IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS

Running Head: IMAGERY TRAINING INTERVENTION IN ACROBATIC GYMNASTS- A PILOT STUDY

The effect of an imagery training intervention on self-confidence and anxiety in acrobatic gymnastics- a pilot study

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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.

The effect of an imagery training intervention on self-confidence and anxiety in acrobatic gymnastics- a pilot study

Self-confidence and a controlled level of anxiety are key components for athletes to achieve their optimal performance (Vadoa, Hall, & Moritz, 1997). Self-confidence is a personal feeling which can be defined as a sense of belief in yourself and in your abilities (Vealey, 1986). It is portrayed as one of the most powerful qualities that elite athletes possess and can also influence performance greatly (Hanton, Meillalieu, & Hall, 2004). Vealey (1986) developed a sport-specific model of confidence which discusses sport confidence as both a trait and a state variable. Trait sports confidence (SC trait) is a relatively stable attribute of an individual's personality and relates to their belief that they can be successful in sport (Vealey, 1986). State sports confidence (SC state) is more likely to be interchangeable and is often learned through experience. This is more specific than SC trait as it relates to an individual's belief in their ability to execute a particular skill (Feltz & Öncü, 2014). The sport-specific model of confidence isolates trait confidence and state confidence and identifies their relationship with competitive orientation (Vealey, 1986). The model predicts that trait confidence in sport and competitive orientation interacts to influence state confidence. Although confidence is a stable trait of personality, psychological skills training (PST) can alter it as a state by teaching the athlete how to control their confidence in specific situations (Costas, 2011).

Research has also identified a relationship between self-confidence and anxiety in sport (Martens, Burton, Vealey, Bump, & Smith, 1990; Tsopani, Dallas, & Skordilis, 2011) with some research suggesting that a high level of self-confidence has the ability to overcome cognitive anxiety and physiological arousal (Hanton et al., 2004). Anxiety is a multidimensional response which is often associated with worry, nervousness or unease about a situation. However, for some, anxiety can also connote a feeling of eagerness or a desire to

do complete a task. Anxiety is broken down further into the different symptoms that athletes may experience. Cognitive anxiety refers to the thought component which can be caused by negative feelings about the situation or one's self. Somatic anxiety is the physiological effect of anxiety which is caused by automatic arousal (Martens et al., 1990). Common examples include butterflies in the stomach or sweaty palms as a result of intense nerves. For these reasons, athletes may perceive anxiety to be a negative response which can ultimately inhibit their performance (Jones & Hanton, 2001). A recent study concluded that the direction of anxiety in male athletes was determined by external incentive and their personality (Balyan, Tok, Tatar, Binboga, & Balyan, 2016). More specifically, Monsma and Overby (2004) found that the level of experience in ballet dancers determined the intensity of cognitive and somatic anxiety. Successful dancers tended to experience more cognitive anxiety which was not detrimental to their performance; however, higher levels of somatic anxiety were found in unsuccessful dancers. The Model of Facilitative or Debilitative of Anxiety (Jones, 1995) implies that it is dependent on the athlete's perception of their anxiety that determines the outcome of their performance. The model illustrates that the control factor can direct anxiety into positive expectancies or can have a debilitative effect on the athlete. This model is supported by the findings of Tsopani et al. (2011) where rhythmic gymnasts reported high levels of cognitive anxiety but also achieved high scoring performances. Furthermore, athletes should aim to have an enhanced level of self-confidence and learn to regulate their anxiety in order to have a facilitative effect on sport performance (Feltz & Öncü, 2014). Ideally, the primary outcome is for athlete to have the ability to control their psychological state.

It has long been acknowledged that mental imagery is a form of PST for guiding and managing athletic performance (Murphy, 1994). However, imagery training is a versatile technique and therefore should follow a systematic approach and target the athlete's area of

concern (Martin, Moritz, & Hall, 1999). The applied model of imagery training (Martin et al., 1999) was specifically formulated to direct mental practice for athletes and suggests variables which may influence the outcome of the training. The model consists of four main constructs; 1) the sport situation, 2) the imagery type, 3) the outcome and 4) imagery ability of the athlete. The sport situation is specific to the athlete, whether the mental imagery takes place in training, competition or for rehabilitation purposes. Imagery type is based on research developed by Hall, Mack, Paivio, and Hausenblas (1998) that conceptualized imagery into five independent types oriented to either motivational or cognitive functions. Cognitive specific (CS) is related to the athlete using their senses to correctly execute a particular skill. For example, a diver visualizing their arm movements entering the rotation and the feeling of their body when they hit the water correctly. Cognitive general (CG) is using the imagination to rehearse strategies that may be used in training. Motivational general is divided into two functions. Motivational general mastery (MG-M) involves the athlete picturing themselves in a calm and focused state while in a sport situation. Motivational general arousal (MG-A) is associated with the athlete visualizing themselves being able to self-regulate their emotions. For instance, an athlete imagines using relaxation techniques prior to competing in an important event. Motivational specific (MS) involves themselves in an environment which triggers a feeling of inspiration. An example could include a sprinter standing on the podium while their country's national anthem plays. Hall, et al. (2009) suggests that the MG-M function is aimed at enhancing self-confidence and MG-A is employed to reduce anxiety. The outcome in the model relates to the goal that the athlete wants to achieve through imagery training. Martin et al. (1999) portray imagery ability as a mediating variable between imagery function and the outcome related to performance. Therefore, it is a crucial component of imagery training and can influence sport performance greatly.

The majority of imagery interventions have targeted learning new skills and improving technique (Munroe-Chandler, Hall, Fishburne, Murphy, & Hall, 2012); however there is evidence to suggest that such interventions also have a positive effect on self-confidence and reducing anxiety (Cumming & Ramsey, 2001). Callow, Hardy, and Hall (2001) used a multiple baseline design to examine the impact of an imagery program on four high-performing badminton players. The results of the study indicated a significant increase in self-confidence in three out of four athletes who followed MG-M based imagery scripts twice a week for 3 weeks. Research based on imagery interventions have also shown to have an impact on anxiety in athletes. Mellalieu, Hanton, and Thomas (2009) focused on the effects of an imagery intervention on competitive anxiety in collegiate rugby players. By following a MG-A imagery strategy, the results revealed that the rugby players reported greater facilitative interpretations of competitive anxiety after the intervention.

Specific disciplines of gymnastics, such as artistic gymnastics, have received much attention regarding imagery training and have found it beneficial to performance. Researchers have often adopted the PETTLEP approach which relates to the physical, environmental, task, timing, learning, emotional and perspective of imagery training (Holmes & Collins, 2001). This approach was employed for skill enhancement in young artistic gymnasts and was compared to several groups including; a traditional based imagery group, a physical training group and a control group (Smith, Wright, Allsopp, & Westhead, 2007). The PETTLEP group showed a significant increase in skill execution and overall performance along with the physical training group. However, psychological benefits such as reducing anxiety and elevating self-confidence require more focus on the emotional element of imagery (Ramsey, Cumming, Williams, & Brunning, 2010). This evidence suggests that it is appropriate to combine physical training along with imagery training to achieve the most beneficial outcome. Despite these findings, gymnastics is divided into specific disciplines in

which artistic and rhythmic have received more attention than others. Acrobatic gymnastics is a discipline which lacks empirical research in relation to imagery training. Within acrobatic gymnastics, gymnasts are grouped into suitable long-term partnerships which they perform and compete routines together. They fall under one of the following categories; women's pair (WP), men's pair (MP), mixed pair (MxP), women's trio (WG) and men's four (MG). Due to the different mixes of gender, age and number of gymnasts working in each partnership, the psychological pressure for acrobats could be higher than gymnasts who train and compete on their own. This unique form of gymnastics incorporates a variety of other sport-related components in one, for instance, dance performance, working in a team, individual skill acquisition as well as a combination of balance and dynamic skills. Therefore the current study may provide some insight into multidimensional aesthetic sport and more specifically expand the knowledge of acrobatic coaches to encourage PST into their gymnasts' programs. Research conducted in other sports has proposed imagery training for altering self-confidence and anxiety levels yet there is no evidence on the use of imagery training in acrobatic gymnastics (Callow et al., 2001; Mellalieu et al., 2009). Thus, the primary aim of this study was to examine the effects of imagery training on self-confidence and anxiety in acrobatic gymnastic performance. As a pilot study, the findings will determine whether PST would be feasible in group aesthetic athletes, specifically acrobatic gymnasts.

Methods

Participants

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

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

Measures

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

The Sport Imagery Questionnaire (SIQ) developed by Hall et al. (1998) was employed to measure the gymnast's imagery ability and also establish what function of imagery they adopt the most. This could be considered an exploratory measure due to the lack of knowledge of imagery scripts for acrobatic gymnasts. For instance, differentiating the scripts for the positions within partnerships, categories and separating individual skills from group skills. Therefore SIQ was utilized to ensure that the imagery scripts were targeting the correct imagery subscales for anxiety and self-confidence. The questionnaire includes 30 items that are rated on a 7-point Likert scale with 1 representing rarely and 7 representing often. Each item represents one of the five functions of imagery; cognitive general, cognitive specific, motivational- general mastery, motivational general arousal or motivational specific. The SIQ is a common measurement tool to adopt in an imagery investigation as it clearly separates the imagery functions and makes it easier to analyze (Peltomaki, 2014). The average internal reliability estimates for the SIQ in this particular study ranged from $\alpha = .50$ and $\alpha = .74$.

The measures of sport performance were facilitated to coincide with the Scottish National Championships in order to gather post-intervention data. To mimic this setting for baseline measurements, a practice competition was held within the gymnasts' training facility. The practice competition followed British Gymnastics guidelines where all of the partnerships were required to wear matching leotards and perform their competition routine in front of a panel of qualified judges (Federation of International Gymnastics, 2009). Each partnership was judged on the difficulty of their routine, execution of all of the skills and their artistic presentation which results in a score out of 30. Despite the pre and post measurements differing in magnitude, competition guidelines and regulations were followed in both.

Procedures

The head coach was contacted and given information on the purpose and procedures of the investigation. After gaining signed consent from the participants and parents of athletes under the age of 12, they were briefed on the questionnaires and the layout of the practice competition. They were asked to complete a demographic questionnaire in order to gather descriptive information on the sample (age, competitive acrobatic years, and weekly hours of training) and asked to complete the CSAI-2 and the SIQ. The questionnaires were completed in a group setting prior to performing their competition routine. Three qualified judges were used to score the gymnasts with an average execution score from two judges and one score from artistry. After each partnership was given a final score, they were randomly assigned to either the imagery training group or a control group.

The imagery training group was asked to complete two, 15 minute imagery sessions a week for 6 weeks. Unfortunately, a 6 week program and the post intervention tests interfered with the gymnast's competition season and therefore the decision was made to reduce the program to 4 weeks. These sessions were in the form of imagery scripts which were progressive and specific to each partnership over the 4 week period (see appendices 1 and 2). The imagery sessions took place before the gymnast's physical training. After each session, the gymnasts were asked to keep an imagery diary which elaborated on their imagery experience and informed the researcher of any struggles they may have had with the imagery work. The control group continued with their original training throughout the 4 weeks. The CSAI-2 and the SIQ were administered to the gymnasts again after the 4 week intervention. These questionnaires were given out prior to a national championship competition where the gymnasts completed the same routine and scores were taken for measuring acrobatic performance.

Data Analysis

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

Results

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

Table 1

Descriptive Statistics for the CSAI-2

	Control				**Intervention**			
Variable	Pre-test		Post-test		Pre-test		Post-test	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
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

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

****INSERT FIGURE 1 HERE***

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

Table 2

Descriptive statistics for the SIQ

	Control				Intervention			
Variable	Pre-test		Post-test		Pre-test		Post-test	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
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

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

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

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

Discussion

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

The results suggest that acrobatic gymnasts can use imagery training to increase their self-confidence levels but not for reducing cognitive or somatic anxiety. Additionally, a 4 week imagery intervention did not increase the score of acrobatic performances in competition. Furthermore, the performance scores for the intervention group were considerably higher than the control group at the baseline level which implies that other variables may have accounted for the pre-test difference in performance. For example, the participants ranged in years of experience and the number of hours they trained a week which could have influenced the outcome result. However, matching gymnasts up of different ages, experience and training into a competitive partnership is the nature of the sport. In response, future research should consider decreasing the sample size in order to examine specific partnerships (WP, MP, WG, MG, MxP) and cap the level in which they compete at. The intervention faced challenges and limitations when considering the time restriction of the imagery training and working around the gymnasts' physical training. Due to overlapping events in the gymnasts' training schedule and competition season, the program was reduced to two, 15 minute sessions per week for 4 weeks. This imagery training may not have been consistent enough to change their anxiety levels according to Munroe-Chandler et al. (2012) who recommend daily imagery sessions for athletes. Additionally, the study was designed to coincide with the gymnast's competition season which consequently led to the pre to post sport performance measures differing in magnitude. Baseline measures were held in the gymnasts' training facility and could be considered a relaxed setting in comparison to a national competition. The post-test measurement was the Scottish Championships which is a

relatively large competition where anxiety and nerves may be elevated. Thus, the difference in pre to post measurements may have altered the anxiety levels in the acrobatic gymnasts and could have affected the outcome results. However, by observing the specific changes in CSAI-2 scores, a slight decrease in cognitive and somatic anxiety was recorded in the intervention group post-test. The control group marginally increased their cognitive anxiety after 4 weeks. Therefore, the imagery group had reduced their anxiety from pre to post-test despite the assumption that a larger competition leads to higher anxiety. Despite its validity in previous research, an additional limitation, in terms of measurements, was the use of the outdated version of the CSAI-2. Both groups increased their imagery use from pre to post-test; however no significant results were observed between the intervention and control group. Despite this, it is important to report that the intervention group significantly increased their MG-A and MG-M imagery from pre to post-test which indicates that the intervention targeted the intended functions.

The research conducted by Callow et al. (2001) support the findings of the present study where a MG-M based imagery program significantly increased self-confidence in athletes. Similarly, the results of this investigation reinforce Vadoa et al.'s (1997) hypothesized relationship between the use of imagery and an enhanced self-confidence in aesthetic athletes. Their findings also revealed a positive relationship between the use MG-A imagery and cognitive anxiety (Vadoa et al., 1997). In this respect, the results of the present study contradict with these findings as an increased use of imagery did not show a change in cognitive anxiety. Furthermore, the non-significant comparison in anxiety levels between the imagery intervention group and control group conflict with Mellalieu et al. (2009) who reported a reduced anxiety level after MG-M imagery training in rugby players. These conflicting results may be due to the difference in sports, where MG-M imagery training works well to reduce anxiety in rugby players but not in aesthetic sports such as acrobatic

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

According to the findings of the present study, acrobatic gymnasts can benefit from PST and specifically enhance their self-confidence by adopting imagery training in practice and competition. However, further research is required to identify the effect of an increased duration imagery intervention in acrobatic gymnastics which follow a more intense and consistent program. In terms of acrobatics incorporating athletes competing in a small group, performing individual skills and also including a dance element, the current study could relate to other aesthetic sports and build on the knowledge of imagery training. This particular study concludes that a 4 week imagery intervention did increase self-confidence in acrobatic gymnasts but did not have an effect on reducing their anxiety. Moreover, imagery training does not increase the score of competitive performances in acrobatic gymnastics.

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.

Appendix B- Imagery script 2

Fridays Session- 12-18 Men's Four

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 3 partners 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. You begin to dance your choreography to the upbeat and joyful music. You can see your partners at the corner of your eye and you are all dancing in perfect synchronization. Your nerves switch into excitement as you climb up in to the first tempo skill… You take a deep breath as you bend for the basket in precise timing with your partners. The salto's reach maximum height and the landing is solid. To match the music, you maintain a joyful smile and you notice judges smiling back. As you flow through the routine, each skill you perform is powerful but controlled, you and your partners know exactly what they're doing. Every perfect move and individual you perform boosts your confidence throughout the routine, it feels easy and effortless. All four of you finish the routine bang on the beat, and you hear the audience cheer for you. You walk off the competition floor feeling proud of yourself and your partners.

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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.

The effect of an imagery training intervention on self-confidence and anxiety in acrobatic gymnastics- a pilot study

Self-confidence and a controlled level of anxiety are key components for athletes to achieve their optimal performance (Vadoa, Hall, & Moritz, 1997). Self-confidence is a personal feeling which can be defined as a sense of belief in yourself and in your abilities (Vealey, 1986). It is portrayed as one of the most powerful qualities that elite athletes possess and can also influence performance greatly (Hanton, Meillalieu, & Hall, 2004). Vealey (1986) developed a sport-specific model of confidence which discusses sport confidence as both a trait and a state variable. Trait sports confidence (SC trait) is a relatively stable attribute of an individual's personality and relates to their belief that they can be successful in sport (Vealey, 1986). State sports confidence (SC state) is more likely to be interchangeable and is often learned through experience. This is more specific than SC trait as it relates to an individual's belief in their ability to execute a particular skill (Feltz & Öncü, 2014). The sport-specific model of confidence isolates trait confidence and state confidence and identifies their relationship with competitive orientation (Vealey, 1986). The model predicts that trait confidence in sport and competitive orientation interacts to influence state confidence. Although confidence is a stable trait of personality, psychological skills training (PST) can alter it as a state by teaching the athlete how to control their confidence in specific situations (Costas, 2011).

Research has also identified a relationship between self-confidence and anxiety in sport (Martens, Burton, Vealey, Bump, & Smith, 1990; Tsopani, Dallas, & Skordilis, 2011) with some research suggesting that a high level of self-confidence has the ability to overcome cognitive anxiety and physiological arousal (Hanton et al., 2004). Anxiety is a multidimensional response which is often associated with worry, nervousness or unease about a situation. However, for some, anxiety can also connote a feeling of eagerness or a desire to

do complete a task. Anxiety is broken down further into the different symptoms that athletes may experience. Cognitive anxiety refers to the thought component which can be caused by negative feelings about the situation or one's self. Somatic anxiety is the physiological effect of anxiety which is caused by automatic arousal (Martens et al., 1990). Common examples include butterflies in the stomach or sweaty palms as a result of intense nerves. For these reasons, athletes may perceive anxiety to be a negative response which can ultimately inhibit their performance (Jones & Hanton, 2001). A recent study concluded that the direction of anxiety in male athletes was determined by external incentive and their personality (Balyan, Tok, Tatar, Binboga, & Balyan, 2016). More specifically, Monsma and Overby (2004) found that the level of experience in ballet dancers determined the intensity of cognitive and somatic anxiety. Successful dancers tended to experience more cognitive anxiety which was not detrimental to their performance; however, higher levels of somatic anxiety were found in unsuccessful dancers. The Model of Facilitative or Debilitative of Anxiety (Jones, 1995) implies that it is dependent on the athlete's perception of their anxiety that determines the outcome of their performance. The model illustrates that the control factor can direct anxiety into positive expectancies or can have a debilitative effect on the athlete. This model is supported by the findings of Tsopani et al. (2011) where rhythmic gymnasts reported high levels of cognitive anxiety but also achieved high scoring performances. Furthermore, athletes should aim to have an enhanced level of self-confidence and learn to regulate their anxiety in order to have a facilitative effect on sport performance (Feltz & Öncü, 2014). Ideally, the primary outcome is for athlete to have the ability to control their psychological state.

It has long been acknowledged that mental imagery is a form of PST for guiding and managing athletic performance (Murphy, 1994). However, imagery training is a versatile technique and therefore should follow a systematic approach and target the athlete's area of

concern (Martin, Moritz, & Hall, 1999). The applied model of imagery training (Martin et al., 1999) was specifically formulated to direct mental practice for athletes and suggests variables which may influence the outcome of the training. The model consists of four main constructs; 1) the sport situation, 2) the imagery type, 3) the outcome and 4) imagery ability of the athlete. The sport situation is specific to the athlete, whether the mental imagery takes place in training, competition or for rehabilitation purposes. Imagery type is based on research developed by Hall, Mack, Paivio, and Hausenblas (1998) that conceptualized imagery into five independent types oriented to either motivational or cognitive functions. Cognitive specific (CS) is related to the athlete using their senses to correctly execute a particular skill. For example, a diver visualizing their arm movements entering the rotation and the feeling of their body when they hit the water correctly. Cognitive general (CG) is using the imagination to rehearse strategies that may be used in training. Motivational general is divided into two functions. Motivational general mastery (MG-M) involves the athlete picturing themselves in a calm and focused state while in a sport situation. Motivational general arousal (MG-A) is associated with the athlete visualizing themselves being able to self-regulate their emotions. For instance, an athlete imagines using relaxation techniques prior to competing in an important event. Motivational specific (MS) involves themselves in an environment which triggers a feeling of inspiration. An example could include a sprinter standing on the podium while their country's national anthem plays. Hall, et al. (2009) suggests that the MG-M function is aimed at enhancing self-confidence and MG-A is employed to reduce anxiety. The outcome in the model relates to the goal that the athlete wants to achieve through imagery training. Martin et al. (1999) portray imagery ability as a mediating variable between imagery function and the outcome related to performance. Therefore, it is a crucial component of imagery training and can influence sport performance greatly.

The majority of imagery interventions have targeted learning new skills and improving technique (Munroe-Chandler, Hall, Fishburne, Murphy, & Hall, 2012); however there is evidence to suggest that such interventions also have a positive effect on self-confidence and reducing anxiety (Cumming & Ramsey, 2001). Callow, Hardy, and Hall (2001) used a multiple baseline design to examine the impact of an imagery program on four high-performing badminton players. The results of the study indicated a significant increase in self-confidence in three out of four athletes who followed MG-M based imagery scripts twice a week for 3 weeks. Research based on imagery interventions have also shown to have an impact on anxiety in athletes. Mellalieu, Hanton, and Thomas (2009) focused on the effects of an imagery intervention on competitive anxiety in collegiate rugby players. By following a MG-A imagery strategy, the results revealed that the rugby players reported greater facilitative interpretations of competitive anxiety after the intervention.

Specific disciplines of gymnastics, such as artistic gymnastics, have received much attention regarding imagery training and have found it beneficial to performance. Researchers have often adopted the PETTLEP approach which relates to the physical, environmental, task, timing, learning, emotional and perspective of imagery training (Holmes & Collins, 2001). This approach was employed for skill enhancement in young artistic gymnasts and was compared to several groups including; a traditional based imagery group, a physical training group and a control group (Smith, Wright, Allsopp, & Westhead, 2007). The PETTLEP group showed a significant increase in skill execution and overall performance along with the physical training group. However, psychological benefits such as reducing anxiety and elevating self-confidence require more focus on the emotional element of imagery (Ramsey, Cumming, Williams, & Brunning, 2010). This evidence suggests that it is appropriate to combine physical training along with imagery training to achieve the most beneficial outcome. Despite these findings, gymnastics is divided into specific disciplines in

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

Methods

Participants

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

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

Measures

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

The Sport Imagery Questionnaire (SIQ) developed by Hall et al. (1998) was employed to measure the gymnast's imagery ability and also establish what function of imagery they adopt the most. This could be considered an exploratory measure due to the lack of knowledge of imagery scripts for acrobatic gymnasts. For instance, differentiating the scripts for the positions within partnerships, categories and separating individual skills from group skills. Therefore SIQ was utilized to ensure that the imagery scripts were targeting the correct imagery subscales for anxiety and self-confidence. The questionnaire includes 30 items that are rated on a 7-point Likert scale with 1 representing rarely and 7 representing often. Each item represents one of the five functions of imagery; cognitive general, cognitive specific, motivational- general mastery, motivational general arousal or motivational specific. The SIQ is a common measurement tool to adopt in an imagery investigation as it clearly separates the imagery functions and makes it easier to analyze (Peltomaki, 2014). The average internal reliability estimates for the SIQ in this particular study ranged from $\alpha = .50$ and $\alpha = .74$.

The measures of sport performance were facilitated to coincide with the Scottish National Championships in order to gather post-intervention data. To mimic this setting for baseline measurements, a practice competition was held within the gymnasts' training facility. The practice competition followed British Gymnastics guidelines where all of the partnerships were required to wear matching leotards and perform their competition routine in front of a panel of qualified judges (Federation of International Gymnastics, 2009). Each partnership was judged on the difficulty of their routine, execution of all of the skills and their artistic presentation which results in a score out of 30. Despite the pre and post measurements differing in magnitude, competition guidelines and regulations were followed in both.

Procedures

The head coach was contacted and given information on the purpose and procedures of the investigation. After gaining signed consent from the participants and parents of athletes under the age of 12, they were briefed on the questionnaires and the layout of the practice competition. They were asked to complete a demographic questionnaire in order to gather descriptive information on the sample (age, competitive acrobatic years, and weekly hours of training) and asked to complete the CSAI-2 and the SIQ. The questionnaires were completed in a group setting prior to performing their competition routine. Three qualified judges were used to score the gymnasts with an average execution score from two judges and one score from artistry. After each partnership was given a final score, they were randomly assigned to either the imagery training group or a control group.

The imagery training group was asked to complete two, 15 minute imagery sessions a week for 6 weeks. Unfortunately, a 6 week program and the post intervention tests interfered with the gymnast's competition season and therefore the decision was made to reduce the program to 4 weeks. These sessions were in the form of imagery scripts which were progressive and specific to each partnership over the 4 week period (see appendices 1 and 2). The imagery sessions took place before the gymnast's physical training. After each session, the gymnasts were asked to keep an imagery diary which elaborated on their imagery experience and informed the researcher of any struggles they may have had with the imagery work. The control group continued with their original training throughout the 4 weeks. The CSAI-2 and the SIQ were administered to the gymnasts again after the 4 week intervention. These questionnaires were given out prior to a national championship competition where the gymnasts completed the same routine and scores were taken for measuring acrobatic performance.

Data Analysis

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

Results

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

Table 1
Descriptive Statistics for the CSAI-2

	Control				**Intervention**			
Variable	Pre-test		Post-test		Pre-test		Post-test	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
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

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

****INSERT FIGURE 1 HERE***

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

Table 2

Descriptive statistics for the SIQ

	Control				Intervention			
Variable	Pre-test		Post-test		Pre-test		Post-test	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
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

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

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

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

Discussion

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

The results suggest that acrobatic gymnasts can use imagery training to increase their self-confidence levels but not for reducing cognitive or somatic anxiety. Additionally, a 4 week imagery intervention did not increase the score of acrobatic performances in competition. Furthermore, the performance scores for the intervention group were considerably higher than the control group at the baseline level which implies that other variables may have accounted for the pre-test difference in performance. For example, the participants ranged in years of experience and the number of hours they trained a week which could have influenced the outcome result. However, matching gymnasts up of different ages, experience and training into a competitive partnership is the nature of the sport. In response, future research should consider decreasing the sample size in order to examine specific partnerships (WP, MP, WG, MG, MxP) and cap the level in which they compete at. The intervention faced challenges and limitations when considering the time restriction of the imagery training and working around the gymnasts' physical training. Due to overlapping events in the gymnasts' training schedule and competition season, the program was reduced to two, 15 minute sessions per week for 4 weeks. This imagery training may not have been consistent enough to change their anxiety levels according to Munroe-Chandler et al. (2012) who recommend daily imagery sessions for athletes. Additionally, the study was designed to coincide with the gymnast's competition season which consequently led to the pre to post sport performance measures differing in magnitude. Baseline measures were held in the gymnasts' training facility and could be considered a relaxed setting in comparison to a national competition. The post-test measurement was the Scottish Championships which is a

relatively large competition where anxiety and nerves may be elevated. Thus, the difference in pre to post measurements may have altered the anxiety levels in the acrobatic gymnasts and could have affected the outcome results. However, by observing the specific changes in CSAI-2 scores, a slight decrease in cognitive and somatic anxiety was recorded in the intervention group post-test. The control group marginally increased their cognitive anxiety after 4 weeks. Therefore, the imagery group had reduced their anxiety from pre to post-test despite the assumption that a larger competition leads to higher anxiety. Despite its validity in previous research, an additional limitation, in terms of measurements, was the use of the outdated version of the CSAI-2. Both groups increased their imagery use from pre to post-test; however no significant results were observed between the intervention and control group. Despite this, it is important to report that the intervention group significantly increased their MG-A and MG-M imagery from pre to post-test which indicates that the intervention targeted the intended functions.

The research conducted by Callow et al. (2001) support the findings of the present study where a MG-M based imagery program significantly increased self-confidence in athletes. Similarly, the results of this investigation reinforce Vadoa et al.'s (1997) hypothesized relationship between the use of imagery and an enhanced self-confidence in aesthetic athletes. Their findings also revealed a positive relationship between the use MG-A imagery and cognitive anxiety (Vadoa et al., 1997). In this respect, the results of the present study contradict with these findings as an increased use of imagery did not show a change in cognitive anxiety. Furthermore, the non-significant comparison in anxiety levels between the imagery intervention group and control group conflict with Mellalieu et al. (2009) who reported a reduced anxiety level after MG-M imagery training in rugby players. These conflicting results may be due to the difference in sports, where MG-M imagery training works well to reduce anxiety in rugby players but not in aesthetic sports such as acrobatic

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

According to the findings of the present study, acrobatic gymnasts can benefit from PST and specifically enhance their self-confidence by adopting imagery training in practice and competition. However, further research is required to identify the effect of an increased duration imagery intervention in acrobatic gymnastics which follow a more intense and consistent program. In terms of acrobatics incorporating athletes competing in a small group, performing individual skills and also including a dance element, the current study could relate to other aesthetic sports and build on the knowledge of imagery training. This particular study concludes that a 4 week imagery intervention did increase self-confidence in acrobatic gymnasts but did not have an effect on reducing their anxiety. Moreover, imagery training does not increase the score of competitive performances in acrobatic gymnastics.

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.

Appendix B- Imagery script 2

Fridays Session- 12-18 Men's Four

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 3 partners 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. You begin to dance your choreography to the upbeat and joyful music. You can see your partners at the corner of your eye and you are all dancing in perfect synchronization. Your nerves switch into excitement as you climb up in to the first tempo skill… You take a deep breath as you bend for the basket in precise timing with your partners. The salto's reach maximum height and the landing is solid. To match the music, you maintain a joyful smile and you notice judges smiling back. As you flow through the routine, each skill you perform is powerful but controlled, you and your partners know exactly what they're doing. Every perfect move and individual you perform boosts your confidence throughout the routine, it feels easy and effortless. All four of you finish the routine bang on the beat, and you hear the audience cheer for you. You walk off the competition floor feeling proud of yourself and your partners.

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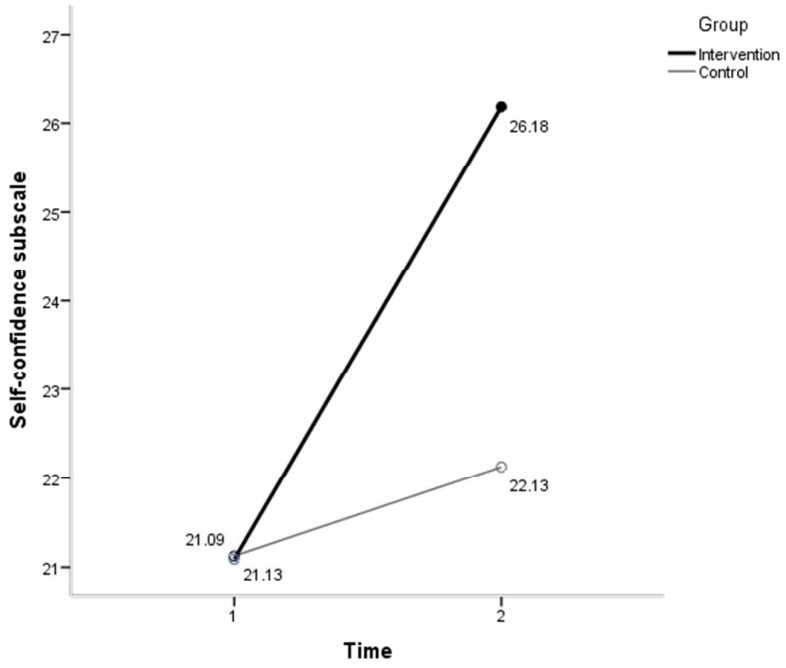

Figure. 1. Mean self-confidence scores for the CSAI-2 for the control and intervention group from pre to post. The maximum score for the self-confidence subscale is 36. Time 1= pre-test and time 2= post-test

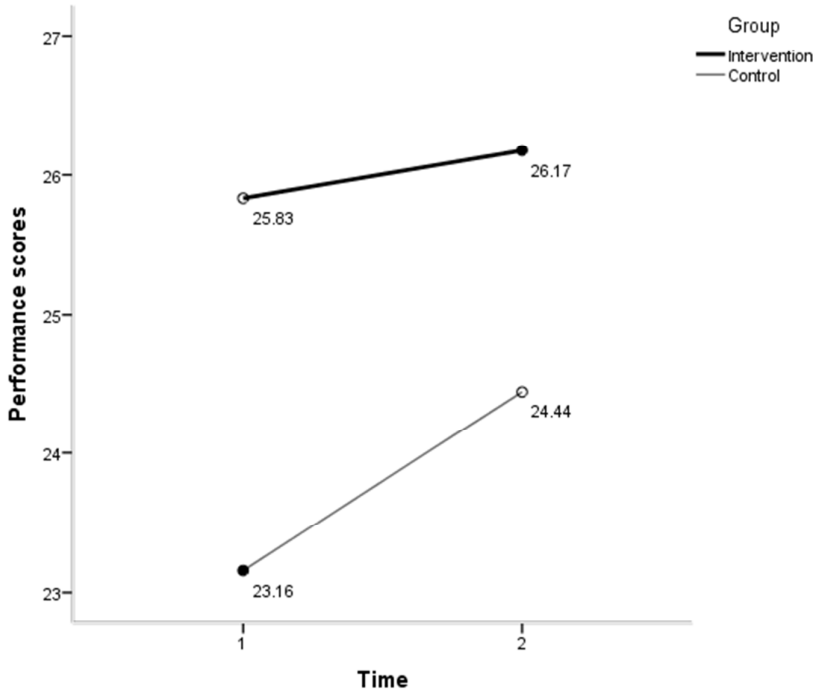

Figure. 2. Mean Performance scores for the control group and intervention group from pre to post test. The maximum acrobatic performance score a partnership can achieve is 30.00. Time 1= pre-test and time 2= post-test.