Applications of psychological skills training for Paralympic table tennis athletes

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This study examined effects of psychological skills training (PST) for Korean national table tennis athletes with spinal cord injuries (SCI), who were training for the 2012 London Paralympics. Participants were three male table tennis players with level two SCI, and all participants attended a total of eight sessions of PST over a period of 3 months. The PST consisted of self-talk, imagery, cognitive restructuring, and routine. To examine the effectiveness of mental coaching, the Test of Performance Strategies questionnaire was administered over three different periods of time: pre-PST, post-PST, and postcompetition. Pre- and posttest outcomes indicated that there were positive changes in self-talk, emotional control, and goal setting of athletes with SCI. With the exception of

relaxation, Athlete 1 was able to maintain and use all of the improved mental skills in Paralympic competitions. However, although the mental skills of the athletes 2 and 3 generally improved, they were not able to take full advantage of these improvements in Paralympic competitions. PST can be developed and effectively utilized by athletes with SCI. Disability-specific issues should be considered to provide a better intervention program.

Keywords: Performance strategies, Spinal cord injuries, Self-talk, Imagery, Routine

INTRODUCTION

As the host country of the 2018 Winter Paralympics, the Korean government has put a lot of effort into strengthening adapted sports, and as a direct result the performances of Korean athletes with disabilities have greatly improved over the past decade. However, there is a dearth of comprehensive studies focusing on sports science and performance-enhancing support for Korean national athletes with physical, intellectual, and visual impairments. One of the major reasons why there is a lack of research investigating on psychological skills training (PST) for athletes with disabilities may be due to the difficulty of clearly linking it to their performance.

Sport psychologists may define performance in slightly different ways, but in general performance is defined as an act of carry-

ing out specific physical routines or procedures by someone who has received physical activity training (Osborne et al., 2014). Performance has multiple components including psychological, physiological, and socio-cultural factors. More specifically, performance is highly influenced by athletic skills, psychology, physical fitness, and game strategies (Martinent and Decret, 2015). Even though these studies address the importance of both physical and mental training for athletes without disabilities, there is still a lack of research conducted on PST for athletes with disabilities.

A PST program consists of a series of activities including educating, developing a program, acquiring psychological skills, and applying these to the actual game situation (Calmels et al., 2004).

Mesagno et al. (2008) recommend that PST address the athletes' individual differences in the PST developing stages. In addition, the authors suggested that PST help athletes reach their

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Received: April 7, 2018 / Accepted: May 14, 2018

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peak potential through training and further their drive in psychologically challenging settings. The PST research on athletes without disabilities addresses various sports including both open and closed types of sports (Calmels et al., 2004; Thelwell et al., 2006).

Table tennis is an example of the open skill sport, which rapidly increases levels of anxiety and negative thinking, and is hard to control player's emotion (Martinent and Decret, 2015). Thus, table tennis is one of the hardest sports for an athlete to consistently maintain peak performance. Martinent and Decret (2015) found that self-confidence, positive thinking, and the abilities to release strain and to control emotions are the psychological factors that are best represented in table tennis. World-class athletes tend to demonstrate not only superior physical performances, but also better emotional control abilities (Thomas et al., 2007), so they are better at applying coping strategies in competitions (Puente-Díaz and Anshel, 2005).

The most popular PST domains are self-talk (Hatzigeorgiadis et al., 2004; Hatzigeorgiadis et al., 2009), imagery (Calmels et al., 2004), and routine (Mesagno et al., 2008). According to Hardy et al. (2001), self-talk is an effective technique to control anxiety. Self-talk can improve positive thinking, help remember performance cues, and increase concentration level (Hatzigeorgiadis et al., 2004). Moreover, athletes' psychological skills have a better outcome in their physical performances when self-talk and imagery trainings are combined together (Hatzigeorgiadis et al., 2004). Similarly, PST which involves self-talk, imagery, and performance routine has demonstrated to help achieve higher competition performances (Orlick, 1986).

There are numerous applied sport psychology studies that have been conducted and focused on performances of athletes without disabilities in sports settings (Calmels et al., 2004; Hardy et al., 2001; Hatzigeorgiadis et al., 2004; Hatzigeorgiadis et al., 2009; Mesagno et al., 2008). On the contrary, there is a lack of published research regarding the PST in Adapted Physical Activity (APA) field. Additionally, the existing PST studies published in APA have focused primarily on participants with intellectual disabilities (Gorely et al., 2002; Porretta and Surburg, 1995; Screws and Surburg, 1997). Recently, a single-case study on the PST with an elite wheelchair water-skiing athlete was published (de Bressy de Guast et al., 2013). However, to date, very few studies have been conducted on the effects of PST of athletes with spinal cord injuries (SCI) on performance in highly competitive sport. Therefore, the purpose of this study was to investigate effects of PST for national table tennis players with SCI.

MATERIALS AND METHODS

Participants

Participants were three male national table tennis players with SCI, who were training for 2012 London Paralympics. All participants were classified as class 2 based on the International Table Tennis Federation sport class allocation criteria. The participants' ages ranged from 35 to 47 years (mean $\pm$ standard deviation, 42 ± 6.25). They were trained to compete in both the individual and team categories at Paralympics. Due to nervous system malfunction, all participants were unable to hold rackets when they were competing, so medical bandages were used.

Measures

Psychological performance strategy (Test of Performance Strategies)

A Test of Performance Strategies (TOPS) questionnaire was developed (Thomas et al., 1999) and assesses athletes' psychological skills and performance strategies in competition including goal-setting (e.g., I set specific result goals), self-talk (e.g., I manage self-talk effectively), emotional control (e.g., My emotions get out of control under pressure), imagery (e.g., I rehearse performance in my mind), automaticity (e.g., I'm able to trust my body to perform skills), activation (e.g., I can psych myself to perform well), relaxation (e.g., I relax myself to get ready to perform), and negative thinking (e.g., I imagine screwing up). It has a 36-item questionnaire with nine factors, with an additional subscale relating to control of physical and mental condition (e.g., I can control my body to perform well). Participants completed the questionnaire that had a 5-point Likert-type scale that ranged from 1 (never) to 5 (always). High scores per nine subscale scores indicate positive improvement in psychological skills and performance strategies.

Interview

The first step for preparation of PST (pre-PST), each of the participants were interviewed to identify physical and mental characteristics regarding preparation, best and worst performances, and their previous experience with mental training. Based on this information, PST programs were developed to meet specific needs and were supported with detailed explanations of practical application for each participant. This study used interviews to identify individual athletes' psychological characteristics in order to tailor PST components according to their specific needs. Participants were then interviewed post-PST to examine the effectiveness.

Procedure

Approval to conduct this study was obtained from Korea Paralympic Committee. The participants signed and returned consent forms. This study was conducted from early June, 2012 to the early September, 2012 at the Para-athlete Training Center of South Korea. Preparation for the PST lasted about one month, followed by 2 months of the PST. The PST occurred one to 3 times per week, 2 to 4 hr at a time, in an office or a lounge at the training center. It was conducted in the following five steps: (a) preparation, (b) (individualized) program development, (c) PST, (d) application, and (e) evaluation (Orlick, 1986). The PST procedures were presented in Table 1.

Preparation

The authors met with coaches and athletes and observed them during training to gather information about the athletes' physical and mental characteristics.

Program development

Both qualitative and quantitative techniques were used to develop the PST program for the athletes with SCI. For the qualitative technique, the authors selected components from the TOPS and Orlick (1986)'s game review worksheet information to construct semistructured open questions for the individual interview. Specific examples are as follows: (a) goal setting (e.g., What do you want to get out of PST?), (b) best and worst performances (e.g., What was the difference between your best and worst performances?), (c) self-talk (e.g., What kinds of self-talk do you use before, during, and after competition?), (d) imagery (e.g., What kinds of imagery do you use before and after competition?), and (e) routine (e.g., What kinds of routines do you use before serving?). For quantitative part, the authors used the TOPS to assess athletes' psychological skills and performance strategies. The results of the pre-test were represented on radar charts (Fig. 1).

Table 1. Psychological skills training (PST) procedure

Procedure	Session	Content	Reference
Preparation	1st	First meeting and observation	Osborne et al. (2014)
	2nd	Orientation for PST	Osborne et al. (2014)
Program development	3rd	Understanding athletes' characteristic with interview	Hardy et al. (2001) Orlick (1986) Orlick and Partington (1988) Mamassis and Doganis (2004)
	4th	Understanding athletes' characteristic with test of performance strategies PST program development	Thomas et al. (1999)
Acquisition of PST program	5th	Offering program (self-talk, imagery, cognitive restructuring, and routine)	Self-talk: Hatzigeorgiadis et al. (2004) Imagery: Calmels et al. (2004) Routine: Mesagno et al. (2008)
	6th	Practice of PST program	
Application of PST	7th	Application of practice game	Osborne et al. (2014)
	8th	Application of final practice game	Osborne et al. (2014)
Evaluation		Right after each athlete's competition

Fig. 1. Participants' Test of Performance Strategies: pretest mean score.

Psychological skills requisition and application

Each participant was trained in the individualized PST program (developed as described above) during the table tennis training period (2 months), and practiced every night before sleeping. In the process, participants practiced and acquired mental skills and they applied their PST programs to practice competitions. The PST programs were adjusted as necessary during this step until finalization, around 3 weeks prior to the 2012 London Paralympics. After providing the final version of the PST program, the TOPS questionnaire was administered to reassess the participants' psychological skills and performance strategies the post-PST.

Evaluation

Right after the completion of both individual and team events at the Paralympics, the TOPS was administered for the final time.

Data analysis

Data analysis was separated into two stages: First, the athletes' psychological characteristics (i.e., anxiety, confidence, concentration, etc.) were extracted by interviewing and then were used to develop the PST programs. Second, the TOPS was used to examine the intervention effects of the PST. Thus, the questionnaire was administered over three different time periods that are pre-PST, post-PST, and postcompetition. The postcompetition questionnaire was conducted immediately after competition in the 2012 London Paralympics. The data from the TOPS were analyzed using radar charts (Fig. 1) and the mean differences between each athlete's three TOPS scores were assessed.

RESULTS

Phases of PST

Preparation

Observation of the participants' characteristics: Information about the three athletes was gathered as preparation for PST development. The researcher observed that athlete 2 was particularly enthusiastic about physical training and (technical) skills practice. In practice games, athlete 2 showed little emotion whether he won or lost. Athlete 1 was found to be similar in levels of enthusiasm for training and practice. But in practice games, his face would change color based on his performance and he frequently displayed negative self-talk. Athlete 3 maintained a positive attitude toward training, but without the enthusiasm of athletes 1 and 2. When he made an error in practice games, he would re-

spond physically (e.g., shake his head to himself). Components from the TOPS and Orlick's game review worksheet were used to conduct an interview.

Program development

(a) Interview: Highlights (quotations) of each athlete's characteristics will follow. Athlete 1 stated as follows.

"When I get nervous, my physical reaction time goes down and I mentally blank out and lose interest in playing... I want to increase my concentration and stop thinking negatively."

These are some of athlete 2's statements.

"I lack confidence and easily get nervous. When tense, I lose my pace; I don't know which serve is more effective. I keep thinking of my errors. Even when I'm leading (in points), I want to be more confident in my skills and match strategies."

Another statement below is from athlete 3.

"In competition I can only do 50%–60% of my best. When the point-gap gets big, I become easily distracted and lose game control. I feel bad for my opponent because of my poor performance. Games are low-pressure and just fun. But I want to concrete harder."

(b) TOPS: Athletes TOPS are shown in Fig. 1.

(c) PST development: Based on the interviews and the TOPS results, tailored PST programs were developed. Because the PST period was short (2 months), the researcher chose not to improve all nine psychological skills, but instead focused on improving self-talk, imagery, and routine, step by step; cognitive restructuring and breathing techniques. The PSTs were further specialized by emphasis on a few of the very weakest skills of each athlete. To be more specific, self-talk skill was improved using posters of the 2012 London Paralympic stadium for table tennis to familiarize them with that environment. The posters included positive cues ("Let's do my best!" "Let's have fun, let's make it fun, I can have fun," "Let's show everything I've got with no regrets!" "Let's succeed!"). Additionally, the athletes were trained to remind themselves of the thoughts they had during their peak performances.

All athletes trained to imagine themselves performing their best in the familiarized London table tennis stadium. Previously, the researcher had asked the athletes to describe their feelings at their peak performances, that is, the confidence they felt before that game, the feeling of the winning shot, and the emotions felt right after winning. They were asked to recall the breathing, the muscle tension, and the restlessness during that game. They consistently practiced visualizing these physical, emotional, and mental feelings. They were also trained to imagine controlling differ-

Table 2. Athlete 3's routine

Category	Content
The day before competition	Sleep early, rise early
The night before competition	Check tournament bracket Look up videos of scheduled opponents' play Visualize playing against them, and visualize winning
Arrival at the stadium	Basic stretches Practice technical skills (30–60 min)
The waiting room before competition	Focus on myself ("focus on your play," etc.) Focus on physical and mental condition Recall the good feelings from practice and game strategies Visualize a winning strategy against the opponent
Immediately before competition	"Go for it! It's not a big deal," approach the table with a grunt
Service	Always serve a back-hand Decide serve placement after studying opponent Shake racket back and forth Decide serve-type after observing opponent's position Bounce ball and serve
Time-outs	When leading (in points), keep focus When behind (in points), look at floor and grunt to regain focus When gaining a point, yell, "Fighting (Yes!/All right!!)" When losing a point, practice swing to regain focus

ent game scenarios against their rivals. Routines were divided into specific categories: the day before competition, the night before competition, arrival at the stadium, the waiting room before competition, immediately before competition, service, and time-outs. Both physical and cognitive components were included in their routines. For example, Table 2 represents athlete 3's routine.

Psychological skills training

Following the development of the PSTs, the athletes practiced their own programs. The aim of the programs was to make the use of the psychological skills automatically. Above all, the programs were designed to help the athletes come as close to experiencing actual competition in London as possible, by effectively using all the psychological skills. Before sleeping, all athletes recited the words on the self-talk posters mentioned above, at least 5 times. They practiced imagery of their peak performances. Next, they mentally rehearsed their routines. The results of their training were confirmed in practice matches, during the PST period. For example, when athlete 3 won a point, he grunted ("Aht!"), when he lost a point, he practiced his swing and said, "Focus on the ball, focus on the ball (etc.)..." (self-talk). The more

each of the athlete practiced their reactions became more consistent.

Psychological skills requisition and application

The purpose of this stage was to confirm the athletes' progress with the PST by evaluating the application of this training in practice competitions. When necessary, the programs were modified, based on observation, data collection, and feedback from the athletes. During this stage, athlete 1 reported that though he strove to make use of his routines in a competition, he had difficulty using all of the psychological skills, compared with the other two participants. When he made errors, he reverted to old habits, forgetting his PST. Athlete 2 reported that he practiced imagery, self-talk, and winning-game scenarios whenever he had time. Athlete 3 reported that he used routines effectively in practice matches and that he practiced before sleep training. This stage concluded with the distribution of the finalized PST and the administration of the TOPS (the post-PST test).

Evaluation

In this stage, the TOPS was administered for the final time (postcompetition test) and then compared with both the pre and post-PST for each athlete. Next, the results of the London Paralympics were examined. Lastly, the athletes were interviewed about the effects of the PST, after Paralympic competition.

(a) TOPS results by psychological skill: As shown in Table 3, all three athletes' self-talk mean values increased from the pre to the post-PST test. Moreover, the mental skill was implemented during the London Paralympics, especially by athlete 1; as he showed steady improvement in this skill.

Controlling negative thinking skill increased in the post, compared to the pre-PST test, for all three athletes, but athletes 2 and 3 scored lower in this skill in the Olympic competition compared to the post-PST test. Emotional control followed the same pattern as negative thoughts (improvement from pre to post-PST and lower scores for athletes 2 and 3 in Olympic competition). Overall, scores in this skill were low for athletes 2 and 3, as shown in Table 3. Scores for automaticity increased from the pre- to the post-PST test, especially athlete 1, who showed steady improvement from the pre-PST test to the postcompetition test. Goal setting improved from the pre- to the post-PST test. Athlete 1 improved further in Paralympic competition, however, athletes 2 and 3 scored lower in the Paralympics compared to post-PST levels. The imagery of athletes 1 and 2 was improved from the pre- to the post-PST test. Athlete 1 continued to improve in this skill

Table 3. Mean score of test of performance strategies

Performance strategy	Athlete No.	Pretest	Posttest	Competition
Self-talk	1	3.25	4.00	4.50
	2	4.00	4.50	4.50
	3	4.25	4.75	4.75
Negative thinking	1	3.50	4.00	4.25
	2	2.25	4.50	4.00
	3	2.50	4.25	3.75
Emotional control	1	1.50	3.00	3.25
	2	2.75	3.50	3.25
	3	3.00	3.75	3.50
Automatic performance	1	2.00	4.00	4.75
	2	3.00	4.00	4.00
	3	2.50	4.50	4.25
Goal setting	1	3.00	3.50	4.25
	2	3.75	5.00	5.00
	3	3.25	4.50	4.50
Imagery	1	2.75	4.50	4.75
	2	3.50	4.50	4.25
	3	5.00	5.00	4.50
Activation	1	3.50	4.50	4.50
	2	4.00	4.25	4.00
	3	3.00	4.50	4.50
Relaxation	1	3.00	4.00	3.50
	2	3.00	4.00	2.75
	3	3.00	4.25	2.50
Condition	1	3.50	4.50	4.50
	2	4.00	4.50	4.25
	3	4.25	4.50	4.50

on through Paralympic competition. All athletes showed improvement from the pre- to the post-PST test in activation. Athletes 1 and 2 maintained activation on through Paralympic competition.

All athletes' relaxation skill levels increased from the pre- the post-PST test. However, all athletes' scores in this skill decreased during Olympic competition. Notably, athletes 2 and 3 reported their lowest scores (for both relaxation and overall) in the post-competition test. On the other hand, compared to pre-PST level, athlete 1 showed improvement in competition for this skill. In the control of physical and mental condition skill, all athletes improved from the pre- to the post-PST test. Further, athletes 1 and 3 maintained the control of condition skill in Paralympic competition.

(b) Olympic competition results: Athletes 1, 2, and 3 participated in the men's team event, earning the bronze medal for that event. Athlete 1 achieved the silver medal in the men's singles

event. Athlete 2 was eliminated in the preliminaries for the singles event. Athlete 3 was eliminated in the quarter-finals. Athlete 1's TOPS score improvements were reflected in outstanding results in the Paralympics. Although the TOPS scores of athletes 2 and 3 increased from the pre- to the post-PST test, they were not able to fully apply their mental skills in Paralympic competitions. This may have had an effect on the results of their singles competition when compared with Athlete 1.

(c) Postcompetition interviews: Interviews were conducted after competition to explore the effects of the PST on the London Paralympics. The athletes were asked to what degree they acquired their PST, to what degree their PST effected Paralympic competition, and their overall attitude toward the PST. Athlete 1 was inclined to negative thinking after experiencing failure in the Sydney 2000 Paralympics. However, due to the effects of the PST for the London 2012 Paralympics, Athlete 1 was able to regulate negative thoughts. He reported that self-talk was the most effective skill for his outstanding results in the London 2012 Paralympics.

Athlete 2 reported that the specific and systematic nature of the PST influenced his performance positively. Athlete 3 stated that he was very satisfied with the PST program developed for him. He became convinced that the PST was beneficial for performance in competition, although he was regrettably not able to fully apply his PST in London. He also stated that the PST period was too short.

DISCUSSION

This study examined the effects of PST for table tennis national athletes with SCI. The results suggested that all three athletes' mental skills were generally increased after PST. To be specific, the PST indicated positive changes in self-talk, emotional control, and goal setting for the table tennis athletes with SCI. With the exception of relaxation, Athlete 1 was able to maintain and use all the improved mental skills in Paralympic competition. However, although the mental skills of athletes 2 and 3 generally improved, they were not able to take full advantage of these improvements in Paralympic competition. Whitehead et al. (2016) three stages of learning model could explain why relaxation was not effective as other psychological skills.

According to Whitehead et al. (2016), individual's motor learning goes through cognitive, associative, and autonomous process and this can be applied to the PST. For instance, one simple self-talk might not diminish the negative thoughts right away and

transfer the athletes to the autonomous stage. Moreover, simulating the competition with rivals and successful demonstration of specific game skills in imaginary training does not guarantee that the psychological skills will be completely transferable in competitions. Therefore, all psychological skills including self-talk, imagery, and routine should be practiced for a longer period, so they will be able to become autonomous for the athletes not only in imagery but also in practice and games.

Supporting the previous research, the outcomes of this study undergird the idea of Hanrahan et al. (1990) idea that PST programs are applicable to athletes with disabilities. Additionally, the results of this study replicate several previous findings for athletes with disabilities. For instance, Travis and Sachs (1991) found that a swimmer who participated in the Special Olympics was able to differentiate between relaxation and tension after a mental skills training program to learn relaxing and control competitive anxiety. Gregg et al. (2004) reported the effects of a PST package on off-task behaviors, work outputs, and competition results for three track and field athletes with intellectual disabilities.

Similar positive findings for PST have been obtained consistently for athletes without disabilities as well (e.g., Blakeslee and Goff, 2007; Paquette and Sullivan, 2012). That is, the use of self-talk and controlling negative thoughts reveals that all athletes sufficiently used the self-talk skill (Hatzigeorgiadis et al., 2009). Hatzigeorgiadis et al. (2009)'s study also supported this notion that the self-talk showed positive effect on athletes' performances and reducing the anxiety level. Indeed, the current study highlights the importance of the self-talk as one of the PSTs, as self-talk can enhance attention focus, redirect negative thoughts, and create positive thoughts and images (Orlick and Partington, 1988; Stephens et al., 2012).

Finally, athlete 1 demonstrated steady increase in all the PST throughout pre- and post-PST test, and subsequently won a silver medal at the London Paralympics. By showing that they could control their psychological emotions at high profile events such as Olympics and Paralympics, which are known to increase the athletes' level of anxiety, the athletes manifested the positive effect of the PST. Likewise, Orlick and Partington (1988) illustrate a positive link between athletes' mental readiness and Olympic performance outcomes for Canadian Olympians who participated in summer or winter Olympics in 1984.

Although the results of this study show that the PST program have a positive impact on the performance of table tennis national athletes with SCI, the outcomes of the current findings could not be generalized due to the low number of participants. The current

study had applied the PST program for a period of 3 months, so future studies should address the recommendation of Mamassis and Doganis (2004) and apply longer psychological interventions. Furthermore, additional research on the PST program with athletes with different types of limitations and athletes with different skill levels (i.e., novice players, world class athletes) is needed.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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