

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 1 Running Head: IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS-
4 2 A PILOT STUDY

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7 4 The effect of an imagery training intervention on self-confidence and anxiety in acrobatic
8 5 gymnastics- a pilot study
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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Abstract

Acrobatic gymnastics is a unique sport due to the different mixes of gender, age and number of gymnasts working in each partnership, yet psychological skills training within this domain is currently unknown. The aim of this study was to examine the effect of an imagery training intervention on acrobatic performance, self-confidence and anxiety in acrobatic gymnastics. Participants ($n=19$) completed the Sport Imagery Questionnaire and the Competitive State Anxiety Inventory 2 prior to performing their competition routine. They were then randomly assigned to a 4 week imagery training intervention ($n=11$) or control group ($n=8$). Repeated measures ANOVAs were used to examine changes in acrobatic performance, levels of self-confidence and anxiety. The imagery intervention significantly increased acrobat's self-confidence, however; imagery did not significantly reduce anxiety or improve acrobatic performance. Future research should consider adopting a longer intervention period to elicit a reduction in anxiety levels and an enhancement of acrobatic performance.

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 39 The effect of an imagery training intervention on self-confidence and anxiety in acrobatic
4 40 gymnastics- a pilot study
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7 42 Self-confidence and a controlled level of anxiety are key components for athletes to
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10 43 achieve their optimal performance (Vadova, Hall, & Moritz, 1997). Self-confidence is a
11
12 44 personal feeling which can be defined as a sense of belief in yourself and in your abilities
13
14 45 (Vealey, 1986). It is portrayed as one of the most powerful qualities that elite athletes possess
15
16 46 and can also influence performance greatly (Hanton, Meillalieu, & Hall, 2004). Vealey
17
18 47 (1986) developed a sport-specific model of confidence which discusses sport confidence as
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20
21 48 both a trait and a state variable. Trait sports confidence (SC trait) is a relatively stable
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23 49 attribute of an individual's personality and relates to their belief that they can be successful in
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25 50 sport (Vealey, 1986). State sports confidence (SC state) is more likely to be interchangeable
26
27 51 and is often learned through experience. This is more specific than SC trait as it relates to an
28
29 52 individual's belief in their ability to execute a particular skill (Feltz & Öncü, 2014). The
30
31 53 sport-specific model of confidence isolates trait confidence and state confidence and
32
33 54 identifies their relationship with competitive orientation (Vealey, 1986). The model predicts
34
35 55 that trait confidence in sport and competitive orientation interacts to influence state
36
37 56 confidence. Although confidence is a stable trait of personality, psychological skills training
38
39 57 (PST) can alter it as a state by teaching the athlete how to control their confidence in specific
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41 58 situations (Costas, 2011).
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45 59 Research has also identified a relationship between self-confidence and anxiety in
46
47 60 sport (Martens, Burton, Vealey, Bump, & Smith, 1990; Tsopani, Dallas, & Skordilis, 2011)
48
49 61 with some research suggesting that a high level of self-confidence has the ability to overcome
50
51 62 cognitive anxiety and physiological arousal (Hanton et al., 2004). Anxiety is a
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53 63 multidimensional response which is often associated with worry, nervousness or unease about
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55 64 a situation. However, for some, anxiety can also connote a feeling of eagerness or a desire to
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 65 do complete a task. Anxiety is broken down further into the different symptoms that athletes
4
5 66 may experience. Cognitive anxiety refers to the thought component which can be caused by
6
7 67 negative feelings about the situation or one's self. Somatic anxiety is the physiological effect
8
9
10 68 of anxiety which is caused by automatic arousal (Martens et al., 1990). Common examples
11
12 69 include butterflies in the stomach or sweaty palms as a result of intense nerves. For these
13
14 70 reasons, athletes may perceive anxiety to be a negative response which can ultimately inhibit
15
16 71 their performance (Jones & Hanton, 2001). A recent study concluded that the direction of
17
18 72 anxiety in male athletes was determined by external incentive and their personality (Balyan,
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20 Tok, Tatar, Binboga, & Balyan, 2016). More specifically, Monsma and Overby (2004) found
21
22 73 that the level of experience in ballet dancers determined the intensity of cognitive and
23
24 74 somatic anxiety. Successful dancers tended to experience more cognitive anxiety which was
25
26 75 not detrimental to their performance; however, higher levels of somatic anxiety were found in
27
28 76 unsuccessful dancers. The Model of Facilitative or Debilitative of Anxiety (Jones, 1995)
29
30 77 implies that it is dependent on the athlete's perception of their anxiety that determines the
31
32 78 outcome of their performance. The model illustrates that the control factor can direct anxiety
33
34 79 into positive expectancies or can have a debilitating effect on the athlete. This model is
35
36 80 supported by the findings of Tsopani et al. (2011) where rhythmic gymnasts reported high
37
38 81 levels of cognitive anxiety but also achieved high scoring performances. Furthermore,
39
40 82 athletes should aim to have an enhanced level of self-confidence and learn to regulate their
41
42 83 anxiety in order to have a facilitative effect on sport performance (Feltz & Öncü, 2014).
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44 84 Ideally, the primary outcome is for athlete to have the ability to control their psychological
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46 85 state.
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52 87 It has long been acknowledged that mental imagery is a form of PST for guiding and
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54 88 managing athletic performance (Murphy, 1994). However, imagery training is a versatile
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56 89 technique and therefore should follow a systematic approach and target the athlete's area of
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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2
3 90 concern (Martin, Moritz, & Hall, 1999). The applied model of imagery training (Martin et al.,
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5 91 1999) was specifically formulated to direct mental practice for athletes and suggests variables
6
7 92 which may influence the outcome of the training. The model consists of four main constructs;
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9
10 93 1) the sport situation, 2) the imagery type, 3) the outcome and 4) imagery ability of the
11
12 94 athlete. The sport situation is specific to the athlete, whether the mental imagery takes place
13
14 95 in training, competition or for rehabilitation purposes. Imagery type is based on research
15
16 96 developed by Hall, Mack, Paivio, and Hausenblas (1998) that conceptualized imagery into
17
18 97 five independent types oriented to either motivational or cognitive functions. Cognitive
19
20 98 specific (CS) is related to the athlete using their senses to correctly execute a particular skill.
21
22 99 For example, a diver visualizing their arm movements entering the rotation and the feeling of
23
24 100 their body when they hit the water correctly. Cognitive general (CG) is using the imagination
25
26 101 to rehearse strategies that may be used in training. Motivational general is divided into two
27
28 102 functions. Motivational general mastery (MG-M) involves the athlete picturing themselves in
29
30 103 a calm and focused state while in a sport situation. Motivational general arousal (MG-A) is
31
32 104 associated with the athlete visualizing themselves being able to self-regulate their emotions.
33
34 105 For instance, an athlete imagines using relaxation techniques prior to competing in an
35
36 106 important event. Motivational specific (MS) involves themselves in an environment which
37
38 107 triggers a feeling of inspiration. An example could include a sprinter standing on the podium
39
40 108 while their country's national anthem plays. Hall, et al. (2009) suggests that the MG-M
41
42 109 function is aimed at enhancing self-confidence and MG-A is employed to reduce anxiety. The
43
44 110 outcome in the model relates to the goal that the athlete wants to achieve through imagery
45
46 111 training. Martin et al. (1999) portray imagery ability as a mediating variable between imagery
47
48 112 function and the outcome related to performance. Therefore, it is a crucial component of
49
50 113 imagery training and can influence sport performance greatly.
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 114 The majority of imagery interventions have targeted learning new skills and
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5 115 improving technique (Munroe-Chandler, Hall, Fishburne, Murphy, & Hall, 2012); however
6
7 116 there is evidence to suggest that such interventions also have a positive effect on self-
8
9 117 confidence and reducing anxiety (Cumming & Ramsey, 2001). Callow, Hardy, and Hall
10
11 118 (2001) used a multiple baseline design to examine the impact of an imagery program on four
12
13 119 high-performing badminton players. The results of the study indicated a significant increase
14
15 120 in self-confidence in three out of four athletes who followed MG-M based imagery scripts
16
17 121 twice a week for 3 weeks. Research based on imagery interventions have also shown to have
18
19 122 an impact on anxiety in athletes. Mellalieu, Hanton, and Thomas (2009) focused on the
20
21 123 effects of an imagery intervention on competitive anxiety in collegiate rugby players. By
22
23 124 following a MG-A imagery strategy, the results revealed that the rugby players reported
24
25 125 greater facilitative interpretations of competitive anxiety after the intervention.
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29 126 Specific disciplines of gymnastics, such as artistic gymnastics, have received much
30
31 127 attention regarding imagery training and have found it beneficial to performance. Researchers
32
33 128 have often adopted the PETTLEP approach which relates to the physical, environmental,
34
35 129 task, timing, learning, emotional and perspective of imagery training (Holmes & Collins,
36
37 130 2001). This approach was employed for skill enhancement in young artistic gymnasts and
38
39 131 was compared to several groups including; a traditional based imagery group, a physical
40
41 132 training group and a control group (Smith, Wright, Allsopp, & Westhead, 2007). The
42
43 133 PETTLEP group showed a significant increase in skill execution and overall performance
44
45 134 along with the physical training group. However, psychological benefits such as reducing
46
47 135 anxiety and elevating self-confidence require more focus on the emotional element of
48
49 136 imagery (Ramsey, Cumming, Williams, & Brunning, 2010). This evidence suggests that it is
50
51 137 appropriate to combine physical training along with imagery training to achieve the most
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53 138 beneficial outcome. Despite these findings, gymnastics is divided into specific disciplines in
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 139 which artistic and rhythmic have received more attention than others. Acrobatic gymnastics is
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5 140 a discipline which lacks empirical research in relation to imagery training. Within acrobatic
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7 141 gymnastics, gymnasts are grouped into suitable long-term partnerships which they perform
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9
10 142 and compete routines together. They fall under one of the following categories; women's pair
11
12 143 (WP), men's pair (MP), mixed pair (MxP), women's trio (WG) and men's four (MG). Due to
13
14 144 the different mixes of gender, age and number of gymnasts working in each partnership, the
15
16 145 psychological pressure for acrobats could be higher than gymnasts who train and compete on
17
18 146 their own. This unique form of gymnastics incorporates a variety of other sport-related
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20 147 components in one, for instance, dance performance, working in a team, individual skill
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22 148 acquisition as well as a combination of balance and dynamic skills. Therefore the current
23
24 149 study may provide some insight into multidimensional aesthetic sport and more specifically
25
26 150 expand the knowledge of acrobatic coaches to encourage PST into their gymnasts' programs.
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28 151 Research conducted in other sports has proposed imagery training for altering self-confidence
29
30 152 and anxiety levels yet there is no evidence on the use of imagery training in acrobatic
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32 153 gymnastics (Callow et al., 2001; Mellalieu et al., 2009). Thus, the primary aim of this study
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34 154 was to examine the effects of imagery training on self-confidence and anxiety in acrobatic
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36 155 gymnastic performance. As a pilot study, the findings will determine whether PST would be
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38 156 feasible in group aesthetic athletes, specifically acrobatic gymnasts.
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157 **Methods**

158 **Participants**

159 Twenty-one acrobatic gymnasts were recruited from a gymnastics club who fulfilled
160 the inclusion criteria of competing at a National level and a minimum age of 9 years. This
161 particular age was selected as a competitive partnership comprises of different roles which
162 are dependent on age and weight. Therefore, partnerships with young gymnasts were
163 included to ensure an efficient sample size. Due to the nature of acrobatic gymnastics, the

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 164 participants were selected in their competition partnerships and additionally excluded
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5 165 together if one gymnast did not fulfill the requirements of the study. One partnership (two
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7 166 gymnasts) were eliminated from the study as they could not complete the compulsory
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10 167 performance measurements due to injury. The final sample consisted of nineteen gymnasts (6
11
12 168 males, 13 females, mean age= 13.2 years, $SD= 2.7$) who had an average competitive
13
14 169 experience of 3.7 years. None of the participants had received imagery training prior to the
15
16 170 intervention. The partnerships differed in category and level, therefore they were paired up
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18 171 with a similar partnership and then randomly assigned into either the imagery intervention
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20 172 group or the control group. This increased the probability of achieving a balanced sample
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22 173 with similar partnerships in each group. As a result, 11 gymnasts were in the intervention
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24 174 group with the following categories; MG, MxP, WP and WG and the control group consisted
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26 175 of 8 gymnasts; two WG's (competing at different levels) and an MxP. The group numbers
27
28 176 were uneven due to the exclusion of an injured MxP.

Measures

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34 178 The Competitive State Anxiety Inventory-2 (CSAI-2), developed by Martens et al.
35
36 179 (1990), was used to establish the gymnasts' levels of anxiety and self-confidence prior to
37
38 180 competition. The inventory consists of 27 items answered on a 4-point Likert scale of 1: Not
39
40 181 at all and 4: Very much so. The inventory incorporates three subscales; cognitive anxiety,
41
42 182 somatic anxiety and confidence, all represented by nine items. According to Martens et al.
43
44 183 (1990), each subscale score ranges between 9 and 36 with higher scores indicating greater
45
46 184 cognitive and somatic anxiety or self-confidence. This measure has been consistently used in
47
48 185 imagery interventions in other dance-related studies (Monsma & Overby, 2004; Fish, Hall, &
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50 186 Cumming, 2004) and is considered to be a reliable measure in aesthetic sports (Link, 2011).
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52 187 This study had an acceptable average internal reliability estimates with the subscales ranging
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54 188 from $\alpha = .74$ and $\alpha = .88$.

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 189 The Sport Imagery Questionnaire (SIQ) developed by Hall et al. (1998) was
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5 190 employed to measure the gymnast's imagery ability and also establish what function of
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7 191 imagery they adopt the most. This could be considered an exploratory measure due to the
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9
10 192 lack of knowledge of imagery scripts for acrobatic gymnasts. For instance, differentiating the
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12 193 scripts for the positions within partnerships, categories and separating individual skills from
13
14 194 group skills. Therefore SIQ was utilized to ensure that the imagery scripts were targeting the
15
16 195 correct imagery subscales for anxiety and self-confidence. The questionnaire includes 30
17
18 196 items that are rated on a 7-point Likert scale with 1 representing rarely and 7 representing
19
20 197 often. Each item represents one of the five functions of imagery; cognitive general, cognitive
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22 198 specific, motivational- general mastery, motivational general arousal or motivational specific.
23
24
25 199 The SIQ is a common measurement tool to adopt in an imagery investigation as it clearly
26
27 200 separates the imagery functions and makes it easier to analyze (Peltomaki, 2014). The
28
29 201 average internal reliability estimates for the SIQ in this particular study ranged from $\alpha = .50$
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31 202 and $\alpha = .74$.

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33
34 203 The measures of sport performance were facilitated to coincide with the Scottish
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36 204 National Championships in order to gather post-intervention data. To mimic this setting for
37
38 205 baseline measurements, a practice competition was held within the gymnasts' training
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40 206 facility. The practice competition followed British Gymnastics guidelines where all of the
41
42 207 partnerships were required to wear matching leotards and perform their competition routine
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44 208 in front of a panel of qualified judges (Federation of International Gymnastics, 2009). Each
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46 209 partnership was judged on the difficulty of their routine, execution of all of the skills and
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48 210 their artistic presentation which results in a score out of 30. Despite the pre and post
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50 211 measurements differing in magnitude, competition guidelines and regulations were followed
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52 212 in both.

213 Procedures

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 214 The head coach was contacted and given information on the purpose and procedures
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5 215 of the investigation. After gaining signed consent from the participants and parents of athletes
6
7 216 under the age of 12, they were briefed on the questionnaires and the layout of the practice
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9 217 competition. They were asked to complete a demographic questionnaire in order to gather
10
11 218 descriptive information on the sample (age, competitive acrobatic years, and weekly hours of
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13 219 training) and asked to complete the CSAI-2 and the SIQ. The questionnaires were completed
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15 220 in a group setting prior to performing their competition routine. Three qualified judges were
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17 221 used to score the gymnasts with an average execution score from two judges and one score
18
19 222 from artistry. After each partnership was given a final score, they were randomly assigned to
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21 223 either the imagery training group or a control group.

22 224 The imagery training group was asked to complete two, 15 minute imagery sessions a
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24 225 week for 6 weeks. Unfortunately, a 6 week program and the post intervention tests interfered
25
26 226 with the gymnast's competition season and therefore the decision was made to reduce the
27
28 227 program to 4 weeks. These sessions were in the form of imagery scripts which were
29
30 228 progressive and specific to each partnership over the 4 week period (see appendices 1 and 2).
31
32 229 The imagery sessions took place before the gymnast's physical training. After each session,
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34 230 the gymnasts were asked to keep an imagery diary which elaborated on their imagery
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36 231 experience and informed the researcher of any struggles they may have had with the imagery
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38 232 work. The control group continued with their original training throughout the 4 weeks. The
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40 233 CSAI-2 and the SIQ were administered to the gymnasts again after the 4 week intervention.
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42 234 These questionnaires were given out prior to a national championship competition where the
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44 235 gymnasts completed the same routine and scores were taken for measuring acrobatic
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46 236 performance.

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54 237 **Data Analysis**

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

238 To ensure normal distribution and homogeneity within the sample, the Levene's test
 239 was used. Alpha coefficients, means and standard deviation for each subscale of the CSAI-2,
 240 the SIQ and performance scores were calculated for the baseline measurements and the post
 241 intervention measurements. A Repeated Measures ANOVA was used identify any changes in
 242 acrobatic performance, anxiety or self-confidence between the intervention and control
 243 groups and at baseline and post-intervention. The test of significance was set at 95%
 244 confidence, resulting in a significant value of $p < .05$. Effect sizes were estimated using
 245 Cohen's (1992) interpretation guidelines of $d \geq 0.2$ (small effect size), $d \geq 0.5$ (medium
 246 effect size) and $d \geq 0.8$ (large effect size).

247 Results

248 Cognitive anxiety, somatic anxiety and self-confidence were subscales of the CSAI-2
 249 that served as the dependent variables in the intervention. The means and standard deviations
 250 for the control group and intervention group, for pre-test and post-test are displayed in Table
 251 1. There was no significant interaction effect between group and time for cognitive anxiety
 252 ($F_{1,17} = 1.96$, $p > .05$, $\eta^2 = .10$) and somatic anxiety ($F_{1,17} = .92$, $p > .05$, $\eta^2 = .35$). The imagery
 253 intervention group significantly increased their confidence levels in comparison to the control
 254 group ($F_{1,17} = 14.18$, $p = .002$), with a moderate effect size of .46. Figure 1 illustrates the
 255 difference in confidence scores pre and post-test for the intervention and control group.

256 **Table 1**
 257 Descriptive Statistics for the CSAI-2

Variable	Control				Intervention			
	Pre-test		Post-test		Pre-test		Post-test	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
CA	19.63	4.37	20.88	7.16	19.55	4.59	17.82	4.66
SA	20.13	5.46	20.00	7.95	20.64	6.86	18.55	6.62
Confidence	21.13	1.96	22.13	3.91	21.09	4.30	26.18*	4.38

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

258 Note: CA= Cognitive anxiety, SA= Somatic anxiety. *M* represents the mean value and *SD* represents the
 259 standard deviation. *= significant ($p < .05$) difference pre and post intervention. The maximum score for the
 260 three variables is 36.

261

262 ****INSERT FIGURE 1 HERE***

263 There was no significant interaction effect between group and time for any of the
 264 imagery subscales (Table 2). There was a significant main effect of time in the intervention
 265 group for MG-A imagery ($F_{1,17} = 7.16, p = .02, \eta^2 = .30$) and MG-M imagery ($F_{1,17} = 5.16, p =$
 266 $.04, \eta^2 = .23$).

267

268 **Table 2**

269 Descriptive statistics for the SIQ

Variable	Control				Intervention			
	Pre-test		Post-test		Pre-test		Post-test	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
CS	3.73	.711	4.21	.77	4.12	.92	4.65	1.92
CG	3.43	.57	3.56	.90	3.95	1.34	4.20	1.63
MS	3.70	.75	3.92	1.35	3.89	1.48	4.12	1.59
MG-A	3.23	.88	3.67	.86	3.17	1.25	4.02	1.02
MG-M	3.49	.60	3.94	1.07	4.11	.91	4.91	1.27

270 Note: CS= cognitive specific, CG= cognitive general, MS= motivational specific, MG-A= motivational general
 271 arousal, MG-M= motivational general mastery. *M* represents the mean value and *SD* represents the standard
 272 deviation. The maximum score for each variable is 5.0.

273

274 There was no significant interaction effect between group and time for acrobatic
 275 performance ($F_{1,17} = .82, p = .38, \eta^2 = .13$) as a result of the intervention. Figure 2 illustrates a
 276 clear distinction between the two group's baseline scores which may have affected the
 277 outcome values. An independent t-test identified that a significant difference ($p < .05$) existed
 278 between the intervention group and the control group at baseline level, with the intervention
 279 group with considerably higher score.

280 ****INSERT FIGURE 2 HERE****

281

Discussion

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 282 The purpose of the study was to examine the effects of an imagery training intervention
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5 283 on performance, self-confidence and anxiety in acrobatic gymnasts. An additional focus of
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7 284 the investigation was observing the magnitude of these changes which determines whether a
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10 285 PST program would be feasible in such gymnasts.

11 286 The results suggest that acrobatic gymnasts can use imagery training to increase their
12
13 287 self-confidence levels but not for reducing cognitive or somatic anxiety. Additionally, a 4
14
15 288 week imagery intervention did not increase the score of acrobatic performances in
16
17 289 competition. Furthermore, the performance scores for the intervention group were
18
19 290 considerably higher than the control group at the baseline level which implies that other
20
21 291 variables may have accounted for the pre-test difference in performance. For example, the
22
23 292 participants ranged in years of experience and the number of hours they trained a week which
24
25 293 could have influenced the outcome result. However, matching gymnasts up of different ages,
26
27 294 experience and training into a competitive partnership is the nature of the sport. In response,
28
29 295 future research should consider decreasing the sample size in order to examine specific
30
31 296 partnerships (WP, MP, WG, MG, MxP) and cap the level in which they compete at. The
32
33 297 intervention faced challenges and limitations when considering the time restriction of the
34
35 298 imagery training and working around the gymnasts' physical training. Due to overlapping
36
37 299 events in the gymnasts' training schedule and competition season, the program was reduced
38
39 300 to two, 15 minute sessions per week for 4 weeks. This imagery training may not have been
40
41 301 consistent enough to change their anxiety levels according to Munroe-Chandler et al. (2012)
42
43 302 who recommend daily imagery sessions for athletes. Additionally, the study was designed to
44
45 303 coincide with the gymnast's competition season which consequently led to the pre to post
46
47 304 sport performance measures differing in magnitude. Baseline measures were held in the
48
49 305 gymnasts' training facility and could be considered a relaxed setting in comparison to a
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51 306 national competition. The post-test measurement was the Scottish Championships which is a
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 307 relatively large competition where anxiety and nerves may be elevated. Thus, the difference
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5 308 in pre to post measurements may have altered the anxiety levels in the acrobatic gymnasts
6
7 309 and could have affected the outcome results. However, by observing the specific changes in
8
9 310 CSAI-2 scores, a slight decrease in cognitive and somatic anxiety was recorded in the
10
11 311 intervention group post-test. The control group marginally increased their cognitive anxiety
12
13 312 after 4 weeks. Therefore, the imagery group had reduced their anxiety from pre to post-test
14
15 313 despite the assumption that a larger competition leads to higher anxiety. Despite its validity in
16
17 314 previous research, an additional limitation, in terms of measurements, was the use of the
18
19 315 outdated version of the CSAI-2. Both groups increased their imagery use from pre to post-
20
21 316 test; however no significant results were observed between the intervention and control
22
23 317 group. Despite this, it is important to report that the intervention group significantly increased
24
25 318 their MG-A and MG-M imagery from pre to post-test which indicates that the intervention
26
27 319 targeted the intended functions.

31
32 The research conducted by Callow et al. (2001) support the findings of the present
33
34 321 study where a MG-M based imagery program significantly increased self-confidence in
35
36 322 athletes. Similarly, the results of this investigation reinforce Vadoa et al.'s (1997)
37
38 323 hypothesized relationship between the use of imagery and an enhanced self-confidence in
39
40 324 aesthetic athletes. Their findings also revealed a positive relationship between the use MG-A
41
42 325 imagery and cognitive anxiety (Vadoa et al., 1997). In this respect, the results of the present
43
44 326 study contradict with these findings as an increased use of imagery did not show a change in
45
46 327 cognitive anxiety. Furthermore, the non-significant comparison in anxiety levels between the
47
48 328 imagery intervention group and control group conflict with Mellalieu et al. (2009) who
49
50 329 reported a reduced anxiety level after MG-M imagery training in rugby players. These
51
52 330 conflicting results may be due to the difference in sports, where MG-M imagery training
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54 331 works well to reduce anxiety in rugby players but not in aesthetic sports such as acrobatic
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 332 gymnastics. However, a larger base of research is required in this field in order to infer this
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5 333 conclusion.

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7 334 According to the findings of the present study, acrobatic gymnasts can benefit from
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10 335 PST and specifically enhance their self-confidence by adopting imagery training in practice
11
12 336 and competition. However, further research is required to identify the effect of an increased
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14 337 duration imagery intervention in acrobatic gymnastics which follow a more intense and
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16 338 consistent program. In terms of acrobatics incorporating athletes competing in a small group,
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18 339 performing individual skills and also including a dance element, the current study could relate
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21 340 to other aesthetic sports and build on the knowledge of imagery training. This particular study
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23 341 concludes that a 4 week imagery intervention did increase self-confidence in acrobatic
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25 342 gymnasts but did not have an effect on reducing their anxiety. Moreover, imagery training
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27 343 does not increase the score of competitive performances in acrobatic gymnastics.
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

Appendix

Appendix A- Imagery script 1

Friday Session- 11-16 Women's Pair

You step on to the floor with confidence and you feel your heart beating faster than usual.

You present to the judges along with your partner and settle into your starting position

together. Your muscles are relaxed and you feel calm as you listen to the beep at the start of

your routine. The music is slow and heart-warming as you begin to dance your

choreography; your body movements match the routine perfectly. Your nerves switch into

excitement as you climb up to the first balance skill. Both of you are strong and controlled

through hand-to-hand and the transition into Mexican is smooth. When you exit the skill,

you and your partner are delighted... you show this through smiling and you notice judges

smiling back. As you flow through the routine, each skill you perform is controlled; you and

your partner know what you are doing. You count each balance skill for 3 slow seconds in

your head to make sure there are no time fault deductions. Two-on two lever is steady and

the exit is controlled. Every perfect move and individual you perform boosts your confidence

throughout the routine, it feels easy and effortless. You both finish the routine elegantly

together, which matches the music. You walk off the competition floor feeling proud of

yourself and your partner.

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

370 Appendix B- Imagery script 2

371 Fridays Session- 12-18 Men's Four

372 You step on to the floor with confidence and you feel your heart beating faster than usual.

373 You present to the judges along with your 3 partners and settle into your starting position

374 together. Your muscles are relaxed and you feel calm as you listen to the beep at the start of

375 your routine. You begin to dance your choreography to the upbeat and joyful music. You

376 can see your partners at the corner of your eye and you are all dancing in perfect

377 synchronization. Your nerves switch into excitement as you climb up in to the first tempo

378 skill... You take a deep breath as you bend for the basket in precise timing with your

379 partners. The salto's reach maximum height and the landing is solid. To match the music,

380 you maintain a joyful smile and you notice judges smiling back. As you flow through the

381 routine, each skill you perform is powerful but controlled, you and your partners know

382 exactly what they're doing. Every perfect move and individual you perform boosts your

383 confidence throughout the routine, it feels easy and effortless. All four of you finish the

384 routine bang on the beat, and you hear the audience cheer for you. You walk off the

385 competition floor feeling proud of yourself and your partners.

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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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For Review Only

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

Abstract

Acrobatic gymnastics is a unique sport due to the different mixes of gender, age and number of gymnasts working in each partnership, yet psychological skills training within this domain is currently unknown. The aim of this study was to examine the effect of an imagery training intervention on acrobatic performance, self-confidence and anxiety in acrobatic gymnastics. Participants ($n=19$) completed the Sport Imagery Questionnaire and the Competitive State Anxiety Inventory 2 prior to performing their competition routine. They were then randomly assigned to a 4 week imagery training intervention ($n=11$) or control group ($n=8$). Repeated measures ANOVAs were used to examine changes in acrobatic performance, levels of self-confidence and anxiety. The imagery intervention significantly increased acrobat's self-confidence, however; imagery did not significantly reduce anxiety or improve acrobatic performance. Future research should consider adopting a longer intervention period to elicit a reduction in anxiety levels and an enhancement of acrobatic performance.

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 17 The effect of an imagery training intervention on self-confidence and anxiety in acrobatic
4 18 gymnastics- a pilot study
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8 20 Self-confidence and a controlled level of anxiety are key components for athletes to
9
10 21 achieve their optimal performance (Vadova, Hall, & Moritz, 1997). Self-confidence is a
11
12 22 personal feeling which can be defined as a sense of belief in yourself and in your abilities
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14 23 (Vealey, 1986). It is portrayed as one of the most powerful qualities that elite athletes possess
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16 24 and can also influence performance greatly (Hanton, Meillalieu, & Hall, 2004). Vealey
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18 25 (1986) developed a sport-specific model of confidence which discusses sport confidence as
19
20 26 both a trait and a state variable. Trait sports confidence (SC trait) is a relatively stable
21
22 27 attribute of an individual's personality and relates to their belief that they can be successful in
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24 28 sport (Vealey, 1986). State sports confidence (SC state) is more likely to be interchangeable
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26 29 and is often learned through experience. This is more specific than SC trait as it relates to an
27
28 30 individual's belief in their ability to execute a particular skill (Feltz & Öncü, 2014). The
29
30 31 sport-specific model of confidence isolates trait confidence and state confidence and
31
32 32 identifies their relationship with competitive orientation (Vealey, 1986). The model predicts
33
34 33 that trait confidence in sport and competitive orientation interacts to influence state
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36 34 confidence. Although confidence is a stable trait of personality, psychological skills training
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38 35 (PST) can alter it as a state by teaching the athlete how to control their confidence in specific
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40 36 situations (Costas, 2011).
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45 37 Research has also identified a relationship between self-confidence and anxiety in
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47 38 sport (Martens, Burton, Vealey, Bump, & Smith, 1990; Tsopani, Dallas, & Skordilis, 2011)
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49 39 with some research suggesting that a high level of self-confidence has the ability to overcome
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51 40 cognitive anxiety and physiological arousal (Hanton et al., 2004). Anxiety is a
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53 41 multidimensional response which is often associated with worry, nervousness or unease about
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55 42 a situation. However, for some, anxiety can also connote a feeling of eagerness or a desire to
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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2
3 43 do complete a task. Anxiety is broken down further into the different symptoms that athletes
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5 44 may experience. Cognitive anxiety refers to the thought component which can be caused by
6
7 45 negative feelings about the situation or one's self. Somatic anxiety is the physiological effect
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9
10 46 of anxiety which is caused by automatic arousal (Martens et al., 1990). Common examples
11
12 47 include butterflies in the stomach or sweaty palms as a result of intense nerves. For these
13
14 48 reasons, athletes may perceive anxiety to be a negative response which can ultimately inhibit
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16 49 their performance (Jones & Hanton, 2001). A recent study concluded that the direction of
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18 50 anxiety in male athletes was determined by external incentive and their personality (Balyan,
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21 51 Tok, Tatar, Binboga, & Balyan, 2016). More specifically, Monsma and Overby (2004) found
22
23 52 that the level of experience in ballet dancers determined the intensity of cognitive and
24
25 53 somatic anxiety. Successful dancers tended to experience more cognitive anxiety which was
26
27 54 not detrimental to their performance; however, higher levels of somatic anxiety were found in
28
29 55 unsuccessful dancers. The Model of Facilitative or Debilitative of Anxiety (Jones, 1995)
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31 56 implies that it is dependent on the athlete's perception of their anxiety that determines the
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33 57 outcome of their performance. The model illustrates that the control factor can direct anxiety
34
35 58 into positive expectancies or can have a debilitative effect on the athlete. This model is
36
37 59 supported by the findings of Tsopani et al. (2011) where rhythmic gymnasts reported high
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39 60 levels of cognitive anxiety but also achieved high scoring performances. Furthermore,
40
41 61 athletes should aim to have an enhanced level of self-confidence and learn to regulate their
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43 62 anxiety in order to have a facilitative effect on sport performance (Feltz & Öncü, 2014).
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45 63 Ideally, the primary outcome is for athlete to have the ability to control their psychological
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47 64 state.

51
52 65 It has long been acknowledged that mental imagery is a form of PST for guiding and
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54 66 managing athletic performance (Murphy, 1994). However, imagery training is a versatile
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56 67 technique and therefore should follow a systematic approach and target the athlete's area of
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 68 concern (Martin, Moritz, & Hall, 1999). The applied model of imagery training (Martin et al.,
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5 69 1999) was specifically formulated to direct mental practice for athletes and suggests variables
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7 70 which may influence the outcome of the training. The model consists of four main constructs;
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10 71 1) the sport situation, 2) the imagery type, 3) the outcome and 4) imagery ability of the
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12 72 athlete. The sport situation is specific to the athlete, whether the mental imagery takes place
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14 73 in training, competition or for rehabilitation purposes. Imagery type is based on research
15
16 74 developed by Hall, Mack, Paivio, and Hausenblas (1998) that conceptualized imagery into
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18 75 five independent types oriented to either motivational or cognitive functions. Cognitive
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20 76 specific (CS) is related to the athlete using their senses to correctly execute a particular skill.
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22 77 For example, a diver visualizing their arm movements entering the rotation and the feeling of
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24 78 their body when they hit the water correctly. Cognitive general (CG) is using the imagination
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26 79 to rehearse strategies that may be used in training. Motivational general is divided into two
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28 80 functions. Motivational general mastery (MG-M) involves the athlete picturing themselves in
29
30 81 a calm and focused state while in a sport situation. Motivational general arousal (MG-A) is
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32 82 associated with the athlete visualizing themselves being able to self-regulate their emotions.
33
34 83 For instance, an athlete imagines using relaxation techniques prior to competing in an
35
36 84 important event. Motivational specific (MS) involves themselves in an environment which
37
38 85 triggers a feeling of inspiration. An example could include a sprinter standing on the podium
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40 86 while their country's national anthem plays. Hall, et al. (2009) suggests that the MG-M
41
42 87 function is aimed at enhancing self-confidence and MG-A is employed to reduce anxiety. The
43
44 88 outcome in the model relates to the goal that the athlete wants to achieve through imagery
45
46 89 training. Martin et al. (1999) portray imagery ability as a mediating variable between imagery
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48 90 function and the outcome related to performance. Therefore, it is a crucial component of
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50 91 imagery training and can influence sport performance greatly.
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 92 The majority of imagery interventions have targeted learning new skills and
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5 93 improving technique (Munroe-Chandler, Hall, Fishburne, Murphy, & Hall, 2012); however
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7 94 there is evidence to suggest that such interventions also have a positive effect on self-
8
9 95 confidence and reducing anxiety (Cumming & Ramsey, 2001). Callow, Hardy, and Hall
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11 96 (2001) used a multiple baseline design to examine the impact of an imagery program on four
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13 97 high-performing badminton players. The results of the study indicated a significant increase
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15 98 in self-confidence in three out of four athletes who followed MG-M based imagery scripts
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17 99 twice a week for 3 weeks. Research based on imagery interventions have also shown to have
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20
21 100 an impact on anxiety in athletes. Mellalieu, Hanton, and Thomas (2009) focused on the
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23 101 effects of an imagery intervention on competitive anxiety in collegiate rugby players. By
24
25 102 following a MG-A imagery strategy, the results revealed that the rugby players reported
26
27 103 greater facilitative interpretations of competitive anxiety after the intervention.

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30 104 Specific disciplines of gymnastics, such as artistic gymnastics, have received much
31
32 105 attention regarding imagery training and have found it beneficial to performance. Researchers
33
34 106 have often adopted the PETTLEP approach which relates to the physical, environmental,
35
36 107 task, timing, learning, emotional and perspective of imagery training (Holmes & Collins,
37
38 108 2001). This approach was employed for skill enhancement in young artistic gymnasts and
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40 109 was compared to several groups including; a traditional based imagery group, a physical
41
42 110 training group and a control group (Smith, Wright, Allsopp, & Westhead, 2007). The
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44 111 PETTLEP group showed a significant increase in skill execution and overall performance
45
46 112 along with the physical training group. However, psychological benefits such as reducing
47
48 113 anxiety and elevating self-confidence require more focus on the emotional element of
49
50 114 imagery (Ramsey, Cumming, Williams, & Brunning, 2010). This evidence suggests that it is
51
52 115 appropriate to combine physical training along with imagery training to achieve the most
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54 116 beneficial outcome. Despite these findings, gymnastics is divided into specific disciplines in
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 117 which artistic and rhythmic have received more attention than others. Acrobatic gymnastics is
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5 118 a discipline which lacks empirical research in relation to imagery training. Within acrobatic
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7 119 gymnastics, gymnasts are grouped into suitable long-term partnerships which they perform
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10 120 and compete routines together. They fall under one of the following categories; women's pair
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12 121 (WP), men's pair (MP), mixed pair (MxP), women's trio (WG) and men's four (MG). Due to
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14 122 the different mixes of gender, age and number of gymnasts working in each partnership, the
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16 123 psychological pressure for acrobats could be higher than gymnasts who train and compete on
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18 124 their own. This unique form of gymnastics incorporates a variety of other sport-related
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20 125 components in one, for instance, dance performance, working in a team, individual skill
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22 126 acquisition as well as a combination of balance and dynamic skills. Therefore the current
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24 127 study may provide some insight into multidimensional aesthetic sport and more specifically
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26 128 expand the knowledge of acrobatic coaches to encourage PST into their gymnasts' programs.
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28 129 Research conducted in other sports has proposed imagery training for altering self-confidence
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30 130 and anxiety levels yet there is no evidence on the use of imagery training in acrobatic
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32 131 gymnastics (Callow et al., 2001; Mellalieu et al., 2009). Thus, the primary aim of this study
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34 132 was to examine the effects of imagery training on self-confidence and anxiety in acrobatic
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36 133 gymnastic performance. As a pilot study, the findings will determine whether a PST program
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38 134 would be feasible in acrobatic gymnasts.
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Methods**Participants**

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47 137 Twenty-one acrobatic gymnasts were recruited from a gymnastics club who fulfilled
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49 138 the inclusion criteria of competing at a National level and a minimum age of 9 years. This
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51 139 particular age was selected as a competitive partnership comprises of different roles which
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53 140 are dependent on age and weight. Therefore, partnerships with young gymnasts were
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55 141 included to ensure an efficient sample size. Due to the nature of acrobatic gymnastics, the
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 142 participants were selected in their competition partnerships and additionally excluded
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5 143 together if one gymnast did not fulfill the requirements of the study. One partnership (two
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7 144 gymnasts) were eliminated from the study as they could not complete the compulsory
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9 145 performance measurements due to injury. The final sample consisted of nineteen gymnasts (6
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11 146 males, 13 females, mean age= 13.2 years, $SD= 2.7$) who had an average competitive
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13 147 experience of 3.7 years. None of the participants had received imagery training prior to the
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15 148 intervention. The partnerships differed in category and level, therefore they were paired up
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17 149 with a similar partnership and then randomly assigned into either the imagery intervention
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19 150 group or the control group. This increased the probability of achieving a balanced sample
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21 151 with similar partnerships in each group. As a result, 11 gymnasts were in the intervention
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23 152 group with the following categories; MG, MxP, WP and WG and the control group consisted
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25 153 of 8 gymnasts; two WG's (competing at different levels) and an MxP. The group numbers
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27 154 were uneven due to the exclusion of an injured MxP.

Measures

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34 156 The Competitive State Anxiety Inventory-2 (CSAI-2), developed by Martens et al.
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36 157 (1990), was used to establish the gymnasts' levels of anxiety and self-confidence prior to
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38 158 competition. The inventory consists of 27 items answered on a 4-point Likert scale of 1: Not
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40 159 at all and 4: Very much so. The inventory incorporates three subscales; cognitive anxiety,
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42 160 somatic anxiety and confidence, all represented by nine items. According to Martens et al.
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44 161 (1990), each subscale score ranges between 9 and 36 with higher scores indicating greater
45
46 162 cognitive and somatic anxiety or self-confidence. This measure has been consistently used in
47
48 163 imagery interventions in other dance-related studies (Monsma & Overby, 2004; Fish, Hall, &
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50 164 Cumming, 2004) and is considered to be a reliable measure in aesthetic sports (Link, 2011).
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52 165 This study had an acceptable average internal reliability estimates with the subscales ranging
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54 166 from $\alpha = .74$ and $\alpha = .88$.

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 167 The Sport Imagery Questionnaire (SIQ) developed by Hall et al. (1998) was
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5 168 employed to measure the gymnast's imagery ability and also establish what function of
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7 169 imagery they adopt the most. This could be considered an exploratory measure due to the
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9
10 170 lack of knowledge of imagery scripts for acrobatic gymnasts. For instance, differentiating the
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12 171 scripts for the positions within partnerships, categories and separating individual skills from
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14 172 group skills. Therefore SIQ was utilized to ensure that the imagery scripts were targeting the
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16 173 correct imagery subscales for anxiety and self-confidence. The questionnaire includes 30
17
18 174 items that are rated on a 7-point Likert scale with 1 representing rarely and 7 representing
19
20 175 often. Each item represents one of the five functions of imagery; cognitive general, cognitive
21
22 176 specific, motivational- general mastery, motivational general arousal or motivational specific.
23
24
25 177 The SIQ is a common measurement tool to adopt in an imagery investigation as it clearly
26
27 178 separates the imagery functions and makes it easier to analyze (Peltomaki, 2014). The
28
29 179 average internal reliability estimates for the SIQ in this particular study ranged from $\alpha = .50$
30
31 and $\alpha = .74$.

32
33
34 181 The measures of sport performance were facilitated to coincide with the Scottish
35
36 182 National Championships in order to gather post-intervention data. To mimic this setting for
37
38 183 baseline measurements, a practice competition was held within the gymnasts' training
39
40 184 facility. The practice competition followed British Gymnastics guidelines where all of the
41
42 185 partnerships were required to wear matching leotards and perform their competition routine
43
44 186 in front of a panel of qualified judges (Federation of International Gymnastics, 2009). Each
45
46 187 partnership was judged on the difficulty of their routine, execution of all of the skills and
47
48 188 their artistic presentation which results in a score out of 30. Despite the pre and post
49
50 189 measurements differing in magnitude, competition guidelines and regulations were followed
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52
53 190 in both.

191 Procedures

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

1
2
3 192 The head coach was contacted and given information on the purpose and procedures
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5 193 of the investigation. After gaining signed consent from the participants and parents of athletes
6
7 194 under the age of 12, they were briefed on the questionnaires and the layout of the practice
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9 195 competition. They were asked to complete a demographic questionnaire in order to gather
10
11 196 descriptive information on the sample (age, competitive acrobatic years, and weekly hours of
12
13 197 training) and asked to complete the CSAI-2 and the SIQ. The questionnaires were completed
14
15 198 in a group setting prior to performing their competition routine. Three qualified judges were
16
17 199 used to score the gymnasts with an average execution score from two judges and one score
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19 200 from artistry. After each partnership was given a final score, they were randomly assigned to
20
21 201 either the imagery training group or a control group.
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25 202 The imagery training group was asked to complete two, 15 minute imagery sessions a
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27 203 week for 6 weeks. Unfortunately, a 6 week program and the post intervention tests interfered
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29 204 with the gymnast's competition season and therefore the decision was made to reduce the
30
31 205 program to 4 weeks. These sessions were in the form of imagery scripts which were
32
33 206 progressive and specific to each partnership over the 4 week period (see appendices 1 and 2).
34
35 207 The imagery sessions took place before the gymnast's physical training. After each session,
36
37 208 the gymnasts were asked to keep an imagery diary which elaborated on their imagery
38
39 209 experience and informed the researcher of any struggles they may have had with the imagery
40
41 210 work. The control group continued with their original training throughout the 4 weeks. The
42
43 211 CSAI-2 and the SIQ were administered to the gymnasts again after the 4 week intervention.
44
45 212 These questionnaires were given out prior to a national championship competition where the
46
47 213 gymnasts completed the same routine and scores were taken for measuring acrobatic
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49 214 performance.
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54 215 **Data Analysis**
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

216 To ensure normal distribution and homogeneity within the sample, the Levene's test
 217 was used. Alpha coefficients, means and standard deviation for each subscale of the CSAI-2,
 218 the SIQ and performance scores were calculated for the baseline measurements and the post
 219 intervention measurements. A Repeated Measures ANOVA was used identify any changes in
 220 acrobatic performance, anxiety or self-confidence between the intervention and control
 221 groups and at baseline and post-intervention. The test of significance was set at 95%
 222 confidence, resulting in a significant value of $p < .05$. Effect sizes were estimated using
 223 Cohen's (1992) interpretation guidelines of $d \geq 0.2$ (small effect size), $d \geq 0.5$ (medium
 224 effect size) and $d \geq 0.8$ (large effect size).

Results

226 Cognitive anxiety, somatic anxiety and self-confidence were subscales of the CSAI-2
 227 that served as the dependent variables in the intervention. The means and standard deviations
 228 for the control group and intervention group, for pre-test and post-test are displayed in Table
 229 1. There was no significant interaction effect between group and time for cognitive anxiety
 230 ($F_{1,17} = 1.96$, $p > .05$, $\eta^2 = .10$) and somatic anxiety ($F_{1,17} = .92$, $p > .05$, $\eta^2 = .35$). The imagery
 231 intervention group significantly increased their confidence levels in comparison to the control
 232 group ($F_{1,17} = 14.18$, $p = .002$), with a moderate effect size of .46. Figure 1 illustrates the
 233 difference in confidence scores pre and post-test for the intervention and control group.

234 **Table 1**
 235 Descriptive Statistics for the CSAI-2

Variable	Control				Intervention			
	Pre-test		Post-test		Pre-test		Post-test	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
CA	19.63	4.37	20.88	7.16	19.55	4.59	17.82	4.66
SA	20.13	5.46	20.00	7.95	20.64	6.86	18.55	6.62
Confidence	21.13	1.96	22.13	3.91	21.09	4.30	26.18*	4.38

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

236 Note: CA= Cognitive anxiety, SA= Somatic anxiety. *M* represents the mean value and *SD* represents the
 237 standard deviation. *= significant ($p < .05$) difference pre and post intervention. The maximum score for the
 238 three variables is 36.
 239

240 ****INSERT FIGURE 1 HERE***

241 There was no significant interaction effect between group and time for any of the
 242 imagery subscales (Table 2). There was a significant main effect of time in the intervention
 243 group for MG-A imagery ($F_{1,17} = 7.16, p = .02, \eta^2 = .30$) and MG-M imagery ($F_{1,17} = 5.16, p =$
 244 $.04, \eta^2 = .23$).

246 **Table 2**
 247 Descriptive statistics for the SIQ

Variable	Control				Intervention			
	Pre-test		Post-test		Pre-test		Post-test	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
CS	3.73	.711	4.21	.77	4.12	.92	4.65	1.92
CG	3.43	.57	3.56	.90	3.95	1.34	4.20	1.63
MS	3.70	.75	3.92	1.35	3.89	1.48	4.12	1.59
MG-A	3.23	.88	3.67	.86	3.17	1.25	4.02	1.02
MG-M	3.49	.60	3.94	1.07	4.11	.91	4.91	1.27

248 Note: CS= cognitive specific, CG= cognitive general, MS= motivational specific, MG-A= motivational general
 249 arousal, MG-M= motivational general mastery. *M* represents the mean value and *SD* represents the standard
 250 deviation. The maximum score for each variable is 5.0.
 251

252 There was no significant interaction effect between group and time for acrobatic
 253 performance ($F_{1,17} = .82, p = .38, \eta^2 = .13$) as a result of the intervention. Figure 2 illustrates a
 254 clear distinction between the two group's baseline scores which may have affected the
 255 outcome values. An independent t-test identified that a significant difference ($p < .05$) existed
 256 between the intervention group and the control group at baseline level, with the intervention
 257 group with considerably higher score.

258 ****INSERT FIGURE 2 HERE****

Discussion

IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 260 The purpose of the study was to examine the effects of an imagery training intervention
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5 261 on performance, self-confidence and anxiety in acrobatic gymnasts. An additional focus of
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7 262 the investigation was observing the magnitude of these changes which determines whether a
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10 263 PST program would be feasible in such gymnasts.

11 264 The results suggest that acrobatic gymnasts can use imagery training to increase their
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13 265 self-confidence levels but not for reducing cognitive or somatic anxiety. Additionally, a 4
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15 266 week imagery intervention did not increase the score of acrobatic performances in
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17 267 competition. Furthermore, the performance scores for the intervention group were
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19 268 considerably higher than the control group at the baseline level which implies that other
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21 269 variables may have accounted for the pre-test difference in performance. For example, the
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23 270 participants ranged in years of experience and the number of hours they trained a week which
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25 271 could have influenced the outcome result. However, matching gymnasts up of different ages,
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27 272 experience and training into a competitive partnership is the nature of the sport. In response,
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29 273 future research should consider decreasing the sample size in order to examine specific
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31 274 partnerships (WP, MP, WG, MG, MxP) and cap the level in which they compete at. The
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33 275 intervention faced challenges and limitations when considering the time restriction of the
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35 276 imagery training and working around the gymnasts' physical training. Due to overlapping
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37 277 events in the gymnasts' training schedule and competition season, the program was reduced
38
39 278 to two, 15 minute sessions per week for 4 weeks. This imagery training may not have been
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41 279 consistent enough to change their anxiety levels according to Munroe-Chandler et al. (2012)
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43 280 who recommend daily imagery sessions for athletes. Additionally, the study was designed to
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45 281 coincide with the gymnast's competition season which consequently led to the pre to post
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47 282 sport performance measures differing in magnitude. Baseline measures were held in the
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49 283 gymnasts' training facility and could be considered a relaxed setting in comparison to a
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51 284 national competition. The post-test measurement was the Scottish Championships which is a
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 285 relatively large competition where anxiety and nerves may be elevated. Thus, the difference
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5 286 in pre to post measurements may have altered the anxiety levels in the acrobatic gymnasts
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7 287 and could have affected the outcome results. However, by observing the specific changes in
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9 288 CSAI-2 scores, a slight decrease in cognitive and somatic anxiety was recorded in the
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11 289 intervention group post-test. The control group marginally increased their cognitive anxiety
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13 290 after 4 weeks. Therefore, the imagery group had reduced their anxiety from pre to post-test
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15 291 despite the assumption that a larger competition leads to higher anxiety. Despite its validity in
16
17 292 previous research, an additional limitation, in terms of measurements, was the use of the
18
19 293 outdated version of the CSAI-2. Both groups increased their imagery use from pre to post-
20
21 294 test; however no significant results were observed between the intervention and control
22
23 295 group. Despite this, it is important to report that the intervention group significantly increased
24
25 296 their MG-A and MG-M imagery from pre to post-test which indicates that the intervention
26
27 297 targeted the intended functions.

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32 298 The research conducted by Callow et al. (2001) support the findings of the present
33
34 299 study where a MG-M based imagery program significantly increased self-confidence in
35
36 300 athletes. Similarly, the results of this investigation reinforce Vadoa et al.'s (1997)
37
38 301 hypothesized relationship between the use of imagery and an enhanced self-confidence in
39
40 302 aesthetic athletes. Their findings also revealed a positive relationship between the use MG-A
41
42 303 imagery and cognitive anxiety (Vadoa et al., 1997). In this respect, the results of the present
43
44 304 study contradict with these findings as an increased use of imagery did not show a change in
45
46 305 cognitive anxiety. Furthermore, the non-significant comparison in anxiety levels between the
47
48 306 imagery intervention group and control group conflict with Mellalieu et al. (2009) who
49
50 307 reported a reduced anxiety level after MG-M imagery training in rugby players. These
51
52 308 conflicting results may be due to the difference in sports, where MG-M imagery training
53
54 309 works well to reduce anxiety in rugby players but not in aesthetic sports such as acrobatic
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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3 310 gymnastics. However, a larger base of research is required in this field in order to infer this
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5 311 conclusion.

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7 312 According to the findings of the present study, acrobatic gymnasts can benefit from
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10 313 PST and specifically enhance their self-confidence by adopting imagery training in practice
11
12 314 and competition. However, further research is required to identify the effect of an increased
13
14 315 duration imagery intervention in acrobatic gymnastics which follow a more intense and
15
16 316 consistent program. In terms of acrobatics incorporating athletes competing in a small group,
17
18 317 performing individual skills and also including a dance element, the current study could relate
19
20 318 to other aesthetic sports and build on the knowledge of imagery training. This particular study
21
22 319 concludes that a 4 week imagery intervention did increase self-confidence in acrobatic
23
24 320 gymnasts but did not have an effect on reducing their anxiety. Moreover, imagery training
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26 321 does not increase the score of competitive performances in acrobatic gymnastics.
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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

Appendix

323 Appendix A- Imagery script 1

324 Friday Session- 11-16 Women's Pair

325 You step on to the floor with confidence and you feel your heart beating faster than usual.

326 You present to the judges along with your partner and settle into your starting position

327 together. Your muscles are relaxed and you feel calm as you listen to the beep at the start of

328 your routine. The music is slow and heart-warming as you begin to dance your

329 choreography; your body movements match the routine perfectly. Your nerves switch into

330 excitement as you climb up to the first balance skill. Both of you are strong and controlled

331 through hand-to-hand and the transition into Mexican is smooth. When you exit the skill,

332 you and your partner are delighted... you show this through smiling and you notice judges

333 smiling back. As you flow through the routine, each skill you perform is controlled; you and

334 your partner know what you are doing. You count each balance skill for 3 slow seconds in

335 your head to make sure there are no time fault deductions. Two-on two lever is steady and

336 the exit is controlled. Every perfect move and individual you perform boosts your confidence

337 throughout the routine, it feels easy and effortless. You both finish the routine elegantly

338 together, which matches the music. You walk off the competition floor feeling proud of

339 yourself and your partner.

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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

348 Appendix B- Imagery script 2

349 Fridays Session- 12-18 Men's Four

350 You step on to the floor with confidence and you feel your heart beating faster than usual.

351 You present to the judges along with your 3 partners and settle into your starting position

352 together. Your muscles are relaxed and you feel calm as you listen to the beep at the start of

353 your routine. You begin to dance your choreography to the upbeat and joyful music. You

354 can see your partners at the corner of your eye and you are all dancing in perfect

355 synchronization. Your nerves switch into excitement as you climb up in to the first tempo

356 skill... You take a deep breath as you bend for the basket in precise timing with your

357 partners. The salto's reach maximum height and the landing is solid. To match the music,

358 you maintain a joyful smile and you notice judges smiling back. As you flow through the

359 routine, each skill you perform is powerful but controlled, you and your partners know

360 exactly what they're doing. Every perfect move and individual you perform boosts your

361 confidence throughout the routine, it feels easy and effortless. All four of you finish the

362 routine bang on the beat, and you hear the audience cheer for you. You walk off the

363 competition floor feeling proud of yourself and your partners.

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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

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For Review Only

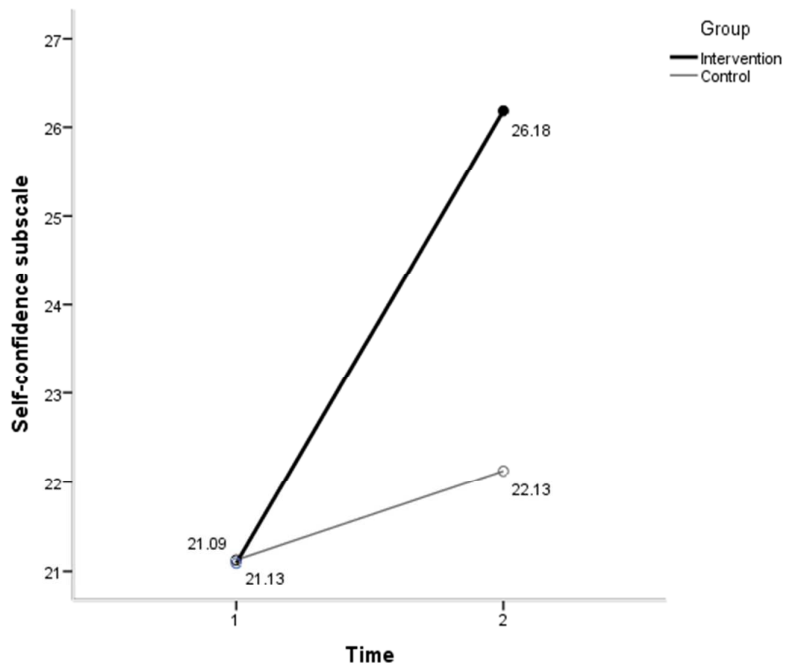


Figure. 1. Mean self-confidence scores for the CSAI-2 for the control and intervention group from pre to post. The maximum score for the self-confidence subscale is 36. Time 1= pre-test and time 2= post-test

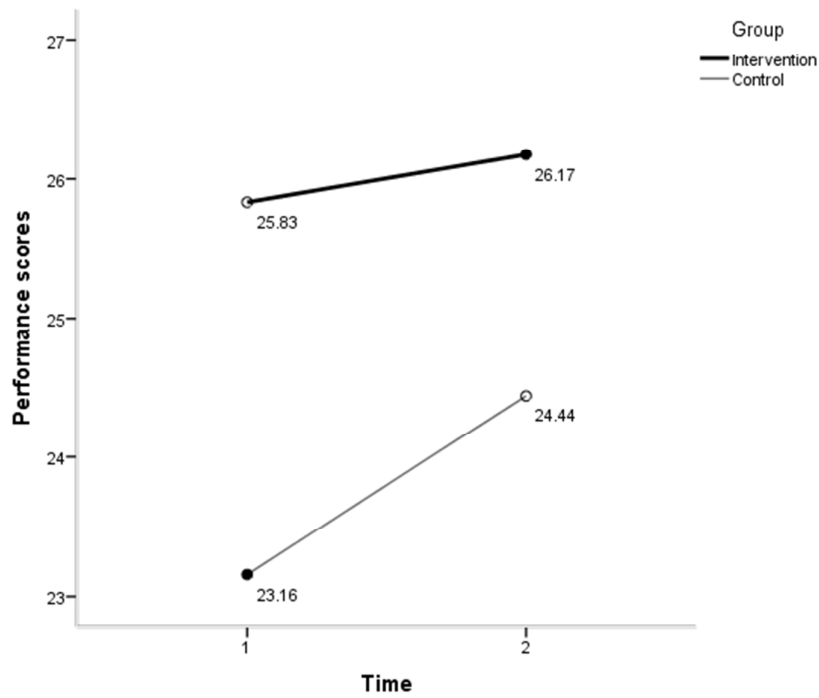


Figure. 2. Mean Performance scores for the control group and intervention group from pre to post test. The maximum acrobatic performance score a partnership can achieve is 30.00. Time 1= pre-test and time 2= post-test.