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Review of sport science research specialised on wheelchair tennis

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ABSTRACT

This article presents a review of previous research on wheelchair tennis. We have analysed previously published sport science articles that concentrate on wheelchair tennis. Findings indicate that a greater scientific production of wheelchair tennis related research is still necessary with specific areas proposed for those involved in research.

Key words: Research, wheelchair tennis, adapted sport
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INTRODUCTION AND METHODOLOGY

Wheelchair tennis is an adapted sport for those with physical/ functional disabilities, played exclusively on a wheelchair as long as the wheelchair tennis player meets the minimum required disability recognised for this sport, which prevents the athlete from playing on two feet.

This bibliography review is presented in two levels: The first segment focuses on articles from the Journal Citation Report (JCR) while the second concentrates on specific tennis journals, in two sub-levels; ITF articles, Coaching and Sport Science Review as well as articles from the ITF Wheelchair Tennis Review. The JCR review includes those articles published between January 2001 and December 2011 while the additional journals reviewed incorporate all issues since the beginning of their publication. The ITF CSSR, between April 1993 and April 2012, and the ITF Wheelchair tennis, between October 2000 and August 2008, when it's publication ended.

Wheelchair tennis research from the point of view of sport sciences. The most relevant and specific research published in JCR magazines:

The research done by Reina, Luis, Sanz, Sabido, García and Moreno (2004) analysed the visual behaviour of wheelchair tennis players in relation to the service return of both right and left handed players. Findings show that the service, depending on the side of the server, impacts on the perceptive processes of the return in tennis and wheelchair tennis in the change of service situation. In the case of left handed players, segments like the arm-racket segment are visible over a longer period of time, so it is possible for a returner to receive more information. Additionally those players with experience of playing left handed opponents, appear to have a greater impact on the perceptive process.

Reina, Moreno and Sanz (2007) conducted research in order to determine the visual behaviour and the motor responses during the return stroke in wheelchair tennis. Results show that expert players focus initially on the head, shoulders and free arm while beginners concentrate on following the launch of the ball to its maximum height. Experienced players provided useful information from the arm-racket segment during the hitting phase and were also faster with their motor response.

Authors like Goosey-Tolfrey and Moss (2005) compared the characteristics of the propulsion speed of the wheelchair with and without a tennis racket. Findings show that when sprinting with the racket, the speed reached over the first three sprints was significantly reduced. Those poor results obtained when carrying the racket maybe due to less efficient pushing that brings about an inefficient application of strength.

Filipcic & Filipcic (2009) analysed the characteristics of the timing in wheelchair tennis. The data was gathered in 22 singles matches on a hard court with results recorded using an IT software application. The results show that the active part represented 19.68% of the playing time, while the passive part accounted for 80.32%. The average time of an individual movement in each point lasted 4.16 seconds with an average of 2.23 strokes per point. Barfield, Malone and Coleman (2009) evaluated the capacity of those who suffer from a spinal cord injury (SCI) to reach the training threshold in tennis by using heart rate monitors to measure the heart rate. The authors concluded that the characteristics required to reach the health and fitness thresholds during tennis practice for those individuals with a low SCI are similar to those individuals tested in the control group.

Roy, Menear, Schmid, Hunter and Malone (2006), also studied the physiological responses through heart rate, during the wheelchair tennis competition. They concluded that wheelchair tennis players who compete must include aerobic conditioning as a part of their training programme. This is because the intensity of wheelchair tennis competition is at a level that tests a players cardiovascular system.

Diaper and Goosey-Tolfrey (2009) examined the physiological changes caused by long term coaching for an elite female wheelchair tennis player when preparing for an important tournament. They also described the interventions in the recovery of the tennis player during the 2004 Paralympic Games. They concluded that the broad education programme was responsible for the changes and adaptations as a result of a greater confidence which helped to achieve a better fitness in the Paralympic Games.

Finally, Reid, Elliott and Alderson (2007) analysed the kinetics of the shoulder joint in the service of elite wheelchair tennis

players. The information about these wheelchair tennis players was measured by comparing this data with that of 12 top performance players. The findings indicate that wheelchair tennis players are presented with a similar injury risk to their shoulder joints to non-disabled tennis players.

The ITF CSSR articles published include several contributions to the teaching didactics (Bullock, 2010), competition strategies (Bullock, 2006), club programmes (Polic, 2000) and a general vision on the sport (Bullock and Sanz, 2010).

The articles published in the ITF Wheelchair Tennis Review are included in Table 1 which also presents the classification made by Fuentes (2012) and includes varied research of the different areas.

Areas	JCR	CSSR	WHEELCHAIR	TOTAL
Tennis didactics		1	16	17
Sport training	3	1	11	15
Sport biomechanics in tennis	1		8	9
Tactical variables and decision making in tennis			8	8
Control and motor learning in tennis	2		4	6
Sport physiology in tennis	2		2	4

Table 1. Classification of previous reviews.

CONCLUSION

The main objective of this article is to review some scientific publications concentrating on wheelchair tennis. In order to do so, we have focused on an analysis of the different documentary sources to identify the publications.

Once all the above mentioned journals have been analysed, we believe additional research is required in order to investigate areas related to physiology, control and motor learning, biomechanics (technique required to make the strokes), and tactics (notational analysis), and psychological and sociological aspects. Further research will develop a better understanding of this important modality in tennis.

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