsequent self-efficacy.

Results for the Less Successful Group

Immediate attributions. There was a significant main effect for controllability upon subsequent self-efficacy ($R^2 = 0.27$, $b = 0.26$, $P < 0.01$) (Table 4). Over and above the variance accounted for by controllability, there were no significant effects for the generalisability dimensions upon subsequent self-efficacy. There was a significant effect for the interactive terms upon subsequent self-efficacy ($\Delta R^2 = 0.18$, $P < 0.01$), primarily attributable to the interaction of controllability and stability ($b = 0.19$, $P < 0.01$). Following the recommendations of Aiken and West (1991), the final regression equation included controllability ($R^2 = 0.27$, $b = 0.30$, $P < 0.01$), stability ($\Delta R^2 = 0.01$, $b = 0.04$, $P < 0.05$), and the interaction of controllability and stability ($\Delta R^2 = 0.17$, $b = 0.20$, $P < 0.01$). Figure 1(a) demonstrates that immediately after performance, if causes were perceived to be stable (stability +1 *SD* above its mean), higher levels of controllability were associated with higher levels of subsequent self-efficacy. Figure 1(b) demonstrates that the effect of controllability upon subsequent self-efficacy is significant at relatively moderate to high levels of stability ($\geq$ -0.80 standard deviations in the level of stability).

Reflective attributions. There was a significant main effect for controllability upon subsequent self-efficacy ($R^2 = 0.17$, $b = 0.21$, $P < 0.01$) (Table 4). Over and above the variance accounted for by controllability, there were no significant effects for the generalisability

dimensions upon subsequent self-efficacy. There was a significant effect for the interactive terms upon subsequent self-efficacy ($\Delta R^2 = 0.23$, $P < 0.01$), primarily attributable to the interaction of controllability and stability ($b = 0.25$, $P < 0.01$). Following the recommendations of Aiken and West (1991), the final regression equation included controllability ($R^2 = 0.17$, $b = 0.17$, $P < 0.01$), stability ($\Delta R^2 = 0.01$, $b = 0.03$, $P > 0.05$), and the interaction of controllability and stability ($\Delta R^2 = 0.24$, $b = 0.23$, $P < 0.01$) [Figure 2(a)]. Figure 2(b) demonstrates that the effect of controllability upon subsequent self-efficacy is significant at moderate to high levels of stability ($\geq$ -0.17 standard deviations in the level of stability). There is a second region of significance. At $\leq$ -1.87 standard deviations in the level of stability, controllability has a negative effect upon subsequent self-efficacy; this region, however, includes data from only two participants (4% of the respective sample).

Relationships between Immediate Attributions, Reflective Attributions and Subsequent Self-Efficacy

Figure 3(a) demonstrates the relationships between immediate and reflective globality attributions and subsequent self-efficacy following more successful performances. Figure 3(b) demonstrates the relationships between immediate and reflective controllability attributions and subsequent self-efficacy following less successful performances. In both cases, reflective attributions did not significantly predict subsequent self-efficacy when immediate attributions were included in the model, suggesting that there may be little benefit in assessing attributions beyond immediate assessments. Figure 3(c) demonstrates the relationships between immediate and reflective interactions of controllability and stability attributions and subsequent self-efficacy following less successful performances. In this case, immediate attributions did not significantly predict subsequent self-efficacy when reflective attributions were included in the model. For this

model, because immediate attributions were assessed before reflective attributions, there is evidence that the effect of immediate attributions upon subsequent self-efficacy was mediated by reflective attributions; the mediated effect was significant (Sobel's, 1982, test: $z = 2.92$, $P < 0.01$). This result suggests that assessments of reflective attributions may help to further our understanding of the nature of the effects of attributions upon outcomes such as self-efficacy.

Discussion

The aim of the present study was to examine the main and interactive effects of immediate and reflective controllability and generalisability attributions upon subsequent self-efficacy. For the more successful group, there was no significant effect for controllability upon subsequent self-efficacy, but there were significant effects for the generalisability dimensions (stability, globality, and universality) upon subsequent self-efficacy; these effects differed across time. Immediately after more successful performances, global attributions (likely to affect a wide range of situations) were associated with higher levels of subsequent self-efficacy; upon reflection, stable (likely to recur), and/or global, and/or personal (unique to the individual) attributions were associated with higher levels of subsequent self-efficacy. In other words, following more successful performances, regardless of the controllability of causes, attributions that are perceived to *generalise* across time, and/or situations, and/or are perceived to be unique to an individual are associated with higher levels of subsequent self-efficacy. Similarly, Bond et al. (2001) found that under conditions of perceived success, participants who generalised causes of success across time had higher levels of self-efficacy. The results of the present study suggest that in addition to stability, further generalisability dimensions of globality and universality affect self-efficacy. This supports propositions (e.g., Rees et al., 2005) for an expanded conceptualisation of generalisability in attribution research. In addition to whether causes

generalise across time (stability), attribution research should also examine whether causes generalise across situations (globality) and/or all people (universality).

For the less successful group, there was a significant effect for controllability upon subsequent self-efficacy, together with an interactive effect for controllability and stability upon subsequent self-efficacy; these effects were similar across time. The effect of controllability upon subsequent self-efficacy demonstrates that immediately after and upon reflection of less successful performances, controllable attributions are associated with higher levels of subsequent self-efficacy. In the research of Anderson and colleagues (e.g., Anderson & Riger, 1991), controllability is considered the most important attribution dimension. Furthermore, Bandura and Wood (1989), and Gernigon and Delloye (2003) also found that individuals who believed the environment was controllable were motivated to exercise fully their self-efficacy. Two significant interactions demonstrated that stability moderates the effect of controllability upon subsequent self-efficacy. It would appear that if causes of less successful performances are perceived as likely to recur (relatively higher levels of stability), higher levels of controllability are associated with higher levels of self-efficacy. In other words, when a cause of a less successful performance is perceived as likely to recur, it is important to perceive that the cause is controllable.

Significant effects for globality upon subsequent self-efficacy were found immediately after and upon reflection of more successful performances. Significant effects for controllability and the interaction of controllability and stability upon subsequent self-efficacy were found immediately after and upon reflection of less successful performances. The results of path analyses suggest that for the effects of globality and controllability upon subsequent self-efficacy, reflective attributions did not significantly predict subsequent self-efficacy when

immediate attributions were included in the model. These results suggest that there is little benefit in assessing attributions beyond immediate assessments. For the effects of the interaction for controllability and stability attributions upon subsequent self-efficacy, immediate attributions did not significantly predict subsequent self-efficacy when reflective attributions were included in the model. As immediate attributions were assessed before reflective attributions, an alternative interpretation is that the effect of immediate attributions upon subsequent self-efficacy was mediated by reflective attributions. Based upon the latter interpretation, the results suggest that assessments of reflective attributions may help to further our understanding of the nature of the relationships between attributions and outcomes such as self-efficacy. Indeed, the results of the present study demonstrate that, in some instances, the salience of immediate attributions in predicting subsequent self-efficacy may be reduced when reflective attributions are taken into account.

Differential effects for immediate and reflective attributions upon subsequent self-efficacy were observed for the more successful group, but not for the less successful group. It would appear that following less successful performances, a satisfactory attribution might have been generated during performance or within half-an-hour following performance. This may be a reflection of the relatively high competitive standard of participants in the present study. Of the 46 participants in the less successful group, 36 (78%) were regional, national, and international performers. From extensive sporting experience, a number of satisfactory explanations for less successful performances are likely to be stored in accessible knowledge structures (Anderson et al., 1996; Fiske & Taylor, 1991). Following a less successful performance, experienced performers may simply form a satisfactory immediate attribution from the retrieval of a stored explanation. The differential effects for immediate and reflective attributions upon subsequent

self-efficacy for the more successful group might reflect the relative timing of when satisfactory attributions are generated following more successful performances. It is reasonable to suggest that a more successful performance is likely to be expected to a greater extent than a less successful performance (Weiner, 1985; Wong & Weiner, 1981). The need, therefore, to immediately generate satisfactory explanations for more successful performances may not be as great as the need to immediately generate satisfactory explanations for less successful performances. Following more successful performances, a satisfactory attribution might be generated upon reflection of performance.

A strength of the present study is that the relationships between the independent (attributions) and dependent (subsequent self-efficacy) variables were examined using data collected at different time points. Participants' attributions were assessed at Time 1 (Day 1) and at Time 2 (Day 4; before self-efficacy), and consisted of participants' recollection of causes of performance. Self-efficacy was assessed at Time 3 (Day 7, 8, or 9; after attributions), and concerned participants' forethought about upcoming performance. There are, however, a number of limitations to the present study that prevent firm conclusions from being drawn: (a) self-efficacy was only assessed at one time point, (b) small samples were used to represent more successful and less successful performances, (c) variables were assessed with unpublished measures that have not been fully established, and (d) low (i.e., < 0.70, Nunnally, 1978) coefficient alpha reliabilities and relatively low average inter-item correlations were reported for stability and globality. These limitations will now be discussed.

In previous research (e.g., Bond et al., 2001; Gernigon & Delloye, 2003), self-efficacy has been assessed at two time points: prior self-efficacy and subsequent self-efficacy. Prior self-efficacy is entered as a control variable in the hierarchical regression analysis and the effects of

attributions upon the *change* in self-efficacy is examined. In the present study, the results relate to attributions and *subsequent* self-efficacy, and not the change in self-efficacy. It is important to note, therefore, that no causal link can be inferred from the present study (see, e.g., Campbell & Stanley, 1963).

The present study had an original sample size of 117 participants. After removing 20 participants before analyses, the more successful group comprised 51 participants, and the less successful group comprised 46 participants. There is some concern in the scientific community that small sample sizes could lead to published research that might contain inconsistencies about what is statistically significant and what is not (see, e.g., Maxwell, 2004). The counter-argument, however, is that when data on important questions are difficult to obtain, small-sample research can be useful for stimulating ideas and theory (Peterson, Smith, & Martorana, 2006). We believe that the present study serves as a stimulus for future research to examine the effects of attributions assessed across time upon outcomes such as self-efficacy, as well as examining interactions among attribution dimensions.

Further validation work needs to be conducted and published on the attributions measure used in the present study before the results of the present study can be viewed with greater confidence. In the present study, coefficient alpha reliabilities and the average inter-item correlations for the stability and globality attribution scales were relatively low. Aiken and West (1991) argued that low reliabilities can have a significant impact on the ability to detect interaction effects. Compared to analyses with no measurement error ($\alpha = 1.00$), the power of analyses is reduced by up to half by having reliabilities of 0.80 and is reduced by up to two thirds when reliabilities drop to 0.70 (Aiken & West, 1991). The use of structural equation modelling would have accounted for measurement error (Jöreskog & Sörbom, 1996). In the present study,

however, sample sizes were too low to incorporate both measurement and structural analyses in a latent variable path analysis (see, e.g., Marsh, Hau, Balla, & Grayson, 1998). With the use of larger samples, future research might consider testing for interactions using structural equation modelling.

Some further avenues exist for future research. As was suggested earlier, the absence of differential effects for immediate and reflective attributions upon subsequent self-efficacy following less successful performances may be due to the relatively high competitive standard of participants in the present study. At lower competitive standards, a satisfactory attribution following less successful performances may take longer to be generated due to an initial lack of knowledge (Anderson et al., 1996). This raises the implication for practitioners concerning when to intervene and when to try and retrain attributions. Empirical evidence to inform this process might be generated through further attribution research using an immediate and reflective framework with participants of varying competitive standards. Although, in the present study, we did not examine the effects of gender upon the attribution process, Gernigon and Delloye (2003) found differential effects of attributions upon self-efficacy for males and females. Future research is necessary to examine whether males and females generate similar immediate and reflective attributions, and what consequences any gender differences may have upon outcomes such as self-efficacy.

Based upon the results of this study, after more successful performances, practitioners should encourage athletes to believe that the causes of success are likely to recur, and/or are likely to positively affect a wide range of situations, and/or are unique to the athlete. After less successful performances, however, practitioners should in general encourage athletes to focus upon aspects of their performance that they can control; this is particularly the case when athletes

view causes of less successful performances as likely to recur. This study serves as a stimulus for future research to examine the effects of attributions measured at multiple time points upon outcomes such as self-efficacy. This study has also provided further evidence in sport for the importance of controllability attributions, together with demonstrating the benefit of focusing upon the interactive effects of controllability and generalisability attributions.

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Table 1

Means, Standard Deviations, Coefficient Alpha Reliabilities, and Intercorrelations of Attribution Dimensions and Subsequent Self-Efficacy for the More Successful Group.

	Mean ± *s*	α	IC	IS	IG	IU	RC	RS	RG	RU
Immediate Attributions										
Controllability (IC)	3.67 ± 0.81	0.82								
Stability (IS)	2.73 ± 0.76	0.71	-0.28*							
Globality (IG)	3.38 ± 0.71	0.68	-0.56**	-0.33*						
Universality (IU)	3.70 ± 0.75	0.79	-0.50**	-0.04	-0.36*					
Reflective Attributions										
Controllability (RC)	3.69 ± 0.81	0.87	-0.28*	-0.10	-0.22	-0.09				
Stability (RS)	2.83 ± 0.85	0.70	-0.07	-0.61**	-0.25	-0.08	-0.10			
Globality (RG)	3.50 ± 0.52	0.53	-0.39**	-0.25	-0.64**	-0.26	-0.16	-0.27		
Universality (RU)	3.93 ± 0.58	0.78	-0.06	-0.20	-0.05	-0.24	-0.39**	-0.07	-0.30*	
Dependent Variable										
Subsequent Self-efficacy	3.59 ± 0.61	0.81	-0.26	-0.29*	-0.56**	-0.12	-0.16	-0.36**	-0.31*	-0.17

Note. $n = 51$.

α = Cronbach alpha.

*$P < 0.05$. **$P < 0.01$.

Table 2

Means, Standard Deviations, Coefficient Alpha Reliabilities, and Intercorrelations of Attribution Dimensions and Subsequent Self-Efficacy for the Less Successful Group.

	Mean ± *s*	α	IC	IS	IG	IU	RC	RS	RG	RU
Immediate Attributions										
Controllability (IC)	3.39 ± 0.81	0.81								
Stability (IS)	2.69 ± 0.68	0.56	-0.01							
Globality (IG)	3.09 ± 0.81	0.78	-0.05	-0.11						
Universality (IU)	3.46 ± 0.85	0.87	-0.28	-0.03	-0.27					
Reflective Attributions										
Controllability (RC)	3.36 ± 0.88	0.84	-0.82**	-0.02	-0.00	-0.07				
Stability (RS)	2.77 ± 0.74	0.65	-0.22	-0.65**	-0.17	-0.09	-0.18			
Globality (RG)	3.12 ± 0.88	0.90	-0.29*	-0.09	-0.60**	-0.39**	-0.14	-0.23		
Universality (RU)	3.67 ± 0.72	0.86	-0.40**	-0.07	-0.15	-0.64**	-0.35*	-0.22	-0.33*	
Dependent Variable										
Subsequent Self-efficacy	3.79 ± 0.51	0.75	-0.52**	-0.10	-0.22	-0.23	-0.41**	-0.14	-0.08	-0.28

Note. $n = 46$.

α = Cronbach alpha.

*$P < 0.05$. **$P < 0.01$.

Table 3

Main and Interactive Effects of Attributions upon Subsequent Self-Efficacy for the More Successful Group. Dependent Variable: Subsequent Self-Efficacy.

Step	Independent variable	ΔR^{2a}	b^{b} (standard error)
	Immediate Attributions		
1	Controllability	0.07**	-0.17** (0.09)
2	Generalisability	0.27**	
	Stability		-0.08** (0.08)
	Globality		-0.37** (0.10)
	Universality		-0.03** (0.09)
3	Interactive terms	0.03**	
	Controllability*Stability		-0.04** (0.09)
	Controllability*Globality		-0.14** (0.12)
	Controllability*Universality		-0.18** (0.12)
	Reflective Attributions		
1	Controllability	0.03**	-0.10** (0.09)
2	Generalisability	0.27**	
	Stability		-0.16** (0.07)
	Globality		-0.27** (0.12)
	Universality		-0.27** (0.10)
3	Interactive terms	0.07**	
	Controllability*Stability		-0.13** (0.07)
	Controllability*Globality		-0.19** (0.13)
	Controllability*Universality		-0.03** (0.12)

Note. $n = 51$. All variables standardised except for interactive terms. Interactive terms formed from preceding (standardised) variables.

[a]Stepwise change in R^2. [b]Unstandardised regression coefficient in respective step.

*$P < 0.05$. **$P < 0.01$.

Table 4

Main and Interactive Effects of Attributions upon Subsequent Self-Efficacy for the Less Successful Group. Dependent Variable: Subsequent Self-Efficacy.

Step	Independent variable	ΔR^{2a}	b^{b} (standard error)
	Immediate Attributions		
1	Controllability	0.27**	-0.26** (0.06)
2	Generalisability	0.10**	
	Stability		-0.07** (0.07)
	Globality		-0.15** (0.06)
	Universality		-0.09** (0.07)
3	Interactive terms	0.18**	
	Controllability*Stability		-0.19** (0.06)
	Controllability*Globality		-0.05** (0.05)
	Controllability*Universality		-0.05** (0.06)
	Reflective Attributions		
1	Controllability	0.17**	-0.21** (0.07)
2	Generalisability	0.06**	
	Stability		-0.05** (0.08)
	Globality		-0.10** (0.06)
	Universality		-0.11** (0.08)
3	Interactive terms	0.23**	
	Controllability*Stability		-0.25** (0.07)
	Controllability*Globality		-0.07** (0.06)
	Controllability*Universality		-0.12** (0.07)

Note. $n = 46$. All variables standardised except for interactive terms. Interactive terms formed from preceding (standardised) variables.

[a]Stepwise change in R^2. [b]Unstandardised regression coefficient in respective step.

*$P < 0.05$. **$P < 0.01$.

Figure Captions

Figure 1. The interactive effect for immediate controllability and stability upon subsequent self-efficacy for the less successful group.

Figure 2. The interactive effect for reflective controllability and stability upon subsequent self-efficacy for the less successful group.

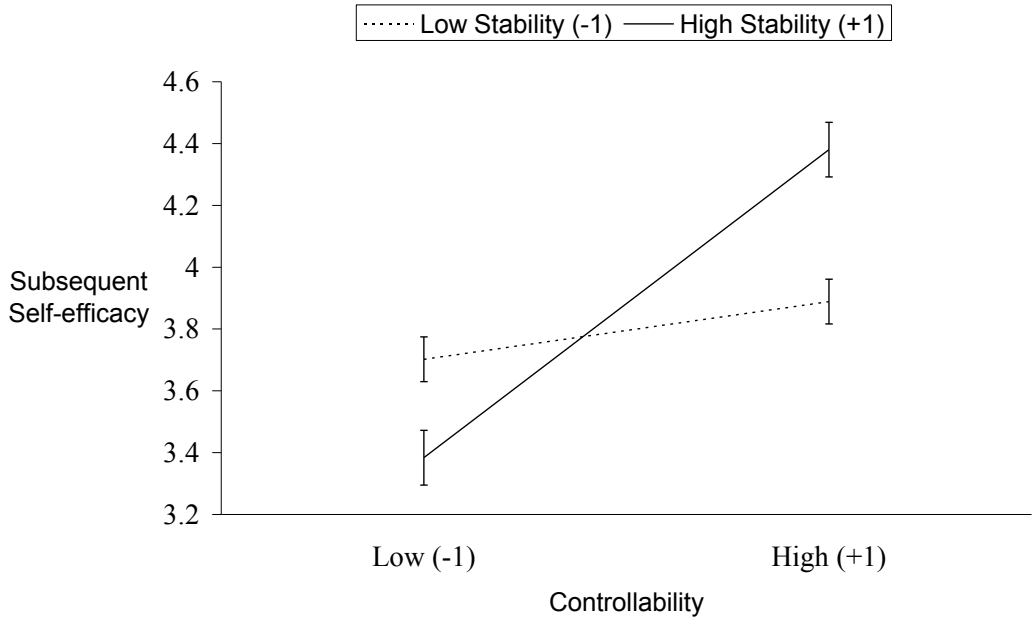
Figure 3. The estimated unstandardised path coefficients and *t*-values for immediate and reflective attributions and subsequent self-efficacy [(a) effects following more successful performances. (b) and (c) effects following less successful performances].

For Figure 3:

Note. *denotes unstandardised path coefficient $P < 0.05$. **denotes unstandardised path coefficient $P < 0.01$.

Figure 1

(a)


Low Stability (-1)
High Stability (+1)
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
Subsequent
Self-efficacy
Low (-1)
High (+1)
Controllability

(b)

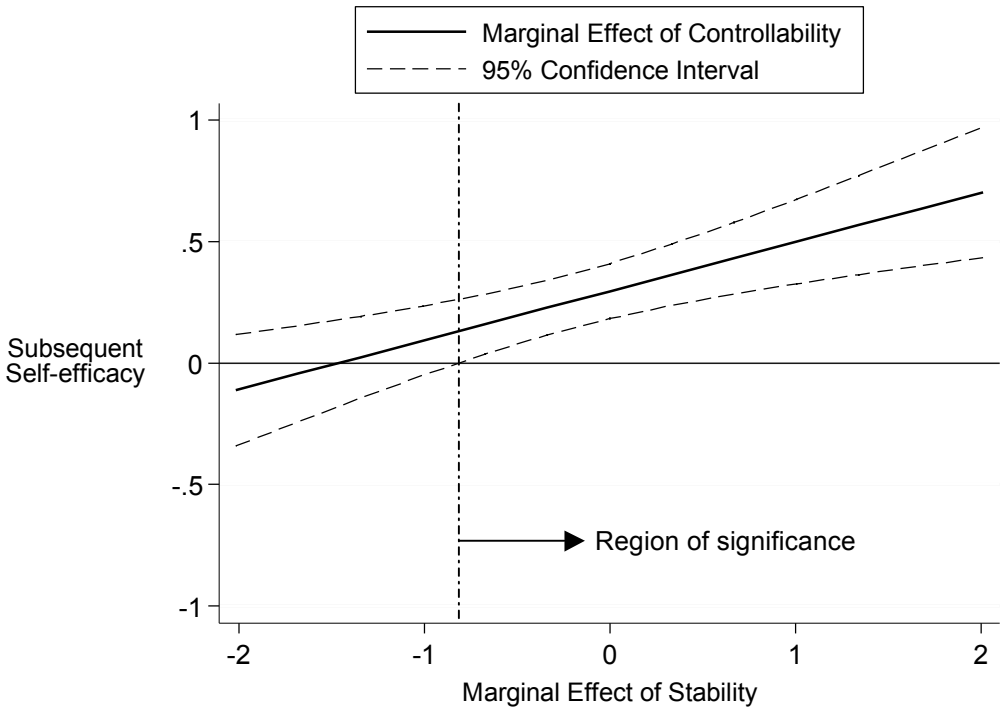
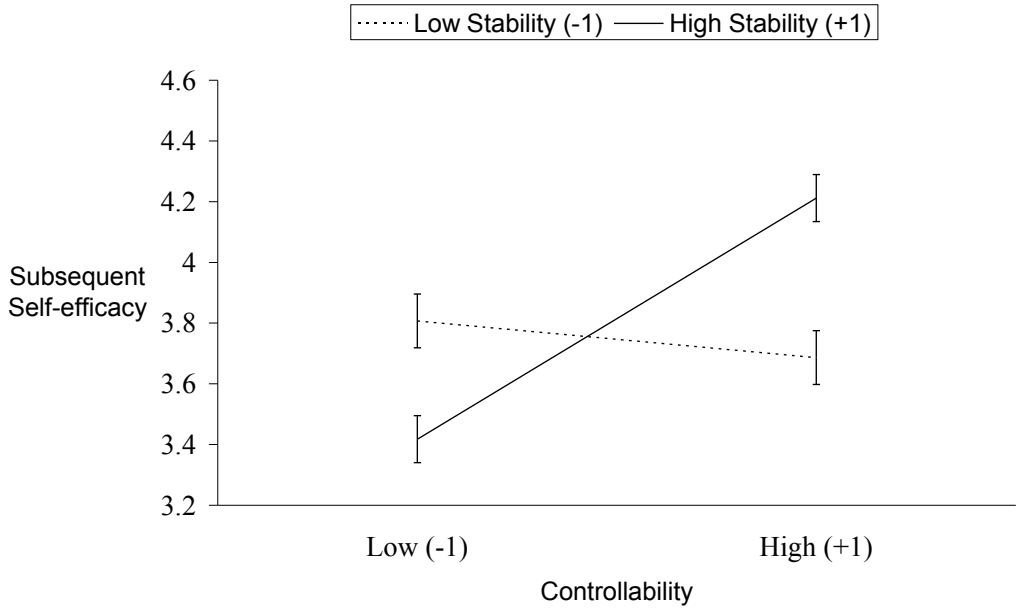

Marginal Effect of Controllability
95% Confidence Interval
1
.5
0
-.5
-1
Subsequent
Self-efficacy
Region of significance
-2
-1
0
1
2
Marginal Effect of Stability

Figure 2

(a)


Low Stability (-1)
High Stability (+1)
4.6
4.4
4.2
4
3.8
3.6
3.4
3.2
Subsequent Self-efficacy
Low (-1)
High (+1)
Controllability

(b)

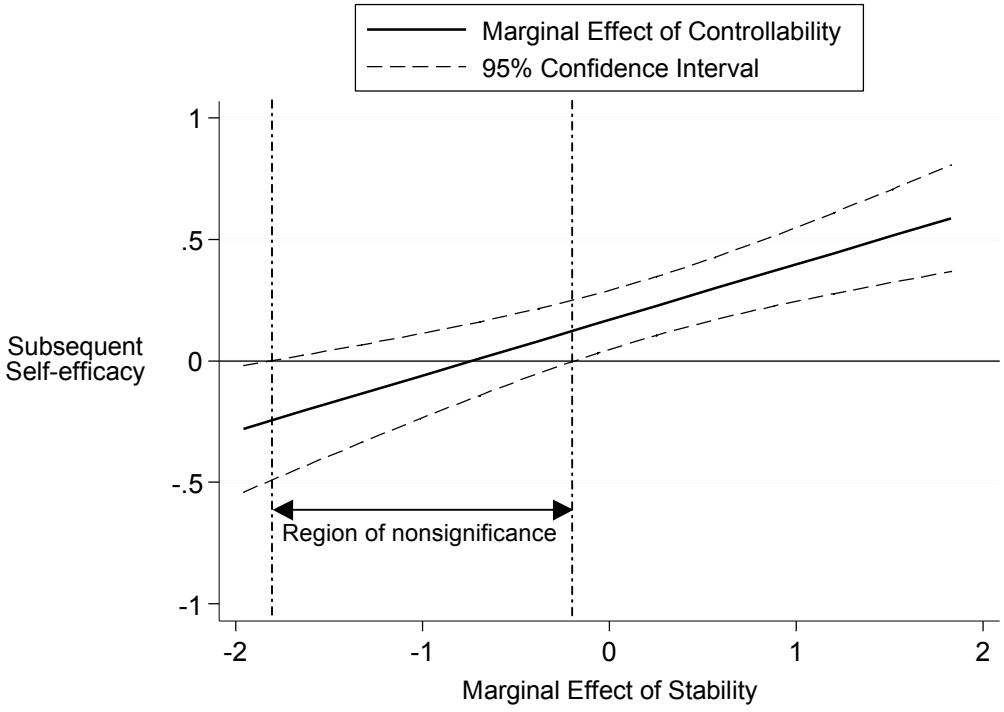
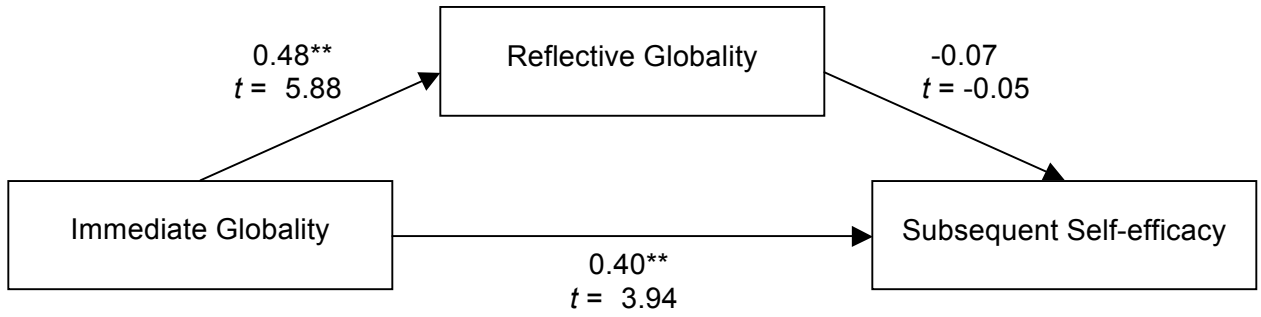
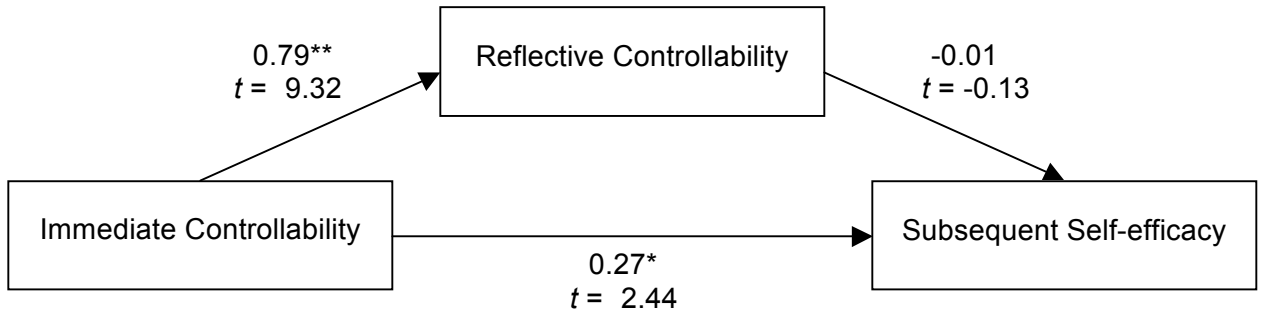

Marginal Effect of Controllability
95% Confidence Interval
1
.5
0
-.5
-1
Subsequent Self-efficacy
Region of nonsignificance
-2
-1
0
1
2
Marginal Effect of Stability

Figure 3

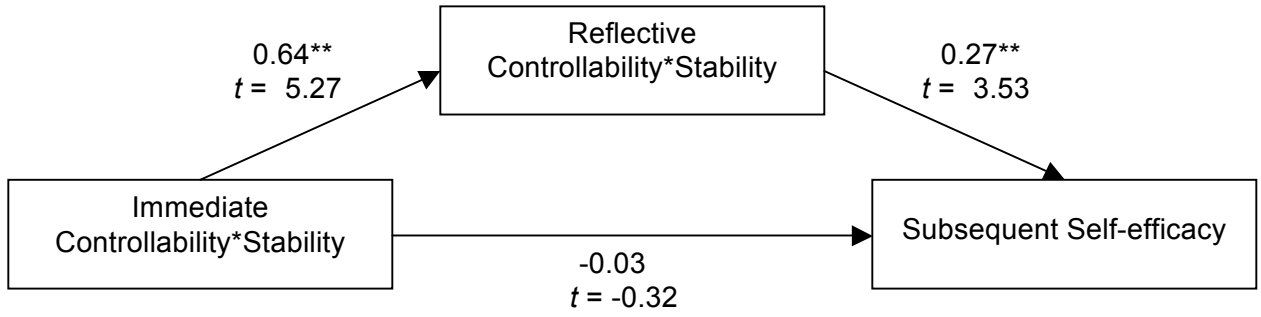
(a)


0.48**
t = 5.88
Reflective Globality
-0.07
t = -0.05
Immediate Globality
Subsequent Self-efficacy
0.40**
t = 3.94

(b)


0.79**
t = 9.32
Reflective Controllability
-0.01
t = -0.13
Immediate Controllability
Subsequent Self-efficacy
0.27*
t = 2.44

(c)


0.64**
t = 5.27
Reflective
Controllability*Stability
0.27**
t = 3.53
Immediate
Controllability*Stability
Subsequent Self-efficacy
-0.03
t = -0.32