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### Athlete imagery ability: A predictor of confidence and anxiety intensity and direction

Williams, Sarah; Cumming, Jennifer

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1 Running head: IMAGERY ABILITY, CONFIDENCE, AND ANXIETY

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4 Athlete Imagery Ability: A Predictor of Confidence and Anxiety Intensity and Direction

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Sarah E. Williams\* and Jennifer Cumming

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University of Birmingham

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12 School of Sport, Exercise & Rehabilitation Sciences, University of Birmingham,

13 Edgbaston, Birmingham, B15 2TT. UK.

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15 \*Corresponding author: [S.E.Williams@bham.ac.uk](mailto:S.E.Williams@bham.ac.uk)

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## 1 Abstract

2 This study investigated whether athletes' sport imagery ability predicted the intensity  
3 and direction of their trait-anxiety, and whether trait-confidence mediated this  
4 relationship. Three-hundred and fifteen male ( $n = 181$ ) and female ( $n = 134$ ) athletes  
5 ( $M_{age} = 19.23$ ;  $SD = 1.16$ ) completed the Sport Imagery Ability Questionnaire to  
6 measure skill, strategy, goal, affect, and mastery ease of imaging, and the Competitive  
7 Trait Anxiety Inventory-2 to measure the intensity and direction of cognitive and  
8 somatic anxiety and self-confidence. Structural equation modeling supported a model  
9 whereby mastery and goal imagery ability positively predicted confidence. This in turn  
10 negatively predicted cognitive and somatic anxiety intensity and positively predicted  
11 cognitive and somatic anxiety direction. Mastery and goal imagery ability indirectly  
12 predicted cognitive and somatic anxiety intensity and direction via self-confidence.  
13 However, mastery ease of imaging directly predicted cognitive anxiety intensity.  
14 Results demonstrate the importance of mastery and goal imagery ability in regulating  
15 confidence and the intensity and direction of anxiety symptoms. Results infer that  
16 individuals who are better at seeing themselves achieving goals and performing well in  
17 difficult situations are able to reduce the impact of negative images by replacing these  
18 with positive ones.

19

20 Key words: cognitive anxiety, confidence, ease of imaging, somatic anxiety

21



1 confidence (e.g., Cumming et al., 2007; Hanton & Jones, 1999b; Hanton, Mellalieu, &  
2 Hall, 2004; Thomas, Maynard, & Hanton, 2007; Williams et al., 2010). Imagery scripts  
3 containing descriptions of anxiety symptoms with feelings of confidence and positive  
4 cognitions of being in control of the situation (i.e., coping imagery) elicit anxiety  
5 symptoms as more helpful towards an upcoming competitive performance (Cumming et  
6 al., 2007; Williams et al., 2010).

7         The mechanism by which these changes occur was proposed by Hanton et al.  
8 (2004) who suggested that higher levels of self-confidence enable athletes to maintain a  
9 positive outlook with regards to competition. By modifying thoughts and feelings, self-  
10 confidence can lead to more facilitative interpretations of anxiety symptoms (see also  
11 Jones & Hanton, 2001). In other words, confidence may mediate the relationship  
12 between imagery use and anxiety symptoms. In support, elite athletes have reported  
13 deliberately using confidence-enhancing strategies such as imagery to reduce  
14 debilitating symptoms of anxiety (Hanton et al., 2004). The findings from Hanton et  
15 al.'s (2004) study also emphasize that anxiety direction may be more influential on  
16 performance outcomes than anxiety intensity (see also Hanton & Jones, 1999a; Neil,  
17 Wilson, Mellalieu, Hanton, & Taylor, 2012).

18         While a relationship between confidence, anxiety and imagery use is well-  
19 established, this relationship has not yet been extended to imagery ability. Imagery  
20 ability can be defined as “an individual’s capability to form vivid, controllable images  
21 and retain them for sufficient time to effect the desired imagery rehearsal” (Morris,  
22 Spittle, & Watt, 2005, p. 37). Consequently, one’s ability to image is reflected through  
23 various dimensions such as vividness, controllability, and ease. Emotion is another  
24 construct sometimes assessed as it is thought that an emotive image is likely to be more  
25 vivid (Lang, Kozak, Miller, Levin, & McLean, 1980). Vividness is the “clarity and  
26 ‘sharpness’ or sensory richness” of an image, whereas controllability refers to the “ease

1 and accuracy with which an image can be transformed or manipulated in one's mind"  
2 (Moran, 1993; p. 158). Conversely, ease of imaging is the amount of effort required to  
3 create and control an image (Cumming & Williams, 2012). While it has been suggested  
4 that vividness relates to imagery generation and control refers to its manipulation, ease  
5 of imaging reflects these different aspects of the imagery processes (Williams &  
6 Cumming, 2011).

7 From an applied perspective, it is important to consider the relationship between  
8 imagery ability and confidence and anxiety. Because, a person's capacity to image can  
9 determine the effectiveness of imagery use (Cumming & Williams, 2012; Robin et al.,  
10 2007). Individuals with higher imagery ability experience more benefits from imaging  
11 compared to their lower level counterparts (e.g., Gregg, Hall, & Nederhof, 2005; Robin  
12 et al., 2007; Williams, Cooley, & Cumming, 2013). Imagery ability can also directly  
13 predict tendencies such as challenge and threat appraisals, confidence, and anxiety  
14 intensity (e.g., Williams & Cumming, 2012c; Abma et al., 2002; Vadocz et al., 1997).  
15 However, the exact nature of these relationships has varied. In some research, athletes  
16 displaying higher levels of confidence have been found to report greater imagery ability  
17 than those with lower confidence (Barr & Hall, 1992; Moritz et al., 1996). Other  
18 studies have demonstrated no differences in imagery ability between high and low  
19 confident athlete groups (see Abma et al., 2002; Vadocz et al., 1997). Similarly, the  
20 relationship between imagery ability and anxiety intensity has not been consistent  
21 between studies (see Vadocz et al., 1997; Monsma & Overby, 2004), and to our  
22 knowledge the relationship between imagery ability and the interpretation of anxiety  
23 symptoms has not yet been investigated.

24 The measure of imagery ability used within previously conducted studies  
25 examining the relationship between imagery ability, and confidence and anxiety may  
26 partly explain why results have been inconsistent. Participants' ability to image simple

1 movements were measured despite there being a much wider range of imagery content  
2 employed by athletes (Williams & Cumming, 2012c). Athletes report imaging  
3 themselves performing skills and strategies, achieving goals and outcomes,  
4 experiencing feelings and emotions associated with performance (i.e., affect imagery),  
5 and positive cognitions while performing well in difficult situations (i.e., mastery  
6 imagery) (Cumming & Williams, 2011). As imagery ability varies with the content  
7 imaged (Williams & Cumming, 2011), measuring athletes' ability to image simple  
8 movements provides a limited explanation of their confidence and anxiety responses to  
9 competition. It is likely that the ability to image sport content would be even more  
10 informative. By employing a measure assessing different sport specific imagery  
11 content, the relationship between imagery ability, confidence, and anxiety can now be  
12 more comprehensively investigated.

13         Based on Bandura's social cognitive theory (1977, 1997), researchers have  
14 suggested that if an athlete images himself/herself successfully performing skills and  
15 strategies, or mastering difficult situations, these images are likely to serve as a stronger  
16 source of confidence by acting as a performance accomplishment (e.g., Callow &  
17 Hardy, 2001; Callow & Waters, 2005). Williams and Cumming (2012c) argue that if an  
18 athlete has a greater capacity to image this content (i.e., greater skill, strategy, goal, and  
19 mastery imagery ability), it may act as a stronger source of confidence. Although  
20 athletes can use a variety of imagery content to enhance confidence and regulate anxiety  
21 (Cumming & Williams, 2012), the use of mastery-type images has shown the strongest  
22 link to confidence (e.g., Callow, Hardy & Hall, 1998; Vadocz et al., 1997). Similarly,  
23 the use of arousal-type images often has the strongest link to anxiety (e.g., Vadocz et  
24 al., 1997; Monsma & Overby, 2004). Imagery content emphasizing positive feelings  
25 and emotions has also been used by researchers to regulate anxiety and enhance  
26 confidence (e.g., Cumming et al., 2007; Hale & Whitehouse, 1998; Williams et al.,

1 2010; Williams & Cumming, 2012b). It is likely that a similar relationship may exist  
2 between imagery ability, and confidence and anxiety; that is, an athlete's ability to  
3 image positive mastery (e.g., performing well under pressure) and affect (e.g., the  
4 feelings associated with a successful performance) imagery content may also have the  
5 strongest links to confidence and anxiety levels respectively.

6 With this in mind the purpose of the present study was designed to test a model  
7 examining the relationship between sport imagery ability, trait-confidence, and  
8 cognitive and somatic anxiety intensity and direction. To gain greater insight into the  
9 direct influence that imagery ability has on an athlete's trait-confidence, the study re-  
10 examined the relationship between SIAQ images and confidence. A second aim was to  
11 investigate whether affect and mastery imagery ability directly predict cognitive and  
12 somatic anxiety intensity and direction, and whether this relationship is mediated  
13 through trait-confidence – a possibility which has yet to be investigated in the literature.

14 Drawing from social cognitive theory, it was hypothesized that by serving as a  
15 source of performance accomplishment, greater imagery ability as measured by the  
16 SIAQ, regardless of imagery content, would positively predict trait-confidence.  
17 However, the ability to image mastery content was expected to be the strongest  
18 predictor. It was also hypothesized that trait-confidence would mediate the relationship  
19 between ease of imaging and cognitive and somatic anxiety intensity and direction by  
20 negatively predicting anxiety intensity and positively predicting anxiety direction. In  
21 addition to mediation, it was predicted that affect and mastery imagery ability would  
22 negatively predict cognitive and somatic anxiety intensity but positively predict their  
23 direction. The hypothesized model can be seen in Figure 1.

## 24 **Method**

### 25 **Participants**



1            Three hundred and fifteen male ( $n = 181$ ) and female ( $n = 134$ ) athletes took part  
2 in the study. Participants had a mean age of 19.23 ( $SD = 1.16$ ) years and represented a  
3 total of 39 different team ( $n = 192$ ) and individual ( $n = 123$ ) sports. The largest sport  
4 cohorts represented were soccer ( $n = 80$ ), rugby ( $n = 33$ ), long distance running ( $n =$   
5 21), field hockey ( $n = 20$ ), and athletics ( $n = 19$ ). Athletes participated in a variety of  
6 competitive levels including recreational ( $n = 73$ ), club ( $n = 128$ ), county ( $n = 62$ ),  
7 regional ( $n = 9$ ), and elite ( $n = 43$ ), and had taken part in their chosen sport for an  
8 average of 7.73 years ( $SD = 4.10$ ).

## 9 **Measures**

10            **Demographic Information.** Participants provided details of their age, gender,  
11 sport played, competitive level, and years of playing experience.

12            **Sport Imagery Ability.** Participants completed the 15-item SIAQ (Williams &  
13 Cumming, 2011) to assess their ease of imaging sport specific cognitive and  
14 motivational imagery content. Five subscales, each composed of 3 items, represent skill  
15 images (e.g., making corrections to physical skills), strategy images (e.g., creating a  
16 new game/event plan), goal images (e.g., myself winning a medal), affect images (e.g.,  
17 the anticipation and excitement associated with my sport), and mastery images (e.g.,  
18 remaining confident in a difficult situation). Participants rate the ease with which they  
19 are able to generate each image on a 7-point Likert type scale ranging from 1 (*very hard*  
20 *to image*) to 7 (*very easy to image*). An average score is then calculated for each type of  
21 imagery. The SIAQ has been identified as a valid and reliable measure of imagery  
22 ability with good psychometric properties (Williams & Cumming, 2011). The SIAQ  
23 demonstrated adequate internal reliability with Cronbach alpha coefficient values all  
24 above .70 (Hair, Anderson, Tatham, & Black, 1998) for skill (.79), strategy (.85), goal  
25 (.81), affect (.76), and mastery (.80) images.

1           **Trait Anxiety and Confidence.** The Competitive Trait Anxiety Inventory-2  
2 (CTAI-2; Albrecht & Feltz, 1987) was employed to assess trait cognitive and somatic  
3 anxiety, and self-confidence intensity and direction. This is a 27-item questionnaire  
4 assessing how cognitively anxious (e.g., I am concerned about performing poorly),  
5 somatically anxious (e.g., my body feels tense), and self-confident (e.g., I'm confident  
6 about performing well) athletes generally feel when competing in their sport. For each  
7 item, the individual rates the intensity with which they usually experience the thought or  
8 feeling on a 4-point Likert type scale ranging from 1 (*not at all*) to 4 (*very much so*).  
9 Using a 7-point Likert type scale ranging from -3 (*very negative/debilitative*) to +3 (*very*  
10 *positive/facilitative*), the individual next rates whether this feeling is generally positive  
11 or negative towards their performance. The CTAI-2 has been identified as a reliable  
12 measure of self-confidence and anxiety intensity and direction (e.g., Mellalieu, Hanton,  
13 & O'Brien, 2004). For the purpose of the study, the self-confidence direction subscale  
14 was not completed by participants. In the present study, the CTAI-2 demonstrated  
15 adequate internal reliability with Cronbach alpha coefficients above .70 for cognitive  
16 intensity (.85), cognitive direction (.82), somatic intensity (.86), somatic direction (.74),  
17 and self-confidence intensity (.88).

## 18 **Procedures**

19           Following ethical approval from the University where the authors are based,  
20 participants were recruited either through their involvement in local sports teams or by  
21 taking an undergraduate sport psychology class. Those participating in the class were  
22 awarded with a course credit. All participants were given an information sheet  
23 explaining the study and had the opportunity to ask further questions. Those agreeing to  
24 take part completed a consent form on the understanding that their participation was  
25 voluntary and they were free to withdraw at any time. Participants then provided their  
26 demographic information and completed the SIAQ and CTAI-2, which took less than 20

1 minutes. After completing the study, participants returned the questionnaires to the  
2 researcher and participants were thanked for their participation.

### 3 **Data Analyses**

4 Data was analyzed using SEM with maximum likelihood estimations using the  
5 computer package AMOS 16.0 (Arbuckle, 2007). The two-step approach was followed  
6 whereby the factor structure of each questionnaire was first examined before  
7 investigating the structural model (Kline, 2005). Although each model's overall  
8 goodness of fit was tested using the chi-squared likelihood statistic ratio ( $\chi^2$ ; Jöreskog &  
9 Sörbom, 1993), a nonsignificant value is rarely obtained in practice. Therefore we  
10 employed additional fit indices based on Hu and Bentler's recommendations (1999).  
11 First, the standardized root mean square residual (SRMR; Bentler, 1995) and Root  
12 Mean Square Error of Approximation (RMSEA) were employed as indicators of  
13 absolute fit reflected in values of  $\leq .08$  and  $.06$  respectively representing an adequate fit  
14 (Hu & Bentler, 1999). Secondly, the Tucker Lewis Index (TLI) and Comparative Fit  
15 Index (CFI) were selected to reflect incremental fit with values  $> .90$  and  $> .95$   
16 indicating an adequate and excellent model fit respectively (Hu & Bentler, 1999). It is  
17 important to note that although there is some debate regarding how appropriate these  
18 values are at demonstrating appropriate model fit (see Markland, 2007; Marsh, Hau, &  
19 Wen, 2004), these criteria are still the most commonly reported as indications of an  
20 adequate model fit and are subsequently followed here.

21 Any questionnaires demonstrating a poor factor structure underwent the removal  
22 of problematic items in a step-by-step process to improve the model fit by inspection of  
23 the modification indices. This approach is justified as resultant models are derived from  
24 the best-performing indicators without sacrificing the hypothesized model structure  
25 (Hofmann, 1995).

1           Once all questionnaires demonstrated an adequate model fit, a process to  
2 improve the variable to sample size ratio and increase the stability of the estimates was  
3 undertaken. This involved constructing specific parcels for remaining items on the  
4 CTAI-2 subscales (Little, Cunningham, Shahar, & Widaman, 2002). In a similar  
5 manner to Williams and Cumming (2012c), an item-to-construct balance approach was  
6 taken whereby the item with the highest factor loading was parceled with the item with  
7 the lowest factor loading from the same subscale. The item with the second highest  
8 loading was then paired with the item displaying the second lowest loading until all  
9 items were assigned to a two-item parcel (Little et al., 2002). The measurement model  
10 as a whole was then investigated and Mardia's coefficient was examined to determine  
11 whether data displayed multivariate normality.

12           Mediation analysis was conducted following Hayes (2013) recommendation of  
13 testing for indirect effects. This involved testing the indirect effects of the SIAQ  
14 subscales that predicted confidence (i.e., the mediator) to examine whether they  
15 indirectly predicted cognitive and somatic anxiety intensity and direction via self-  
16 confidence. Bootstrapping of 2000 samples was used to generate 90% confidence  
17 intervals. Standardized regressions and 90% confidence intervals were reported for all  
18 significant indirect effects.

## 19                           **Results**

### 20           **Descriptive Characteristics**

21           Means and standard deviations for the SIAQ and CTAI-2 were calculated and  
22 are presented in Table 1. SIAQ subscale means ranged from 4.76 to 5.70. CTAI-2 mean  
23 scores ranged from 2.16 to 2.50 for intensity and from -0.50 to 0.05 for direction.

### 24           **Measurement Model**

25           The CFA for the model representing the SIAQ revealed a good fit to the data.

26           However, the poor fit of the CTAI-2 necessitated the systematic removal of three items

1 from the cognitive anxiety subscales, three from the somatic anxiety subscales and one  
2 from the confidence subscale before adequate fit to the data was found<sup>1</sup>. After parceling  
3 the revised CTAI-2 subscale items, the measurement model as a whole revealed a  
4 satisfactory fit to the data,  $\chi^2(389) = 565.83$ ,  $p < .001$ , CFI = .96, TLI = .95, SRMR =  
5 .05, RMSEA = .04 (90% CI = 0.03 - 0.05). Inspection of the Mardia's coefficient  
6 revealed data did not display multivariate normality (normalized estimate = 20.94).  
7 Consequently the bootstrapping technique was employed in all further analysis.

### 8 **Structural Model**

9 In accordance with our hypotheses, regression paths were drawn from all five  
10 types of imagery ability to trait-confidence (Figure 1). Regression paths were also  
11 drawn from confidence to cognitive anxiety intensity and direction, and somatic anxiety  
12 intensity and direction. Finally direct regression paths were added from both affect and  
13 mastery imagery to cognitive anxiety intensity and direction, and somatic anxiety  
14 intensity and direction. The structural model demonstrated an adequate fit to the data,  
15  $\chi^2(407) = 659.84$ ,  $p < .001$ , CFI = .94, TLI = .94, SRMR = .06, RMSEA = .04 (90% CI  
16 = 0.04 - 0.05). Inspecting the regression weights indicated that the paths to trait-  
17 confidence from skill ( $p = .764$ ), strategy ( $p = .206$ ), and affect ( $p = .510$ ) imagery were  
18 all nonsignificant and therefore removed from the model. Furthermore the paths from  
19 affect imagery to somatic anxiety direction ( $p = .596$ ), and from mastery imagery to  
20 somatic anxiety intensity ( $p = .128$ ), somatic anxiety direction ( $p = .348$ ), and cognitive  
21 anxiety direction ( $p = .199$ ) were nonsignificant and also removed from the model.

22 After making these changes, the second model revealed an almost identical fit,  
23  $\chi^2(414) = 665.83$ ,  $p < .001$ , CFI = .94, TLI = .94, SRMR = .05, RMSEA = .04 (90% CI  
24 = 0.04 - 0.06). Inspecting the regression weights indicated that the paths from affect  
25 imagery to somatic intensity ( $p = .079$ ) and cognitive direction ( $p = .061$ ) were only  
26 approaching significance, and were therefore removed from the model. The final model

1 revealed an almost identical fit,  $\chi^2(416) = 672.52, p < .001, CFI = .94, TLI =$   
2  $.94, SRMR = .05, RMSEA = .04$  (90% CI = 0.04 - 0.06). This final model is displayed  
3 in Figure 2 with standardized regression weights. Results reveal that athletes with  
4 greater mastery imagery ability ( $\beta = .47, p < .001$ ) and goal imagery ability ( $\beta = .23, p =$   
5  $.003$ ) are more self-confident. In turn, greater confidence predicts lower levels of  
6 cognitive ( $\beta = -.45, p < .001$ ) and somatic ( $\beta = -.46, p < .001$ ) anxiety intensity, and  
7 facilitative perceptions of these symptoms (cognitive direction:  $\beta = .30, p < .001$ ;  
8 somatic direction:  $\beta = .25, p < .001$ ). Moreover, greater mastery imagery ability  
9 directly predicts lower levels of cognitive anxiety intensity ( $\beta = -.23, p < .025$ ). Finally,  
10 greater affect imagery ability predicts higher levels of cognitive anxiety intensity ( $\beta =$   
11  $.17, p < .043$ ). When comparing the first (i.e., hypothesized) model to the final model,  
12 the nonsignificant change in  $\chi^2$  and the small drop in expected-cross validation index  
13 (ECVI) from 3.16 to 3.15 revealed the final model displayed a more parsimonious fit  
14 (Byrne, 2010). Therefore, the final model provides the best fit to the data.

### 15 **Mediation Analysis**

16 To investigate our second hypothesis, we investigated whether trait-confidence  
17 mediated the relationship between mastery and goal imagery and cognitive and somatic  
18 anxiety intensity and direction by testing for indirect effects (Hayes, 2013). Results  
19 from the mediation analysis provided an adequate fit to the data,  $\chi^2(195) = 464.98, p <$   
20  $.001, CFI = .92, TLI = .90, SRMR = .06, RMSEA = .07$  (90% CI = 0.06 - 0.07).

21 Although only mastery imagery ability directly predicted all four anxiety subscales  
22 (cognitive intensity:  $\beta = -.57, p < .001$ ; cognitive direction:  $\beta = .33, p = .002$ ; somatic  
23 intensity:  $\beta = -.24, p = .021$ ; somatic direction:  $\beta = .28, p < .010$ ), both mastery and  
24 goal imagery ability indirectly and significantly predicted all four anxiety subscales.

25 Results of these indirect predictions are displayed in Table 2.

## 1 **Discussion**

2           The aim of the present study was to examine the relationship between sport  
3 imagery ability, trait-confidence, and cognitive and somatic anxiety intensity and  
4 direction. It also provided the opportunity to re-investigate whether goal and mastery  
5 sport imagery ability are the only predictors of trait-confidence as previously found by  
6 Williams and Cumming (2012c). A second aim was to investigate whether imagery  
7 ability predicted anxiety directly or through self-confidence; that is, whether confidence  
8 mediated this relationship.

9           Based on the literature (Bandura, 1977, 1997; Callow & Waters, 2005), it was  
10 hypothesized that all five types of sport imagery ability would positively predict trait-  
11 confidence. Contrary to our hypothesis only goal and mastery imagery ability  
12 positively predicted trait-confidence as the pathways from skill, strategy, and affect  
13 imagery ability were all nonsignificant. These results are in accordance with previous  
14 research which also found only goal and mastery imagery ability to positively predict  
15 trait-confidence (Williams & Cumming, 2012c). Together, both studies indicate that  
16 athletes generally feel more confident when they are able to more easily image  
17 themselves achieving specific goals and outcomes (e.g., winning), and coping and  
18 persisting during difficult situations (e.g., staying positive after a setback). This  
19 suggests that while imaging skills and strategies may improve athletes' confidence, how  
20 well an individual can image these may not be associated with confidence levels.

21           The present study also examined whether confidence predicted lower anxiety  
22 levels as well as more positive interpretations of these symptoms. We also tested  
23 whether confidence mediated the relationship between imagery ability and anxiety  
24 intensity and direction. In support of our second hypothesis, trait-confidence negatively  
25 predicted cognitive and somatic anxiety intensity and positively predicted their  
26 directions. Furthermore, it mediated the relationship between mastery and goal imagery

1 ability, and cognitive and somatic anxiety intensity and direction. Findings support the  
2 existing anxiety literature which suggests that confidence can lead to more positive  
3 interpretations of cognitive and somatic anxiety symptoms (see Hanton et al., 2004;  
4 Jones & Hanton, 2001). They also indicate that athletes who are better able to image  
5 themselves persisting and overcoming difficult situations and achieving goals, are likely  
6 to be protected against higher anxiety levels and negative interpretations of these  
7 symptoms through enhancing their confidence. A rugby player interviewed by  
8 Mellalieu et al (2009), explained that; “[the imagery] builds your confidence so that you  
9 really believe you can do it no matter what you’re feeling...the usual worries I get  
10 beforehand aren’t as destructive, I see them now as helpful as I’m confident I know I  
11 can make my kicks even with the pressure.” (p. 182). Our findings infer that imagery  
12 ability can activate the same kind of mechanism.

13 In partial support of our final hypothesis, when any indirect effects through self-  
14 confidence were accounted for cognitive anxiety intensity was directly negatively and  
15 positively predicted by mastery and affect imagery ability respectively. It can be  
16 suggested that individuals with poorer mastery imagery ability; 1) may be unable to  
17 alter their anxiety intensity and direction though enhancing their confidence using  
18 positive images, and/or 2) may also be unable to alter or transform any spontaneous  
19 intrusive negative imagery that can result from low confidence (Hanton et al., 2004).

20 Although affect imagery ability directly predicted cognitive anxiety intensity,  
21 the direction of this was opposite to our hypothesis. There was also no significant direct  
22 relationship between affect imagery ability and somatic anxiety intensity. Therefore  
23 none of our hypotheses regarding affect imagery ability and anxiety intensity were  
24 supported. This may be due to affect imagery content reflecting positive feelings and  
25 emotions that are not necessarily associated with anxiety. Williams and Cumming  
26 (2012c) found that affect imagery ability did not significantly predict a threat state



1 which is associated with negative thoughts and feelings. It could also be suggested that  
2 individuals who experience more negative worries and concerns (i.e., cognitive anxiety  
3 intensity) are naturally able to generate images associated with feelings and emotions  
4 associated with performance more easily as a mechanism to try to deal with these  
5 negative thoughts. However, these are suggestions and future research should  
6 investigate this more thoroughly, possibly using a qualitative methodology, to  
7 understand the relationship in more depth.

8         To our knowledge, this is the first study to investigate whether imagery ability is  
9 able to directly predict anxiety direction. Although imagery ability did not directly  
10 predict cognitive and somatic anxiety direction, the mediation analysis infers that higher  
11 mastery and goal imagery ability, impacts upon these outcomes indirectly via trait-  
12 confidence. Previous research shows mastery imagery use can result in greater levels  
13 of confidence and more facilitative interpretations of anxiety symptoms (e.g., Cumming  
14 et al., 2007; Hanton & Jones, 1999b; Williams et al., 2010). The present study  
15 demonstrates a similar relationship between imagery ability, confidence, and  
16 interpretation of anxiety symptoms.

17         A possible explanation for why skill, strategy, and affect imagery ability did not  
18 predict confidence could be due to the dimension of imagery ability assessed. Although  
19 the present study assessed ease of imaging, imagery ability can also be reflected in other  
20 dimensions and constructs such as vividness, controllability and emotion. A clearer  
21 more vivid image may lead to feeling more confident (see Callow, Roberts, & Fawkes,  
22 2006). Alternatively, experiencing more emotions reflective of a positive performance  
23 or being able to control these to the appropriate intensity may be associated with higher  
24 confidence levels and more positive interpretations of anxiety. Consequently, imagery  
25 vividness of skill, strategy, and affect imagery may be a stronger predictor of  
26 confidence, and subsequent anxiety intensity and direction. Ease of imagery is known

1 to be highly correlated with other dimensions of imagery ability and has been suggested  
2 the most comprehensive dimension of imagery ability (Cumming & Williams 2012:  
3 Williams & Cumming, 2011). However, future research should still examine whether  
4 certain imagery ability dimensions are stronger predictors of confidence and anxiety.

5 A limitation of the present study is that it does not consider the individual  
6 preferences of anxiety intensity for optimal performance. Lower levels of anxiety do  
7 not always elicit a more facilitative interpretation of these symptoms as factors such as  
8 sport type and situational importance can play a role (e.g., Hanton, Jones, & Mullen,  
9 2000). It is therefore important for practitioners to not assume that a reduction in  
10 anxiety symptoms is appropriate for all athletes and will automatically enable athletes to  
11 interpret these as more facilitative. Although confidence was most strongly associated  
12 with anxiety intensity, research indicates that anxiety direction is a stronger predictor of  
13 performance (e.g., Neil et al., 2012). Performance was not measured in the current  
14 study so the relationship between confidence, anxiety intensity and direction, and  
15 performance should be examined in future studies to more fully understand the  
16 relationship.

### 17 **Applied Implications and Future Research**

18 Importantly, the findings demonstrate that imagery ability is directly related to  
19 trait-confidence and related to anxiety either directly or indirectly via trait-confidence.  
20 Findings indicate, as well as implementing imagery interventions to regulate anxiety,  
21 imagery ability may be a critical component in regulating anxiety. Training athletes in  
22 how to create and control mastery and goal images (i.e., improving their imagery  
23 ability), could increase confidence or directly reduce anxiety. Future research should  
24 investigate whether techniques such as Layered Stimulus Response Training and  
25 observation (Cumming & Williams, 2012), can improve this self-regulation strategy and  
26 increase the effectiveness of imagery interventions.

1 Higher levels of imagery ability are also associated with more frequent imagery  
2 use (Gregg, Hall, McGowan, & Hall, 2011; Williams & Cumming, 2012a). Improving  
3 athletes' imagery ability may increase trait-confidence and reduce anxiety through using  
4 imagery more frequently. It would be interesting to investigate the relationship between  
5 imagery ability and confidence and anxiety when accounting for the influence of  
6 imagery use through administration of the Sport Imagery Questionnaire (Hall, Mack,  
7 Paivio, & Hausenblas, 1998).

## 8 **Conclusion**

9 In conclusion, results of the present study investigated the relationship between  
10 athlete imagery ability, confidence, and cognitive and somatic anxiety intensity and  
11 direction. Similar to previous research, results revealed that only mastery and goal  
12 imagery ability positively predict trait-confidence which negatively predict cognitive  
13 and somatic anxiety intensity and positively predicted cognitive and somatic anxiety  
14 direction. Confidence mediated the relationship between mastery and goal imagery  
15 ability, and cognitive anxiety direction and between mastery imagery ability and  
16 somatic anxiety intensity and direction. Results also revealed that cognitive anxiety  
17 intensity was directly predicted negatively by mastery imagery ability and positively by  
18 affect imagery ability. Findings contribute to the growing body of literature that  
19 demonstrates the relationship between imagery ability and various cognitive, affective,  
20 and behavioral outcomes. However, nonsignificant predictions of skill and strategy  
21 imagery ability highlight that this relationship is likely to depend on the specific content  
22 of the imagery and that researchers should think carefully when selecting a measure to  
23 assess imagery ability. Future research should investigate whether these relationships  
24 are causal by training imagery ability to see to what extent this alters confidence and  
25 anxiety intensity and direction.

26 Footnotes:

1    Removed cognitive anxiety items were: “I feel concerned about this competition”, “I  
2    have self-doubts”, and “I’m concerned that I won’t be able to concentrate”, Somatic  
3    items were “I feel nervous”, “My body feels relaxed”, and “My body feels tight”, and  
4    removed confidence item was “I feel at ease”. The removal of these items did not affect  
5    the any of the subscales with all Cronbach alpha values still over .70. Specific model fit  
6    values for each questionnaire and the order that items were removed can be obtained  
7    upon request from the lead author.

8

9

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1 Table 1.

2 Means and standard deviations of the SIAQ and CTAI-2 subscales

	Mean (SD)
<u>SIAQ</u>	
Skill Imagery	5.19 (0.87)
Strategy Imagery	4.88 (1.08)
Goal Imagery	4.76 (1.25)
Affect Imagery	5.70 (0.90)
Mastery Imagery	4.80 (1.08)
<u>CTAI-2</u>	
Cognitive Anxiety Intensity	2.35 (0.58)
Somatic Anxiety Intensity	2.16 (0.55)
Self-Confidence	2.50 (0.55)
Cognitive Anxiety Direction	-0.51 (0.90)
Somatic Anxiety Direction	0.05 (0.72)

3 Note: SIAQ ratings = 1 – 7, CTAI-2 intensity ratings = 1 – 4, direction ratings = -3 -  
 4 +3.

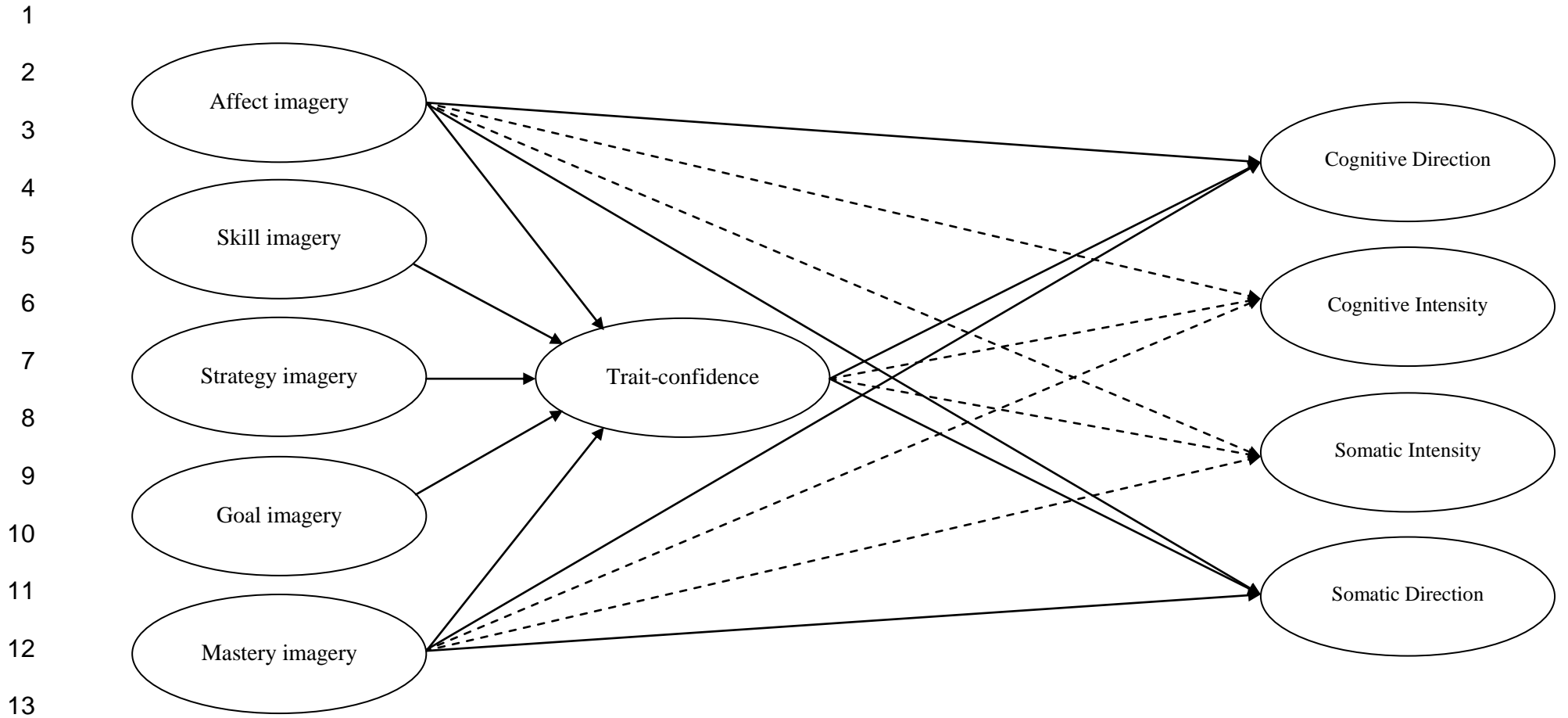
1 Table 2.

2 Indirect effects of mediation analysis

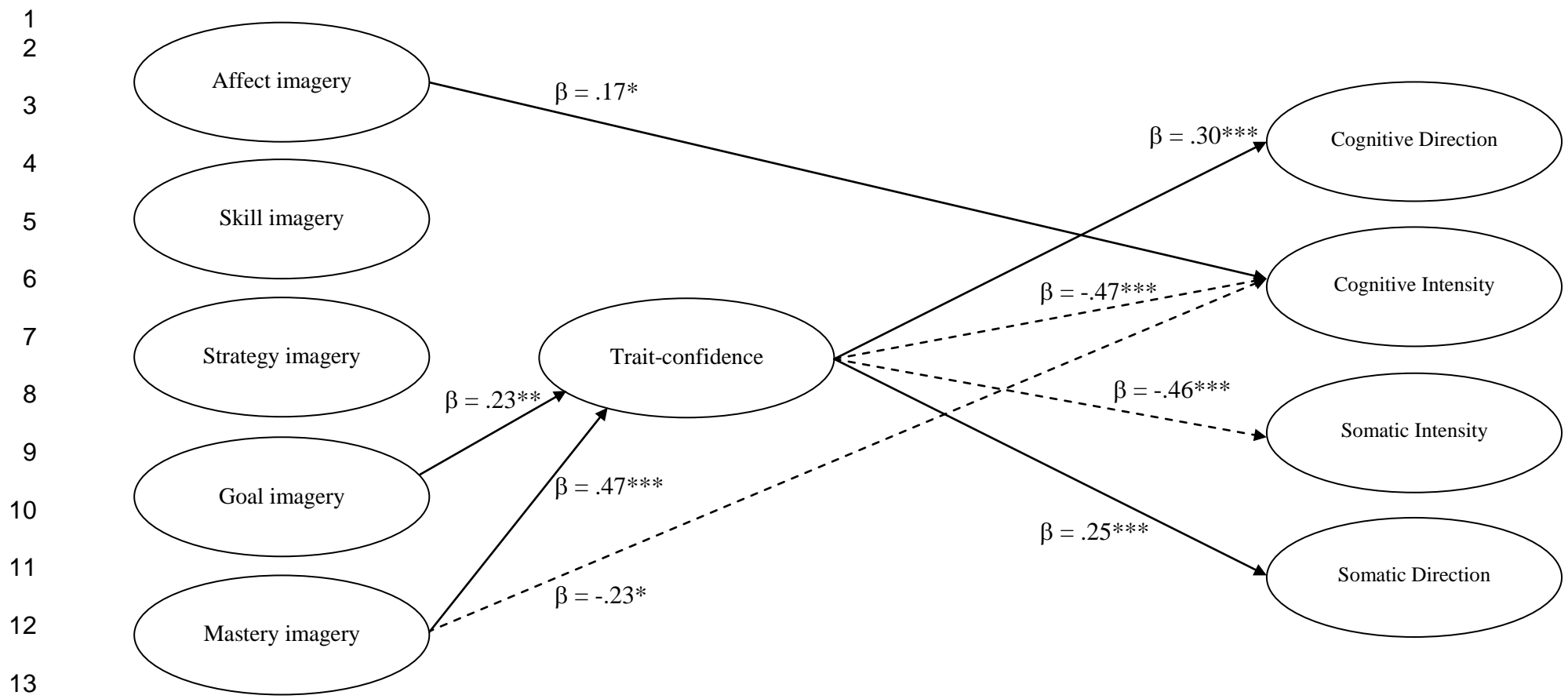
		$\beta$	$p$	CI
Goal Imagery				
	Cognitive Intensity	-.15**	.001	-.233 – -.091
	Somatic Intensity	-.13**	.001	-.218 – -.069
	Cognitive Direction	.11**	.001	.055 – .189
	Somatic Direction	.07*	.039	.013 – .142
Mastery Imagery				
	Cognitive Intensity	-.22**	.001	-.317 – -.153
	Somatic Intensity	-.19***	< .001	-.301 – -.119
	Cognitive Direction	.16**	.001	.087 – .250
	Somatic Direction	.10*	.032	.022 – .196

3 Note: CI = 90% confidence intervals, \*  $p < .05$ , \*\*  $p = .001$ , \*\*\*  $p < .001$ .

- 1 Figures
- 2 Figure 1. Hypothesized model.
- 3 Figure 2. Final model predicting trait-confidence, and cognitive and somatic anxiety
- 4 intensity and direction.
- 5



14 Figure 1. Hypothesized model. For visual simplicity, variances are not presented but are hypothesized as significant. *Note:* Full lines are positive  
15 predictions and dashed lines are negative predictions.



14 Figure 2. Final model predicting trait-confidence, and cognitive and somatic anxiety intensity and direction. *Note:* All coefficients are standardized. \*  $p$   
 15  $< .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ . Full lines are positive predictions and dashed lines are negative predictions. For visual simplicity, variances are not  
 16 presented but were all significant ( $p < .01$ ).