PETTLEP IMAGERY AND VIDEO-OBSERVATION: A MOTIVATION CASE STUDY OF FOUR BADMINTON PLAYERS

PETTLEP and intrinsic motivated badminton performance

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Abstract

Introduction. The purpose of this study was to examine the effects of both PETTLEP imagery and video-observation on the motivation of badminton players using a multiple-baseline across-participants design. ***Material and methods***. Four badminton players were examined. The Situational Intrinsic Motivation Scale was employed to measure participants' situational motivation toward a badminton service activity. The imagery intervention consisted of twelve imagery sessions (two per week for 6 weeks), and the video-observation intervention involved 6 video-observation sessions (two per week for 3 weeks). Video-observation was administered using a multiple-baseline design commencing at Week 4 for Participants 3 and 4 and at Week 7 for Participants 1 and 2, respectively. ***Results***. Visual inspection of results, means scores and effect size calculations suggested increases in self-determined forms of motivation (e.g. intrinsic motivation) for three badminton players, and decreases in less self-determined types of motivation (e.g. extrinsic motivation) for three of the four participants during the imagery intervention. Data also showed greater increases in self-determined forms of motivation for three participants, and greater decreases in less self-determined types of motivation for two of the participants during the imagery + video-observation period. ***Conclusion***. These findings supported the use of PETTLEP imagery to improved motivation in badminton tasks, especially when combined with video-observation.

Key words: motivation, imagery, badminton, video-observation, PETTLEP

Introduction

According to Paivio's framework, who suggested that mental imagery may influence motor behaviour via both cognitive (e.g., performance enhancement) and motivational mechanisms (e.g., confidence enhancement) [1]; numerous studies have showed that mental imagery significantly enhances athletes' motivation [2, 3]. Motivation refers to "the internal and/or external forces that produce the initiation, direction, intensity, and persistence of behaviour" [4]. In sport, high motivation is widely accepted as an essential prerequisite in getting athletes to fulfill their potential [5].

A particular imagery model known as PETTLEP imagery has been shown to be significantly more effective than traditional imagery methods in sport science [6, 7]. Based on neuroscience research advocating similar cortical neuronal activity during imagery and physical performance, the PETTLEP model involves seven key factors (*P*hysical, *E*nvironmental, *T*ask, *T*iming, *L*earning, *E*motion and *P*erspective) that should be considered when developing imagery practice for the best results. The Physical component relates to including the athlete's physical responses during the sporting situation in their imagery, for example executing the same movements as actual performance. The Environment component refers to practicing imagery in a setting similar to the place where the skill would usually take place (e.g., a badminton court). The Task component refers to closely matching the imagined task to the actual one. The Timing component refers to imaging at the same speed as actual execution of the task. The Learning element entails adapting the imagery content in relation to the rate of learning or skill development, for example updating the imagery content as performer improves. The Emotion component refers to including the athlete's emotional response and the meaning the individual attaches to a scenario in their imagery. Finally, the Perspective element involves imagining from either a first- or third-person perspective [8].

One of the most widely tested approaches to motivation in sport is the Hierarchical Model of Intrinsic and Extrinsic Motivation (HMIEM) [9]. According to this model, motivation may be intrinsic, extrinsic, or amotivated [10, 11]. Intrinsic motivation refers to engaging in an activity for the pleasure and satisfaction one derives from direct participation (e.g. doing sport for the pleasure it provides) [12]. In contrast, extrinsic motivation is instrumental in nature and is experienced when someone engages in an activity for incentives that extend beyond those inherent in the activity (e.g. to obtain a prize) [13]. Finally, amotivation represents a lack of contingency between one's actions and their outcomes [13]. For example, athletes who say that they really do not know why they play badminton any more are displaying amotivation toward their sport.

Previous research [10] has revealed that self-determined forms of motivation (intrinsic motivation and identified regulation) are positively associated with positive outcomes (e.g., better learning, enhanced performance) while least self-determined forms of motivation (external regulation or amotivation) are associated with negative outcomes (e.g., less persistence, poorer athletic performance) [13, 14].

Finally, the imagery modality or the form in which an imagery intervention is delivered is a crucial factor in order to ensure imagery's best results [15, 16]. For example, the use of video to maximize the effectiveness of imagery has been commonly used as a motivational strategy in teaching and coaching within the sport domain [4].

Therefore, the purpose of this study was to examine the effects of both PETTLEP imagery and video-observation on the motivation of four badminton players. Additionally, the effectiveness of imagery and video-aided imagery was also compared.

Material and methods

Four recreational badminton players (2 male / 2 female) with a minimum of 10 years playing experience volunteered to take part in this study. All participants were competing at recreational level in the Whitefield League (Manchester; U.K.). Their ages ranged between 24 and 57 years old. All of them provided informed consent and none had previously received any imagery or video-observation training.

The imagery ability of the four participants was measured using the MIQ-R. This 8-item inventory assesses visual and kinaesthetic imagery ability on a 7-point Likert scale, ranging from 1 (very hard to see or feel) to 7 (very easy to see or feel). Numerous studies have frequently employed this measure as necessary prerequisite for valid and useful results [2].

The Situational Intrinsic Motivation Scale (SIMS) is a 16-item self-report inventory [17] and was employed to measure an individual's situational (or state) motivation toward a chosen activity. The SIMS contains 4 subscales: intrinsic motivation, identified regulation, external regulation, and amotivation. Each subscale contains 4 items. Participants are asked to respond to the question, "Why are you currently engaged in this activity?", and then each item is rated on a 7-point Likert scale anchored by 1 (corresponds not at all) and 7 (corresponds exactly). It has been suggested that the SIMS represents a valuable measure of motivation at the situational level applicable to both field and laboratory settings [18].

Additionally, all participants were provided with an imagery diary and instructed to report difficulties, thoughts, and feelings they experienced throughout the study.

Procedure

Two male and two female recreational badminton players volunteered to participate in this study. They were not told the purpose of the research and completed the MIQ-R prior to starting the study. They were then randomly assigned to one of the two intervention conditions (2 participants per condition). The study lasted 9 weeks, entailing three phases (baseline, first intervention phase, and second intervention phase).

Once a baseline was established for each badminton player, participants completed a workshop to ensure they performed their imagery and video-observation as instructed, and solve doubts or queries. Then, the intervention phase was introduced to the participants using a multiple-baseline across participant procedure. Accordingly, the four participants completed imagery sessions (two per week for 6 weeks) during both intervention phases. Yet, Participants 1 and 2 were video-aided during Weeks 7 to 9, and Participants 3 and 4 at Weeks 4, 5 and 6, respectively.

During the intervention period, participants completed the SIMS prior to performing a badminton service task. After each session, they were interviewed to gain information about their experience. Both imagery and video-observation included the seven PETTLEP components. The imagery sessions entailed instructing participants to image 16 flick backhand serves twice per week for 6 weeks. Additionally, PETTLEP-based video-observation involved the elaboration of individualized DVDs executing badminton serves at a badminton court. The video-observation intervention consisted of watching their video-recordings twice a week during 3 weeks.

Data Analysis

Consistent with previous applications of single-subject treatment designs [2], visual analysis of graphed data, the split-middle technique [19] and a Binomial test were employed to interpret the effectiveness of the intervention. Finally, inspection of each participant's mean scores and effect sizes were analysed to glean more information about the efficacy of the intervention.

Results

Self-reports

Interviews and athlete diaries revealed that all participants completed their interventions as instructed. Participants frequently reported the beneficial effect that they believed the interventions had on their motivation. They regularly made reference to imagery helped them analyse and improve technical aspects involved in their backhand serve performance, which resulted in perceived increase in their intrinsic motivation. The four badminton players agreed that engaging in an enjoyable activity was a main source for increasing their motivation. For instance, Participant 3 stated that "I have really enjoyed practice sessions this week and they have been a revelation. Feel that I am improving already". Additionally, focusing on positive feelings, thoughts and outcomes was also reported as an important source to increase their sport motivation. Finally, participants reported that the video-observation helped increase intrinsic motivation for two main reasons. First, video-observation of self aided to "see" precise position and gestures involved in the serve improvement. Secondly, they perceived the music included in their DVDs to be inspirational.

Motivation

Participant 1's mean intrinsic motivation (IM) and mean identified regulation (IDR) increased from the baseline phase to the intervention periods. Despite the Binomial test did not reach significance when comparing the intervention data with the baseline values, visual inspection of graphed data and effect size calculations showed large treatment effects for both imagery and imagery + video observation on Participant 1's IM and IDR values. Taken together, these results suggested non-significant IM and IDR increases during the imagery phase, but yet a large increase in Participant 1's IM and IDR when imagery and video-observation were employed together (Tab. 1).

Secondly, Participant 1's mean external regulation (ER) remained constant across the entire study period, indicating no effect caused by the interventions (Tab. 1).

Finally, Participant 1's amotivation (AM) mean increased from the baseline to both intervention phases. The Binomial failed to reach significance in either of the intervention periods, $p>.05$. However, effect sizes calculations, visual inspection of the graphed data and standard deviations showed large increasing effects during the intervention phases; but yet a higher stability and very large decreasing effects during the combination period compared to the imagery period (d=-1.64). Therefore, although Participant 1's AM increased during the intervention phases, it decreased considerably when imagery was support with video-observation.

Participant 2's mean IM and mean IDR increased from the baseline phase to both intervention phases. The binomial test supported these results at $p<.05$. Moreover, effect size calcula-

Table 1. Means, standard deviations and split middle results for each participant's SIMS values

IM									
PARTICIPANT	BASELINE			INTER.1			INTER.2		
	M	SD	Binomial	M	SD	Binomial	M	SD	Binomial
1	24.7	2.5	0.016*	26.3	1.2	0.016*	27.8	0.4	0.016*
2	13.8	0.8	0.016*	23.8	1.8	0.016*	25.5	0.6	0.016*
3	24	1.3	0.23	26.7	2.1	0.23	24.7	3	0.23
4	23.3	3.3	0.016*	22.3	1.2	0.016*	24.9	0.8	0.016*
IDR									
PARTICIPANT	BASELINE			INTER.1			INTER.2		
	M	SD	f	M	SD	f	M	SD	f
1	23.3	2.5	0.23	24.3	0.8	0.09	25.2	1.6	0.09
2	19.5	1.8	0.016*	24.2	1.6	0.016*	26.2	0.8	0.016*
3	25.2	1.5	0.016*	26.7	2.1	0.09	24.7	3	0.23
4	19.7	1.4	0.23	19.7	1.4	0.016	22.7	2	0.016
ER									
PARTICIPANT	BASELINE			INTER.1			INTER.2		
	M	SD	f	M	SD	f	M	SD	f
1	4	0	**	4	0	**	4	0	**
2	4.8	1.2	0.31	4	0	0.31	4	0	**
3	6.5	1.5	0.09	4.5	1.2	0.09	7.3	1.8	0.09
4	5.8	1.5	0.016*	5.5	1.2	0.016*	4.5	1.8	0.016*
AM									
PARTICIPANT	BASELINE			INTER.1			INTER.2		
	M	SD	f	M	SD	f	M	SD	f
1	14.7	8.4	0.016*	23.7	1.6	0.016*	21	1.7	0.09
2	10.8	2.9	0.016*	4.2	0.4	0.016*	4	0	0.016*
3	4.3	0.5	0.23	4.2	0.4	0.016*	4.9	2	0.23
4	6.8	1.7	0.016*	4.7	0.8	0.016*	4	0	0.31

*statistical significance for the Binomial results at p=.05

tions showed very large treatment effects for both interventions periods in Participant 2's mean IM and mean IDR, overall during the combination period (Tab. 1). In sum, data showed a significant increase on Participant 2's intrinsic motivation and identified regulation scores across the intervention periods, where the greater effects were obtained when imagery was employed together with video-observation.

Participant 2's mean ER and mean AM decreased from the baseline period to both intervention periods. Furthermore, both the Binomial test and visual inspection of the graphed data showed a significant decrease in ER and AM during both interventions periods (p<0.017), where the greater effects were obtained when imagery and video-observation were employed together.

Participant 3's mean IM and mean IDR increased from the baseline to the imagery + video-observation phase and then decreased in the imagery period, respectively. The Binomial test indicated a significant increase for both subscales only in the combination period, p<.017. Finally, effects sizes calculations showed very large treatment effects on Participant 3's IM and IDR scores during the imagery + video-observation intervention. Additionally, d values indicated medium treatment effects in both subscales during the imagery period and large decreasing sized-effects when the video-observation was retired. Altogether, data showed that Participant 3's intrinsic motivation and identified regulation increased from the baseline to both intervention periods. This increase was greater in the first period, when imagery and video-observation were employed together.

Participant 3's mean ER and mean AM decreased from the baseline period to the video-aided imagery and then increased through the imagery period, respectively. The Binomial test failed to reach significant changes from projected ER, with p values greater that .05 for both intervention phases. However, the d index showed very large decreasing effects for the imagery + video treatment and a large increasing effect for the second period compared to the first phase of the intervention. Thus, these results suggest a decrease in mean ER and mean AM from the baseline to the combination period, along with an increase during the imagery phase (when video-observation was excluded).

Participant 4's mean intrinsic motivation slightly decreased from the baseline phase to the combination phase and then increased during the imagery period, respectively. Participant 4's mean identified regulation remained constant during both baseline and the combination periods (M=19.6). The Binomial test indicated a significant increase in IM and IDR subscales for the second intervention period compared to both baseline and the first intervention phase (p<.017). Effect sizes calculations indicated only very large increasing effects on IM and IDR scores during the imagery intervention. Altogether, data showed that Participant 3's IM and IDR only improved significantly when imagery was employed alone.

Participant 4's mean external regulation and mean amotivation decreased from the baseline period to both intervention periods, respectively. Furthermore, the Binomial test supported partially these results indicating a significant decrease in ER in both intervention periods, p<.017; along with a significant increase from the imagery + video-observation to the imagery period, $p<.017$. Effect sizes calculations indicated large decreasing effects in both subscales scores for the imagery intervention period compared to both previous phases. Thus, data suggest a significant decrease in Participant 3's ER and AM during both intervention periods when compared to the baseline. Yet, this decrease was greater when imagery was used alone.

Discussion

In the present study, a multiple-baseline across-participants design was used to evaluate the effect of a PETTLEP-based imagery and video-observation on the sport motivation of four recreational-level badminton players. Despite research investigating the effects of imagery on sports performance has traditionally employed nomothetic designs [3], single-subject design research involves repeated observation or data collection over time, and, thus, individual variability can be studied and the true effects of an intervention on a participant evaluated [8].

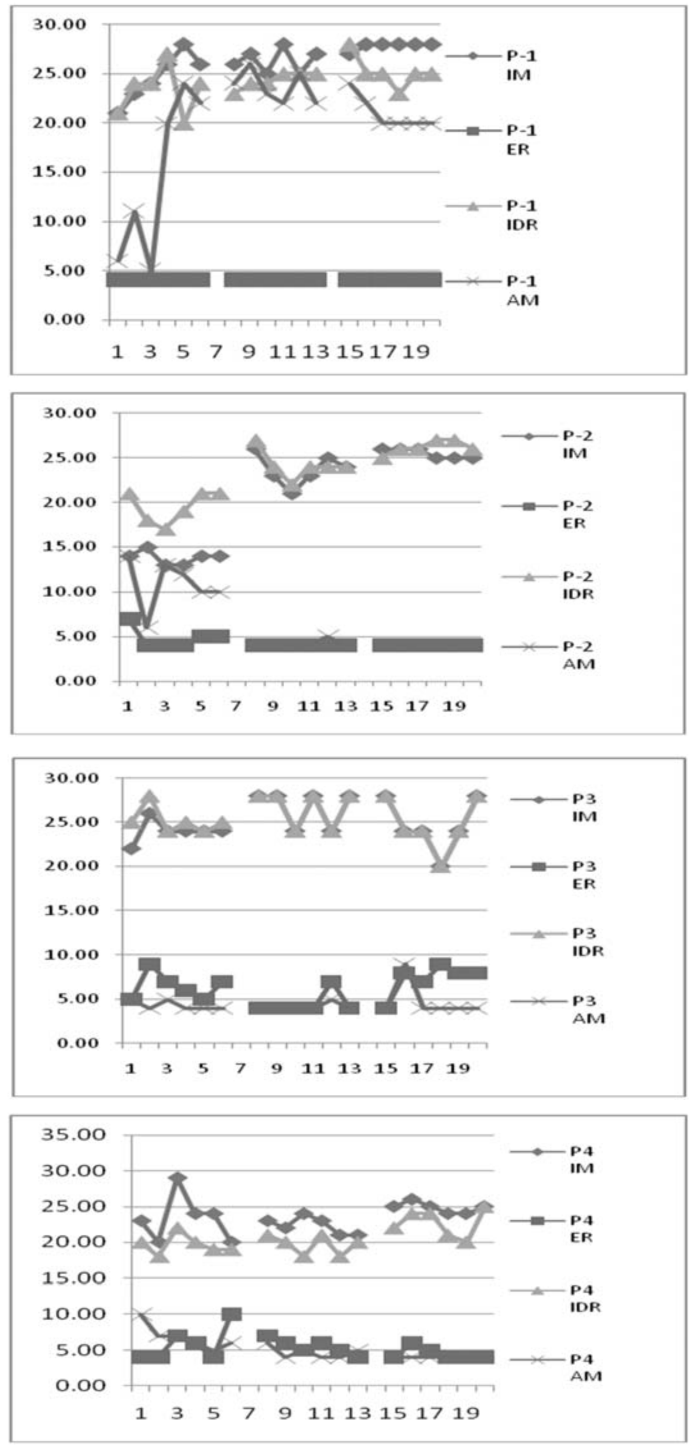
Thus, the present study attended to examine the causal direction of both PETTLEP-based imagery intervention and PETTLEP video-observation on athletes' motivation; and, secondly, to compare the effects of both imagery modalities.

Our first hypothesis was that both interventions would increase participant's intrinsic motivation and identified regulation, and reduces extrinsic motivation and amotivation. Additionally, we predicted greater effects when employing video-aided imagery compared to imagery alone. Therefore, the Situational Intrinsic Motivation Scale (SIMS) was employed in order to measure four main forms of motivation: Identified Regulation (IDR), External Regulation (ER), Intrinsic motivation (IM) and Amotivation (AM).

Identified regulation refers to a self-determined type of extrinsic motivation because behaviour is initiated out of choice, and represents engagement in a behaviour because it is highly valued, whereas when a behaviour becomes integrated it is in harmony with one's sense of self and almost entirely self-determined. The results of this study showed that imagery and imagery + video-observation had an enhancing effect for three of the four badminton players upon their IDR scores, and these values were larger when imagery was supported with video-observation. However, Participant 4 showed greater IDR values when imagery was employed alone. According to Shambrook and Bull [20], a plausible explanation might be that the psychological interventions showed a temporal delay. Participant 4's self-reports supported this, stating that "It seems that the intervention start working now. I think that this is because the practice". Thus, there might not have been enough data points to detect the significance of this delayed increase in motivation.

Secondly, external regulations represent non-self-determined types of extrinsic motivation because athletes do not sense that their behaviour is choiceful and, as a consequence, they experience psychological pressure. Participating in sport to receive prize money or win a gold medal typifies external regulation [13]. Data showed that ER values decreased for three of the participants during the intervention phases. Participant 1's ER remained constant across the entire study. This might be due to the participant's motivational style. He revealed on his athlete's diary that "I am only motivated when I compete and win".

Thirdly, intrinsic motivation (IM) comes from within, is fully self-determined and characterised by interest in, and enjoyment derived from sports participation. The results indicated increased intrinsic motivation scores for two participants during the imagery intervention; and facilitative effects for three of the four badminton players across both intervention periods, with greater results when video-observation aided imagery. However, Participant 4's intrinsic motivation mean



* - Participants 1 and 2 completed: Baseline, Imagery and Imagery + video-observation and Participants 3 and 4 completed: Baseline, Imagery + video-observation and then only Imagery

Figure 1. Graphed values for the four subscales of the Situational Intrinsic Motivation Scale (IM=intrinsic motivation, IDR=identified regulation, ER=external regulation, and AM=amotivation) for each participant (P) (Vertical axe). The horizontal axe represents the number of sessions (6) that each phase entailed

decreased when both intervention were employed together. Further analysis of these outcomes showed that Participant's intrinsic motivation was affected by a negative self-concept during the video-observation. She stated that "When I am watching the DVD I don't like my look, I look a weak opponent and I don't feel motivated to do the service task". This is in line with previous research [21], where it was found that the appearance appeared to be crucial for motivation participation. Furthermore, consistent with Vallerand and his colleagues [9, 10, 22], self-reports from our athletes suggested the existence of three forms of intrinsic motivation caused by imagery and, specially, when imagery was supported with video-observation: intrinsic motivation toward knowledge (which involves engaging in sport for the pleasure and satisfaction that one experiences while learning, exploring or trying to understand something new), toward accomplishment (which results from practicing a sport for the pleasure and satisfaction of out-doing oneself, and the process of trying to reach new personal objectives), and toward experiencing stimulation (which refers to engaging in sport in order to experience stimulating sensations derived from one's engagement in the activity). As they suggested, these effects were greater when video-observation was employed because it facilitated: a) the learning process identifying important technical and attitudinal aspects involved in the task progress (motivation to know); b) the performance improvement (motivation to accomplish); and c) the multisensorial involvement across watching the DVDs (motivation to experience stimulation), as it entailed a greater sensory pleasure, aesthetic experiences, as well as fun and excitement [22].

Finally, amotivation (AM) refers to feelings of incompetence and a lack of connection between one's behaviour and the expected outcome. Our findings showed that three participants' amotivation scores decreased in both intervention periods, and this decrease was greater for two of the four participants during the combination period. However, Participant 1's level of amotivation increased in both intervention phases in comparison with the baseline period, but decreased from the imagery period to the combination phase. Then again, despite Participant 4's amotivation dropped across both interventions periods, amotivation values were smaller when only imagery was used. Some studies of participation motivation suggest that women show differences on some motivational factors for physical activity, placing greater significance on social motives. Participant 4 reported to be self-centred on physical appearance when watching the DVD. This behaviour is symptomatic of narcissism [23] that might have affected her perception of the incompetence. She stated that "a player who looks like smart and adopt a proper posture is intimidating on the badminton court and then, earns respect". Furthermore, consistent with the social learning hypothesis, which argues that narcissism develops as a response to overvaluation [24], Participant 4's ego might be affected by bad self-image and reduced her focus in personal improvement.

Overall, the outcomes of our study have two significant consequences. First of all, it support previous studies regarding the beneficial effects of imagery on the athletes' motivation, mostly enhancing self-determined forms of motivation and reducing less self-determined types of motivation. This is particularly important as intrinsic motivation is considered to be the healthiest type of motivation and reflects an athlete's motivation to perform an activity simply for the reward inherent in their participation. Previous research [13, 14] has revealed that individuals who participate in an activity for extrinsic reasons persist less than those who are intrinsically motivated and are associated with negative outcomes in sport settings. Therefore, in line with previous studies findings regarding the beneficial motivational effects that imagery and video-observation may have upon athletes' motivation [2, 4, 25], we argue that the results of this study support the use of PETTLEP imagery combined with PETTLEP-based video-observation as a useful tool in order to reduce sports negative outcomes via motivational changes.

In conclusion, the results of this study partially corroborated the effectiveness of the PETTLEP approach to motor imagery in enhancing intrinsic motivation in a badminton serve task, especially when used in combination with video-observation. This was supported by visual inspection of graphed data, self-reports and effect size calculations. Additionally, as previously suggested [15, 16], the imagery modality is a crucial issue to be considered to ensure the most effective use of imagery. In line with these authors, the present study introduced an alternative format for imagery interventions to be considered for the fields of sport psychology and badminton training. When completing imagery interventions, badminton coaches and athletes may use PETTLEP video-observation to have greater positive effects on motivation and, thus, on performance. Finally, despite it was not the purpose of our study to examine age, skill level or sex, future research could employ nomothetic studies to examine PETTLEP imagery and video-aided imagery effects on motivation across different ages, sports, levels of expertise in order to replicate and extend the knowledge of our findings.

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