Emotion regulation predicts imagery ability

Anuar, Nurwina; Cumming, Jennifer; Williams, Sarah

DOI:
10.1177/0276236616662200

Emotion Regulation Predicts Imagery ability

Nurwina Anuar[ab*], Sarah E. Williams[a] and Jennifer Cumming[a]

[a]University of Birmingham

[b]Universiti Teknolgi Malaysia

* Corresponding author:
Nurwina Anuar,
School of Sport, Exercise & Rehabilitation Sciences,
University of Birmingham, Edgbaston, Birmingham,
B15 2TT. UK.
wynakmal@gmail.com
+441214158187

Abstract

This study explored the relationship between athletes' emotion regulation and imagery ability. 648 athletes (57% female; M_{age} = 20.79 years, SD = 4.36) completed the Sport Imagery Ability Questionnaire (SIAQ) and Emotion Regulation Questionnaire (ERQ). Structural Equation Modelling supported the hypothesised model in which reappraisal positively predicted all SIAQ subscales. However, suppression had no significant association with imagery ability despite being predicted to be negatively associated. Results support the revised applied model of deliberate imagery use that individual characteristics will influence the imagery experience. Specifically, athletes who reappraise their emotions more frequently find it easier to image sport related content.

Keywords: Emotion regulation, reappraisal, suppression, imagery ability, Revised Applied Model of Deliberate Imagery Use.

Emotion Regulation Predicts Imagery Ability

Imagery has been described as a cognitive experience that mimics a real experience (White & Hardy 1998). It can serve a number of cognitive and motivational functions in sport, exercise, dance, and rehabilitation which includes refining skills, enhancing self-efficacy, and improving motivation (Cumming & Williams, 2012; Hall, 2001; Nordin & Cumming, 2005). However, a person's imagery ability can determine the effectiveness of an imagery intervention. Specifically, higher imagery ability can lead to greater benefits (e.g., improved performance) resulting from an imagery intervention compared to those who find it more difficult to image (Robin et al., 2007). Thus, imagery ability is an important factor to consider when developing effective imagery interventions.

The revised applied model of deliberate imagery use (RAMDIU; Cumming & Williams, 2012) was devised to provide researchers and applied practitioners with a framework for how to develop effective imagery interventions (Cumming & Williams, 2012). Based on its predecessor the applied model of imagery use (Martin, Moritz, & Hall, 1999) the model proposes that for a given situation, athletes should use the type of imagery that will best help them to achieve their desired outcomes (Cumming & Williams, 2012; Martin et al., 1999). Importantly, the model also predicts a moderating role for imagery ability plays in the relationship between the imagery type and the outcomes obtained (Cumming & Williams, 2012; Martin et al., 1999). In addition, the RAMDIU also considers "Who" (i.e., the individual performing the imagery) as a separate component that is likely to impact upon other aspects of the model.

This specific "Who" component includes but is not limited to characteristics such as gender, competitive level, sport type, as well as traits and dispositions including things like confidence and motivational orientation (Cumming & Williams, 2013). Individual characteristics such as these are likely to impact the effectiveness of an imagery intervention.

This is due to an individual's characteristics influencing both the different reasons for imaging (i.e., why image) as well as the imagery content used to achieve these functions (Harwood, Cumming & Fletcher, 2004). For example, in exercise settings, women tend to use imagery more frequently for health and appearance reasons whereas men tend to use imagery more frequently for motivational purposes (Cumming, 2008). Despite research highlighting a relationship between individual characteristics and reasons for imaging, there has been less attention on how these characteristics may impact upon an individual's imagery ability.

A number of studies have shown that athletes of higher competitive level often display greater imagery ability compared to their lower level counterparts (Murphy, Nordin, & Cumming, 2008; Roberts, Callow, Hardy, Markland, & Bringer, 2008; Williams & Cumming, 2011). Literature has also suggested possible gender differences in imagery ability (Isaac & Marks, 1994; Williams & Cumming, 2011), but this finding has been rather inconsistent across studies (Callow & Hardy, 2004; Gregg & Hall, 2006). As well as gender and competitive level differences, recent research has highlighted imagery ability tends to be negatively associated with a threat appraisal and anxiety, and positively associated with a challenge appraisal and confidence (Williams & Cumming, 2015). These initial findings suggest that individual's cognitive and emotional dispositions are likely to relate to their imagery ability.

The association between emotional dispositions and imagery ability is in line with Lang's bioinformational theory (1977, 1979), which proposes that more emotive images will likely lead to more vivid imagery. Specifically, Lang (1977) proposed that the imagery process involves activating a network of propositionally coded information which is stored in the long-term memory. An emotive image is thought to more readily tap into this memory network (Murphy et al., 2008). Indeed, the inclusion of response propositions including verbal responses (e.g., shouting), somatomotor events (e.g., muscle tension), visceral events (e.g., increased heart rate), processor characteristics (e.g., disorientated in time), and sense organ adjustments (e.g., postural changes) are thought to result in certain physiological responses and higher imagery ability (Lang, 1979; Williams, Cooley & Cumming, 2013). As found with vividness, research suggests a more emotive image is also associated with greater ease of imaging (Holmes & Mathews, 2005). Despite the evident relationship between emotions and imagery ability, it may be somewhat surprising that research is yet to examine whether emotion regulation relates to imagery ability.

Emotion regulation involves changing the response (i.e., increase, maintain or decrease) of positive or negative emotions (Gross, 1999). Athletes frequently regulate their emotions to assist with their performance. Although there are thought to be over 400 strategies used to regulate emotions, the two fundamental processes are emotion reappraisal and emotion suppression. Reappraisal refers to changing how you think about a particular situation to decrease its emotional impact (Gross, 2002), which occurs before experiencing the emotion (Gross & John, 2003). For example, if athletes feel embarrassed about making mistakes when in training or competition, they may change the embarrassment to a motivational thought by accepting it as a learning experience. Consequently, the feelings associated with embarrassment are experienced as motivation resulting in a reduced emotional impact. Suppression refers to inhibiting ongoing emotion-expressive behaviour. This response comes later in the emotion process, which decreases the behaviour expression but not the emotion experienced (Gross, 2002). For example, in a football penalty situation, a footballer may disagree with the refereeing decision but may forcibly accept it and continue the game while still feeling angry (Jones, 2003). Typically, reappraisal is associated with pleasant emotions whereas suppression is associated with more negative emotion (Jones, 2003). However, in sport, suppression has not been found to be associated with either positive or negative emotions (Uphill, Lane, & Jones, 2012).

It is likely that athletes' emotion regulation is related with their imagery ability due to the associations that both imagery and emotion regulation have with emotions and memory. Hayes et al. (2010) explained that emotion regulation influences an individual`s cognitive function, especially, the encoded memory function. They suggested that reappraisal will boost memory function whereas suppression impairs memory (Hayes et al., 2010; Gross, 2007). However, research is yet to sufficiently examine to what extent reappraisal and suppression would have on the relationship with memory function and subsequently relate to an individual's imagery ability.

D'Argembeau and Van der Linden (2006) were the first to highlight the potential relationship between emotion regulation and imagery ability. They found that the ability to picture past and future events is related to memory function and emotion regulation. D'Argembeau and Van der Linden suggested that individuals who suppress emotions would have difficulty accessing memory and would therefore not be able to construct an image as readily. Although picturing past and future events was negatively associated with suppression, there was no association with emotion reappraisal. However, this study was limited by the measurement of imagery ability to past and future events, and the events and emotion regulation not being sport specific.

Therefore, the primary aim of this study was to comprehensively explore emotion reappraisal and suppression predicted ease of imaging different sport related content. Based on previous literature (D'Argembeau & Van der Linden, 2006), it was hypothesised that emotion suppression would negatively predict ease of imaging the five types of imagery assessed (i.e., skill, strategy, mastery, goal, and affect). Based on bioinformational theory (Lang, 1979), it was hypothesised that emotion reappraisal would positively predict ease of imaging all five types of imagery. As this is the first study to examine the relationship, we also examined which type of imagery ability emotion regulation most strongly predicted. The hypothesised model can be seen in Figure 1.

—Insert Figure 1 here—

Method

Participants

Six hundred and forty eight (276 males, 372 females; M_{age} = 20.79 years, *SD* = 4.36) athletes participated in the study. The most commonly represented team sports were football (*n* = 197), cheerleading (*n* = 50), basketball (*n* = 35), rugby (*n* = 28), and netball (*n*= 19), and the most commonly represented individual sports were athletics (*n* = 37), swimming (*n* = 27), dance (*n* = 23), road running (*n* = 23), badminton (*n* = 19), and tennis (*n* = 14). All participants had been participating in their sport for an average of 7.67 years (*SD* = 6.50). Participants were either recreational athletes (*n* = 367) who reported playing their sport for leisure, and competitive athletes (*n* = 281) who played sport in more competitive setting.

Measures

Individual characteristics. Participants provided information regarding their age, gender, sport played, competitive level, and years of playing experience.

Sport Imagery Ability Questionnaire. The Sport Imagery Ability Questionnaire (SIAQ; Williams & Cumming, 2011) was used to assess athlete's imagery ability specific to their sport. The SIAQ consists of 15 items in which 3 items represent one of the five subscales; skill imagery ability (e.g., "refining particular skill"), strategy imagery ability (e.g., "making up new plan strategy in my head"), goal imagery ability (e.g., "myself winning a medal"), affect imagery ability (e.g., "the excitement associated with performing"), and mastery imagery ability (e.g., "staying positive after the setback"). Participants indicate their ease of imaging each item on a 7-point scale (1 = *very hard to image*, 7 = *very easy to* *image*). The SIAQ is a valid and reliable measure of imagery ability (Williams & Cumming, 2011). In the present study, internal reliability was good with the Cronbach alpha coefficient of each subscale being .70 or above (skill = .80, strategy = .82, goal = .84, affect = .75, mastery = .70).

Emotion Regulation Questionnaire. The Emotion Regulation Questionnaire for Sport (ERQ; Uphill et al., 2012) was used to assess athlete emotion regulation. This measure was developed from the original Emotion Regulation Questionnaire (Gross & John, 2003). Participants indicate the extent to which they generally regulate their emotions when training or competing in their sport. Six items represent an individual's tendency to reappraise emotions (e.g., "I control my emotions by changing the way I think about the situation I am in") and four items represent an individual's tendency to suppress emotions (e.g., "I keep my emotions to myself"). Responses are made on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The ERQ for sport is a valid and reliable measure of athlete emotion regulation (Uphill et al., 2012). In the present study, the questionnaire demonstrated good internal reliability with Cronbach alpha coefficients of .75 (suppression) and .85 (reappraisal).

Procedures

Participants were recruited following ethical approval for the study from the university where the authors are based. Participants were recruited by contacting local team coaches as well as from an undergraduate sport psychology class who were awarded with a course credit on completion of the study. All potential participants were provided with a questionnaire pack containing an information sheet explaining the nature of the study, a consent form, an individual characteristic form, the SIAQ, and the ERQ. Prior to completion of the questionnaire pack participants were informed that participation was voluntary, they had the right to withdraw at any time, and the information they provided would be confidential. Those who agreed to participate provided written consent and then completed the questionnaire pack which took no longer than 15 minutes.

Data Analyses

Data was inspected for missing values, outliers, and univariate and multivariate normality. To examine whether the hypothesised model should control for gender and/or competitive level, two separate two-way gender (male, female) × competitive level (recreational, competitive) MANOVAs were conducted to examine whether there were any differences in emotion regulation and imagery ability. Pillai's trace value is reported as it is considered the most robust multivariate significance test (Olson, 1976).

To test the hypothesised model data were analysed using AMOS 22.0 software (Arbuckle, 2013). Following the two step approach of structural equation modelling (SEM), maximum likelihood was employed to estimate both the SIAQ and ERQ before exploring the structural model (Kline, 2005). Separate CFAs were first performed on the ERQ and SIAQ questionnaires before the measurement model was examined as a whole. Goodness of fit was tested by the chi-squared likelihood statistic ratio (χ^2; Jöreskog, & Sörbom, 1993). Following the recommendations by Hu and Bentler (1999), additional fit indices were examined and reported. The standardized root mean square residual (SRMR; Bentler, 1995) and Root Mean Square Error of Approximation (RMSEA) were both included as indicators of the absolute fit with values of < .06 and < .08 reflecting a good fit (Hu & Bentler, 1999). The Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) were included to reflect incremental fit with values for both of > .95 and > .90 reflecting an excellent and good fit respectively (Hu & Bentler, 1999). Nevertheless, Hopwood and Donnellan (2010) suggest a more relaxed cut off value for CFI of > .90 and RAMSEA of < .10. Although there is still a debate surrounding the appropriate values for demonstrating an appropriate model fit (see, Markland, 2007;

Marsh, Hau, & Wen, 2004), these values are the most commonly acceptable and reported in the literature as indicative of the model fit.

Once the factor structure of each measure was confirmed, Cronbach alphas of each factor were calculated to inspect the internal consistency of each subscale. In order to achieve desired model fit, the present study employed techniques suggested by Byrne (2009) to modify the model based on estimate and modification indices inspection. Furthermore, bootstrapping was applied to the analyses when the data did not meet the assumption of multivariate normality (Byrne, 2009).

Results

Data Screening and Item Characteristics

There were no missing values, or outliers and data was normally distributed at the univariate level. Inspection of Mardia`s coefficient for the sample was 123.18 and critical ratio was over 1.96 indicating that the data was non-normal at a multivariate level. Bootstrapping was therefore employed for the entire SEM analysis.

Gender and Competitive Level Differences

Emotion regulation. The two-way gender (male, female) × competitive level (recreational, competitive) MANOVA on the ERQ revealed a significant multivariate effect for gender, Pillai`s trace = .01 $F(2,643) = 3.33$, $p < .04$, $\eta_p^2 = .01$. However, at the univariate level there were no significant differences in suppression, $F(1,644) = 1.70$, $p = .19$, $\eta_p^2 = .003$ or reappraisal, $F(1, 644) = 2.89$, $p = .09$, $\eta_p^2 = .004$. There was also no significant main effect for competitive level, Pillai`s trace = .002, $F(2,643) = 0.60$, $p < .55$, $\eta_p^2 = .002$ and no significant gender by competitive level interaction, Pillai`s Trace = .005, $F(2,643) = 1.72$, $p < .18$, $\eta_p^2 = .005$.

Imagery ability. The two-way gender (male, female) × competitive level (recreational, competitive) MANOVA on the SIAQ indicated a significant multivariate effect for gender, Pillai`s Trace = .06, $F(5, 640) = 8.54$, $p < .001$, $\eta_p^2 = .06$. There was no significant multivariate effect for competitive level, Pillai`s Trace = .01, $F(5,640) = 1.73$, $p < .13$, $\eta_p^2 = .01$, and no significant interaction between gender and competitive level, Pillai`s Trace = .02, $F(5,640) = 2.01$, $p < .08$, $\eta_p^2 = .02$.

Results at the univariate level revealed significant gender differences in strategy, $F(1, 644) = 17.72$, $p < .001$, $\eta_p^2 = .03$, observed power = 99%; goal, $F(1, 644) = 29.92$, $p < .001$, $\eta_p^2 = .04$, observed power = 100%; affect $F(1,644) = 6.68$, $p = .01$, $\eta_p^2 = .01$, observed power = 73%; and mastery imagery, $F(1,644) = 14.46$, $p < .001$, $\eta_p^2 = .02$, observed power = 97%, but no significant difference for skill imagery, $F(1, 644) = 2.28$, $p = .132$, $\eta_p^2 = .004$, observed power = 33%. A comparison of the means as shown in Table 1 revealed that males found it significantly easier to image strategy, goal, affect, and mastery images compared to females. Due to these differences, gender was controlled for in the main analyses.

—Insert Table1 here—

Measurement Models

Overall, the separate CFA measurement models revealed a good fit to the data for the ERQ, $\chi^2(68) = 339.68$, $p < .001$, CFI = .94, TLI = .92, SRMR = .05, RMSEA = .06 (90% CI = 0.05 – 0.06), with the inter-factor correlation being 0.31. The measurement model for the SIAQ also fit the data well, $\chi^2(160) = 471.87$, $p < .001$, CFI = .96, TLI = .95, SRMR = .04, RMSEA = .06 (90% CI = 0.04 – 0.04). The inter-factor correlations ranged between 0.30 and 0.44 in magnitude. The measurement model for the ERQ and SIAQ as a whole also revealed a good fit to the data, $\chi^2(264) = 634.71$, $p < .001$, CFI = .94, TLI = .95, SRMR = .08, RMSEA = .05 (90% CI = .04 – .05). The internal reliability for the ERQ and SIAQ subscales is reported in Table 1.

Structural Model

To test the hypothesized model presented in Figure 1, regression lines from suppression and reappraisal were drawn to all SIAQ subscales (i.e., skill, strategy, goal, affect, and mastery imagery ability) while controlling for gender. The structural model revealed a less than adequate fit to the data, $\chi^2(264) = 1133.52$, $p < .001$, CFI = .85, TLI = .84, SRMR =.12, RMSEA = 0.07(90% CI = 0.07 – 0.08). Inspection of the regression weights revealed no significant paths from suppression to all five SIAQ subscales (skill, p = 0.14; strategy, p = 0.17; goal, p = 0.96; affect, p = 0.55; mastery, p = 0.85), indicating that suppression had no association with ease of imaging. These paths were therefore removed from the model. The second model demonstrated an adequate fit to the data, $\chi^2(287)$ = 895.38.19, $p < .001$, CFI = 0.90, TLI = 0.90, SRMR = 0.10 RMSEA = 0.06 (90% CI = 0.05 – 0.06). Reappraisal was found to positively predicted skill, strategy, goal, affect, and mastery imagery ability at ($p < .001$) value. The final model and standardized regression weights can be seen in Figure 2.

—Insert Figure 2 here—

Discussion

The aim of the present study was to examine the relationship between emotion regulation and imagery ability. Specifically, we investigated whether athlete emotion regulation (i.e., reappraisal and suppression) predicted ease of imaging skill, strategy, goal, affect, and mastery imagery. It was hypothesised that reappraisal would positively predict and suppression negatively predict the five types of imagery ability.

The findings partially support our hypothesis. As expected, reappraisal positively predicted all five types of imagery ability. That is, athletes who reappraise their emotions more frequently tend to display higher levels of skill, strategy, goal, affect, and mastery imagery ability. Based on the size of the regression weights, it is interesting to note that reappraisal tendencies most strongly predicted mastery imagery ability, closely followed by skill and affect imagery ability.

The strong relationship between reappraisal and mastery imagery ability is unsurprising. Regulating emotions by reappraisal also involves maintaining or decreasing the emotions experienced in a situation. Athletes who are more frequently reappraising their emotions are likely to be more able to image negative or difficult situations more positively. This can be attributed to the motivational reasons for athletes to reappraise, to decrease the emotional impact (Gross, 2002). Therefore, the stronger of the negative emotion and the more difficult situation the athlete is in, the more vivid mastery imagery content can be.

The association between emotion reappraisal and skill imagery as the second strongest prediction is interesting given that the associated imagery content is more cognitive in nature. This is perhaps due to more of the image information being encoded from memory. As, explained by Gross (2002), reappraisal boosts memory function. Similarly, cognitive neuroscience literature demonstrates that reappraisal enhances encoding in memory (Hayes et al., 2010). Therefore, it is possible that for athletes who tend to reappraise more frequently memories of performing these skills are recalled more easily when imaging. This explanation between imagery and memory function may also apply to imagery strategy and goal as the result appear positives association between reappraisal and the two as well.

The next highest relationship with reappraisal is affect imagery ability. This is unsurprising given that when an athlete reappraises emotions, they change the emotion. Being able to call upon various emotions is likely to facilitate an image incorporating positive feelings and emotions. Also, during reappraisal, the emotion proposition is likely tapped during imagery as suggested by Lang`s (1979) bioinformational theory. These results may also be partly explained by Lang’s assertion that experiencing more emotions when imaging would likely produce more vivid images (Lang, 1979). Importantly, the result of emotion regulation predicting all five types of imagery ability demonstrate that reappraisal is not only related to imagery ability of motivational content, but also the ability to image cognitive content (i.e., skills and strategies).

Contrary to our hypothesis, no relationship was found between suppression and the SIAQ subscales. This finding suggests that suppression as an emotion regulation strategy is not associated with how easily athletes are able to image content in relation to their sport. In contrast, D`Argembeau and Van der Linden (2006) found that suppression negatively predicted imagery of past and future events. They suggested that suppression may affect memory function by diverting attention from encode the details of imaging rather to focus on the emotional responses. In support, studies have documented that suppressing emotions impair memory by blocking the brain pathway involved in retrieval of information, and result in experiencing fewer sensory, contextual and emotional details (D`Argembeau & Van der Linden, 2006; Gross, 2002). However, evidence regarding the suppression that impedes memory encoding (Hayes et al., 2010) does not apply to athletes and sport context. Thus, Uphill et al. (2012) attributed the idea that within the sport context suppression does not tend to be associated with either positive or negative emotions. This is because athletes' suppress emotion if they find it will benefit competition (Gross & Thompson, 2007) meaning it may not be detrimental to memory. This may explain why there appears to be no relationship between athlete emotion suppression and imagery ability.

A second potential explanation could be due to the relationship between reappraisal and suppression. Although, literature has typically identified no relationship between emotion reappraisal and suppression (Hayes et al., 2010; Gross & John 2003), the present study identified a moderate positive relationship. Similarly, Uphill et al. (2012) found reappraisal and suppression were correlated, suggesting that athletes who suppress their emotions more frequently tend to reappraise their emotions more frequently. Consequently, suppression may not be associated with lower levels of imagery ability due to being overridden by the association between emotion reappraisal and imagery ability. To examine this further, future research could re-examine the relationship between imagery ability and emotion regulation in athletes who display high levels of reappraisal and low levels of suppression, and athletes who display high levels of suppression and low levels of reappraisal.

Although the present study found no differences in emotion regulation due gender or competitive level, and no differences in imagery ability due to competitive level, there were a number of differences in imagery ability due to gender. Specifically, males have reported being able to image strategy, goal, affect, and mastery imagery more easily than females. Traditionally, gender differences were thought to only exist in spatio-visual imagery tasks (Campos, Pérez-Fabello, & Gómez-Juncal, 2004) as studies have typically found no self-report differences in imagery ability (e.g., Callow & Hardy, 2004). However, the majority of these studies, (Abma, Fry, Li, & Relyea, 2002; Callow & Hardy, 2004) have used movement based questionnaires such as Vividness of Movement Imagery Questionnaire-2 (VMIQ-2; Roberts et al., 2008) and Movement Imagery Questionnaires (MIQ-R; Hall & Martin, 1997). The more recent emergence of the SIAQ which assesses sport content beyond just movements has resulted in the emergence of more gender differences (Williams & Cumming, 2011). These results along with the present study suggest that gender differences in imagery ability may apply to other imagery content except movement imagery ability (i.e., skill imagery) and is something research should continue to investigate.

The present study findings have important implications for future practice. They provide new insight into the potential relationship between the "who" (i.e., emotion regulation) and "imagery ability" components of the RAMDIU (Cumming & Williams, 2013). Although a direct relationship is not proposed in the model, the results of the present study indicate that this is something to consider. From an applied perspective, it is worth considering these findings when planning imagery interventions. Due to the positive association between imagery ability and emotion reappraisal, it can be suggested that athletes who more frequently reappraise their emotions may experience greater imagery ability and thus benefit more from an imagery intervention compared to those who reappraise emotions less often. Furthermore, the use of emotion reappraisal techniques may have the potential to increase an athlete's imagery ability. In this way, emotion reappraisal training may be an effective "tool" for athletes who struggle to image. It could also be suggested that imagery techniques designed to improve imagery ability and alter appraisals and perceptions of situations such as layered stimulus response training (LSRT; Cumming et al., in press) could encourage more frequent emotion reappraisal in athletes. Additionally, due to the lack of association between emotion suppression and imagery ability, it can be suggested that suppression of athlete emotions is not likely to have a negative impact on imagery ability and thus the effectiveness of an imagery intervention.

A key strength of the present study is the large sample size and comprehensive assessment of both types of emotion regulation and five types of imagery ability, and analytical procedures employed. Although this study provides an important contribution to the literature, it is not without its limitations. The scope of this study was limited by its cross sectional nature. While this study provides important insight into the relationships between emotion regulation and imagery ability, it is important to remember that these relationships do not infer causation. As such, the next logical step in continuing this line of research is to examine the extent to which emotion reappraisal training is able to alter imagery ability.

In conclusion, this is the first study to explore the relationship between the "who" and "imagery ability" components of the RAMDIU, specifically athletes' emotion regulation and ease of imaging. Results revealed that reappraisal was positively associated with skill, strategy, goal, affect, and mastery imagery ability, whereas suppression had no association with imagery ability. These findings suggest that different athlete characteristics are associated with differences in athlete imagery ability. Therefore, it contributes to the growing body of literature in support of the RAMDIU. Future research should explore the extent to which reappraisal training impacts athlete imagery ability.

References

Abma, C. L., Fry, M. D., Li, Y., & Relyea, G. (2002). Differences in imagery content and imagery ability between high and low confident track and field athletes. *Journal of Applied Sport Psychology, 14*, 67-75. doi:10.1080/10413200252907743

Arbuckle, J. L. (2013). *IBM® SPSS® Amos™ 22 User's Guide*. Chicago, IL: IBM.

Bentler, P. M. (1995). *EQS structural equations program manual.* Encino, CA: Multivariate Software Inc.

Byrne, B.M. (2009). *Structural equation modeling with AMOS: basic concepts, applications, and programming (2nd ed.).* New York: Taylor and Francis.

Callow, N., & Hardy, L. (2004). The relationship between the use of kinaesthetic imagery and different visual imagery perspectives. *Journal of sports sciences*, *22*, 167-177. doi:10.1080/02640410310001641449

Campos, A., Pérez-Fabello, M. J., & Gómez-Juncal, R. (2004). Gender and age differences in measured and self-perceived imaging capacity. *Personality and Individual Differences*, *37*, 1383-1389. doi:10.1016/j.paid.2004.01.008

Cumming, J. (2008). Investigating the relationship between exercise imagery, leisure-time exercise behavior, and self-efficacy. *Journal of Applied Sport Psychology*, *20*, 184-198. doi; 10.1080/10413200701810570

Cumming, J., & Williams, S. E. (2013). Introducing the revised applied model of deliberate imagery use for sport, dance, exercise, and rehabilitation. *Movement & Sport Sciences*, *82*(4), 69-81. doi: 10.1051/sm/2013098

Cumming, J., & Williams, S.E. (2012). Imagery: The role of imagery in performance. In S. Murphy (Ed.), *Oxford Handbook of Sport and Performance Psychology. (*pp. 213-232). doi: 10.1093/oxfordhb/9780199731763.013.0011

Cumming, J., Cooley, S. J., Anuar, N., Kosteli, M. C., Quinton, M. L., Weibull, F., & Sarah E. Williams (in press). Developing Imagery Ability Effectively: A Guide to Layered Stimulus Response Training. *Journal of Sport Psychology in Action.*

D'Argembeau, A., & Van der Linden, M. (2006). Individual differences in the phenomenology of mental time travel: The effect of vivid visual imagery and emotion regulation strategies. *Consciousness and cognition*, *15*, 342-350. doi:10.1016/j.concog.2005.09.001

Gregg, M., & Hall, C. (2006). The relationship of skill level and age to the use of imagery by golfers. *Journal of Applied Sport Psychology*, *18*, 363-375. doi: 10.1080/10413200600944140

Gross, J. J. (1999). Emotion regulation: Past, present, future. *Cognition & Emotion*, *13*, 551-573. doi; 10.1080/026999399379186

Gross, J. J. (2002). Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology*, *39*, 281-291. doi: 10.1017.S0048577201393198

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, *85*, 348 -362. Retrieved from http://dx.doi.org/10.1037/0022-3514.85.2.348

Gross, J.J., & Thompson, R.A. (2007). *Emotion regulation: Conceptual foundations*. In J.J. Gross (Ed.), Handbook of emotion regulation (pp. 3–26). New York: Guilford

Hall, C. (2001). *Imagery in sport and exercise.* In Handbook of Sport Psychology (edited by R. Singer, H. Hausenblas and C. Janelle), pp. 529-549. New York: Wiley

Hall, C., & Martin, K. (1997). Measuring movement imagery abilities: A revision of the Movement Imagery Questionnaire. *Journal of Mental Imagery*, *21*, 143–154. Retrieved from : http://psycnet.apa.org/psycinfo/1997-04645-004

Harwood, C., Cumming, J., & Fletcher, D. (2004). Motivational profiles and psychological skills use within elite youth sport. *Journal of Applied Sport Psychology*, *16*, 318-332. doi:10.1080/10413200490517986

Hayes, J. P., Morey, R. A., Petty, C. M., Seth, S., Smoski, M. J., McCarthy, G., & LaBar, K. S. (2010). Staying cool when things get hot: emotion regulation modulates neural mechanisms of memory encoding. *Frontiers in Human Neuroscience*, *4*(230), 1-10. doi: 10.3389/fnhum.2010.00230

Hu, L., & Bentler, P. M. (1999). Cut off criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modelling: A Multidisciplinary Journal*, *6*, 1–55. doi:10.1080/10705519909540118

Holmes, E.A. & Mathews, A. (2005). Mental imagery and emotion: A special relationship? *Emotion*, *5*, 489–495. doi: 10.1037/1528-3542.5.4.489

Hopwood, C. J., & Donnellan, M. B. (2010). How should the internal structure of personality inventories be evaluated? *Personality and Social Psychology Review*, *14*, 332-346. doi : 10.1177/1088868310361240

Isaac, A. R., & Marks, D. F. (1994). Individual differences in mental imagery experience: developmental changes and specialization. *British Journal of Psychology, 85*, 479-500. doi: 10.1111/j.2044-8295.1994.tb02536.x

Jones, M. (2003). Controlling emotions in sport. *The Sport Psychologist*, *17,* 471-486. Retrieved from: http://works.bepress.com/marc_jones/8/

Jöreskog, K. G., & Sörbom, D. (1993). LISREL 8 *user's reference guide.* Chicago, IL: Scientific Software.

Kline, R.B. (2005), *Principles and Practice of Structural Equation Modeling* (2nd Edition ed.). New York: The Guilford Press

Lang, P. J. (1977). Imagery in therapy: An information processing analysis of fear. *Behavior Therapy, 8,* 862-886. doi:10.1016/S0005-7894(77)80157-3

Lang, P. J. (1979). A bio-informational theory of emotional imagery. *Psychophysiology, 16,* 495-512. doi: 10.1111/j.1469-8986.1979.tb01511.x

Martin, K. A., Moritz, S. E., & Hall, C. R. (1999). Imagery use in sport: a literature review and applied model. *The Sport Psychologist, 13,* 245-268. Retrieved from http://journals.humankinetics.com/tsp

Markland, D. (2007). The golden rule is that there are no golden rules: A commentary on Paul Barrett's recommendations for reporting model fit in structural equation modelling. *Personality and Individual Differences, 42*, 851–858. doi:10.1016/j.paid.2006.09.023

Marsh, H.W., Hau, K-T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing

Murphy, S., Nordin, S. M., & Cumming, J. (2008). *Imagery in sport, exercise and dance. Advances in sport psychology* / [ed] T. Horn, Champaign, IL: Human Kinetics

Nordin, S.M., & Cumming, J. (2005). More than meets the eye: Investigating imagery type, direction, and outcome. *The Sport Psychologist, 19,* 1–17. Retrieved from http://works.bepress.com/jennifer_cumming/4/

Olson, C. L. (1979). Practical considerations in choosing a MANOVA test statistic: A rejoinder to Stevens. *Psychological Bulletin, 86,* 1350-1352. doi.org/10.1037/0033-2909.86.6.1350

Roberts, R., Callow, N., Hardy, L., Markland, D., & Bringer, J. (2008). Movement imagery ability: development and assessment of a revised version of the vividness of movement imagery questionnaire. *Journal of Sport & Exercise Psychology, 30,* 200-

221. Retrieved from http://journals.humankinetics.com/jsep-back-issues/JSEPVolume30Issue2April/MovementImageryAbilityDevelopmentandAssessmentofaRevisedVersionoftheVividnessofMovementImageryQuestionnaire

Robin, N., Dominique, L., Toussaint, L., Blandin, Y., Guillot, A., & Her, M. L. (2007). Effects of motor imagery training on service return accuracy in tennis: The role of imagery ability. *International Journal of Sport and Exercise Psychology*, *5*, 175-186. doi: 10.1080/1612197X.2007.9671818

Uphill, M. A., Lane, A. M., & Jones, M. V. (2012). Emotion Regulation Questionnaire for use with athletes. *Psychology of Sport and Exercise*, *13*, 761-770. doi:10.1016/j.psychsport.2012.05.001

White, A., & Hardy, L. (1998). An in-depth analysis of the uses of imagery by high-level slalom canoeists and artistic gymnasts. *Sport Psychologist, 12*, 387-403. Retrieved from http://www.humankinetics.com/acucustom/sitename/Documents/DocumentItem/1983.pdf

Williams, S. E., & Cumming, J. (2011). Measuring athlete imagery ability: the sport imagery ability questionnaire. *Journal of Sport and Exercise Psychology*,*33*, 416-440. Retrieved from http://works.bepress.com/jennifer_cumming/17/

Williams, S. E., & Cumming, J. (2015): Athlete imagery ability: A predictor of confidence and anxiety intensity and direction. *International Journal of Sport and Exercise Psychology*. doi: 10.1080/1612197X.2015.1025809

Williams, S. E., Cooley, S. J., & Cumming, J. (2013). Layered stimulus response training improves motor imagery ability and movement execution. *Journal of sport & exercise psychology*, *35*, 60-71. Retrieved from http://works.bepress.com/jennifer_cumming/29/

Table 1

Mean and standard deviations of imagery priming and imagery ability according to gender and competitive level

		Total sample		**Gender**				**Competitive Level**			
	α	*M*	*SD*	Female		Male		Recreational		Competitive	
				M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Reappraisal	.83	4.89	0.96	4.95	0.94	4.81	0.98	4.92	0.98	4.84	0.93
Suppression	.75	4.00	1.03	3.95	1.01	4.08	1.06	3.98	1.06	4.04	0.99
Skill	.80	5.03	1.05	4.97	1.05	5.22	2.04	4.99	1.05	5.08	1.04
Strategy	.82	4.41	1.18	4.24	1.20	4.65**	1.11	4.34	1.24	4.51	1.10
Goal	.84	4.72	1.35	4.46	1.41	5.07**	1.20	4.57	1.46	4.92	1.18
Affect	.75	5.50	1.04	5.41	1.05	5.63**	1.01	5.49	1.05	5.52	1.02
Mastery	.70	4.64	1.04	4.51	1.07	4.81**	0.97	4.63	1.05	4.65	1.03

Note. ** = significantly higher than female at $p < .05$.

Figure 1.

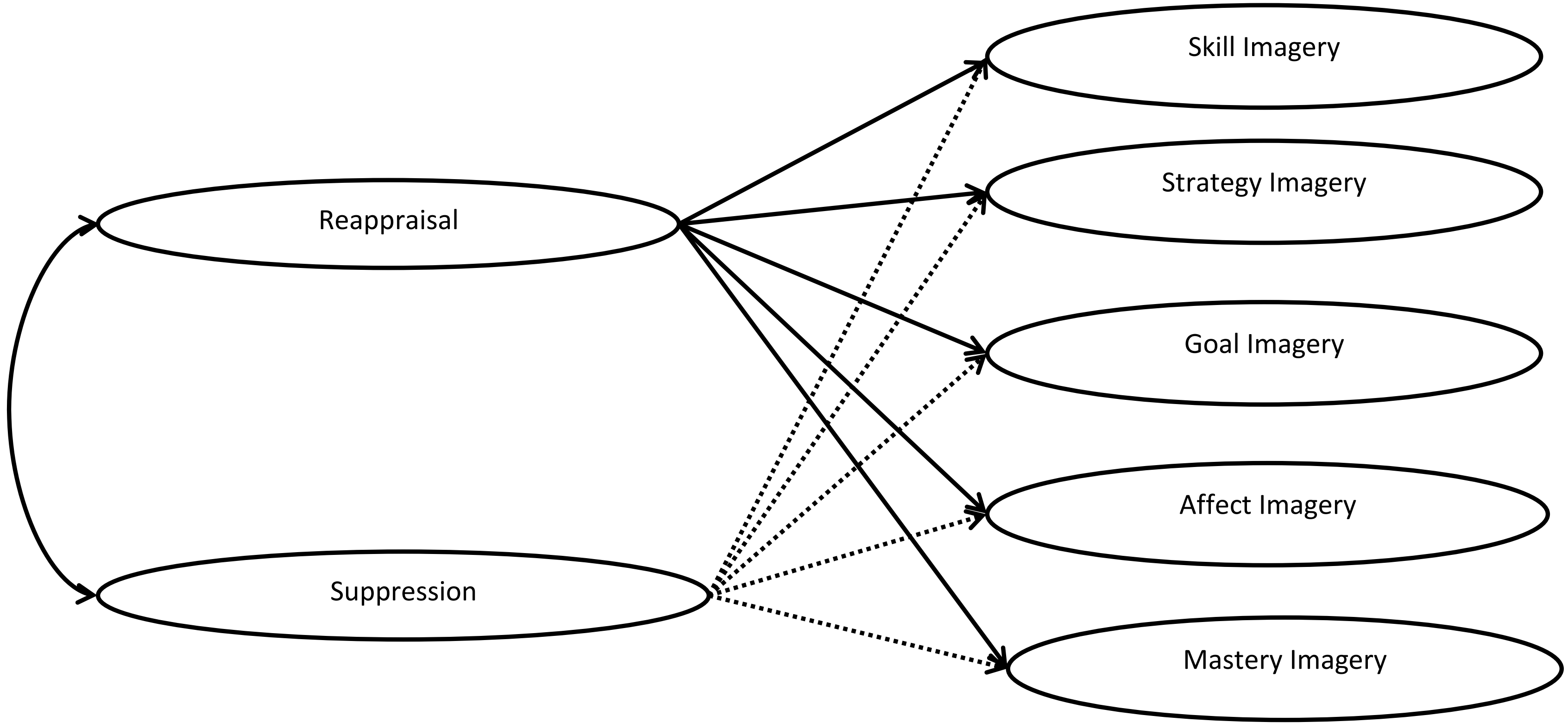

Figure 1. Hypothesized model of emotion regulation, reappraisal, predict imagery ability.

Note. Full lines indicate positively predicted and dashed lines indicate negatively predicted. For visual simplicity, variances between SIAQ subscales and gender controlled are not presented.

Figure 2.

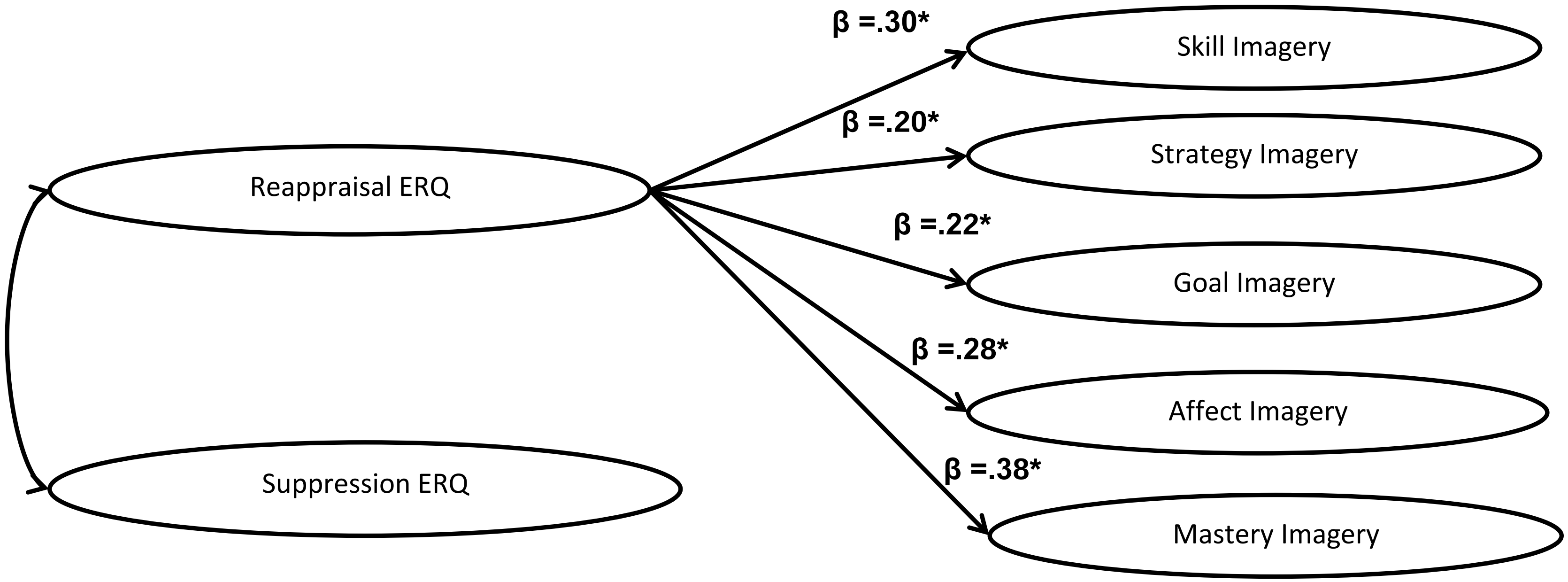

Figure 2. Final model of emotion regulation predicting ease of imaging skill, strategy, goal, affect and mastery.

Note. All coefficients are standardised and positive predictions. * = $p < .001$.

For visual simplicity, variances between SIAQ subscales and gender controlled are not presented.