

Peter Harrison Centre

for Disability Sport

Newsletter

Issue 4 Spring 2009

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Welcome to the 4th newsletter from the Peter Harrison Centre for Disability Sport (PHC).

The preparation for the next Paralympics in London 2012 has started and the Peter Harrison Centre for Disability Sport hopes to contribute in a positive way by working towards its mission: *'To improve knowledge about Paralympic sport and to promote the substantial health and quality of life benefits that can be gained through participation in disability sports'*.

Last year, saw the launch of the Centre's visiting scholar program. The inaugural visiting scholar was Dr Sean Tweedy from the University of Queensland, Australia. He was the guest of the Centre from 18th to 24th January 2009. The week was extremely productive and a number of projects were discussed with group members of the PHC. Chief among these new collaborations was an agreement by the Peter Harrison Centre to contribute to the International Paralympic Committee (IPC) Athletics Classification project. Dr Tweedy is Chief investigator on this four year project, which addresses one of the Paralympic movement's most pressing needs - development of objective, evidence-based methods

for classifying athletes in Paralympic athletics. Dr Tweedy said, "I am very pleased that Dr Vicky Tolfrey's Sports Science team has agreed to contribute to this very challenging and important project. Moreover, the bright minded, skilled staff and wonderful facilities of the PHC will be invaluable."

During his stay Dr Tweedy had discussions with Dr David Howe about contributing an historical profile of the Paralympic movement to an upcoming publication currently under consideration by the International Olympic Committee (IOC) entitled *The Paralympic Athlete*. This follows on from last year which saw the research publication of several articles and a book entitled *The Cultural Politics of the Paralympic Movement: Through the Anthropological Lens*.

During Dr Tweedy's visit, he gave an excellent presentation to the School of Sport and Exercise Sciences Physiology Research Group and had discussions with representatives from UK Sport, the English Institute of Sport and the British Paralympic Association (BPA).

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The Centre would like to thank Nik Diaper, from the English Institute of Sport, for providing the newsletter with photographs of the Beijing 2008 Paralympics which are featured at the top of page 1.

We hope you enjoy learning about the Centre and find the links to the website and other resources useful. If you have any feedback or would like to contact the Centre please email: PHC@lboro.ac.uk or contact the Information Officer on 01509 226387 or C.Greasley@lboro.ac.uk.

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As you can imagine, the week's activities filled the programme and Dr Tweedy's expertise within classification of Paralympic Sport was well received and recognised by all those involved. This first visiting scholarship program is soon to be followed by Professor Thomas Janssen (Free University Amsterdam) who has been invited jointly by the PHC and the BPA to deliver a keynote at the March BPA Sports Science, Sports Medicine and Coaching Conference 2009. Moreover, during this conference Professor Liz Bressan from Stellenbosch University will be visiting the PHC with colleagues from South Africa to discuss links with the Centre.

We are delighted to have been granted support from both the Peter Harrison Foundation and the

School of Sport and Exercise Sciences for the purchase of a specialised treadmill which accommodates wheelchairs. This new investment will generate new and exciting opportunities for applied research in the field of disability sport. We have established a solid platform through great team work involving all members of the Peter Harrison Centre for Disability Sport, excellent links with both the British Paralympic Association and UKSport, and can now move forward with the aim of being the leader in the UK in the area of 'Disability Sport'. This edition of the newsletter will highlight many of the projects we intend to focus our efforts on in the near future.

By Dr Vicky Tolfrey—Director of the PHC

Wheels For All Research Project

By Marie Dannhaeuser, *Research Assistant & PhD Student at the PHC*

Wheels For All is a cycling initiative offered through the Out and About Project in Chorley, Lancashire. The initiative aims to encourage disabled people to become more active by providing opportunities for people with various physical, learning and emotional impairments to use a range of adapted bicycles. Cycling Projects, an organisation working to help people enjoy the benefits of cycling, coordinates Wheels For All through the Out and About Project in partnership with Sustrans, the UK's leading sustainable transport charity. In addition, the BIG Lottery also provides further financial support for the initiative.

The Peter Harrison Centre was approached by Sustrans to conduct a research study investigating impact of the Wheels For All programme on participants' health, well-being and social inclusion. In November, Marie Dannhaeuser, the Centre's Research Assistant responsible for the project, attended Cycling Project's Wheels For All conference. Marie comments: "I felt that it was a very informative day, providing me with a great background and context to the programme. It was useful to see how the programme runs in different places in the UK." While the Peter Harrison

Centre's study will focus on the programme's activities in Chorley, it currently runs in 21 different communities across the UK. It is anticipated that the results of the study will provide a qualitative snapshot of the programme, as well as a basis for developing evaluative tools that can be implemented across the wider Wheels For All network.

In February, Marie attended an indoor session in Chorley to see the programme in action and met with onsite coordinators and participants in order to get a better focus for the project. Marie enjoyed the site visit, commenting: "I was impressed by the range of adapted cycles available to participants – from tricycles, quads to tandem hand-cycles – there is equipment on-site that caters to all levels of cycling experience and ability".

Focus groups with participants and their carers are planned to take place in early Springtime, when the programme moves to its outdoor location. "There are a lot of different groups within the Chorley community who access the programme, and I'm excited to start the focus groups to hear more about their experiences".

Future Direction of Sport Culture and Policy

By Dr David Howe, Deputy Director

Much of the research undertaken by the Sport Culture and Policy team focuses upon the Paralympic Games. Concerns surrounding athlete development have led the team to consider where future generations of Paralympians are coming from. The British and US military have in recent years established programmes to encourage war injured servicemen and women into sport with the hope of 'fast-tracking' them to Paralympic success. These programmes may not be suitable for everyone who sustains an impairment through mishap, and this area is a topic of interest to our group.

The team is working alongside, amongst others, the British Heart Foundation National Centre for Physical Activity and Health (also located at Loughborough University) to determine the social factors that limit involvement in both physical activities generally

and sport specifically for people with impairments. As it stands the sports development pyramid, with a large base of recreational athletes that decrease as the seriousness and severity of training increases toward the Olympics and other elite sporting practices, which are emblematic of mainstream sport, does not exist within Paralympic sport. Instead of a pyramid, disability sport is based on the model of an obelisk. By exploring cultural practices, policies and attitudes surrounding disability sport we hope future research will highlight changes that need to be made in sporting provision for the impaired. Ultimately we hope this research will begin to transform the development obelisk into a pyramid and thus increasing health and well-being for people with an impairment more generally.

The Peter Harrison Centre is part of EU Bid Winning Team

By Dr David Howe, Deputy Director

The Peter Harrison Centre was recently successful as part of a consortium of Centre's with expertise in disability sport who have received approximately €590,000 from the European Union Directorate-General for Education and Culture. This funding was secured by a team of scholars who work at Palacký University of Olomouc is the second-oldest university in the Czech Republic where the first meeting was held on the 25-28 January 2009. Olomouc was the capital of Moravia and has had a university since 1573. This historic city formed the backdrop for what the ten nation team hope will be an important research study designed to establish European Union Standards in Adapted Physical Activity (EUSAPA).

Each research centre is responsible for collating data in their country of origin. As well as the United Kingdom and the Czech Republic other nations involved are Belgium, Finland, France, Ireland, Latvia, Poland, Portugal and Sweden. The purpose of the project is to gather data for the European Federation of Adapted Physical Activity (EUFAPA) in order to establish a consensus of opinion as to what skills are required to be a good practitioner of adapted physical activity (APA). The team at the PHC will be led by Dr David Howe and will include Dr Vicky Tolfrey and David Purdue. They will be responsible for gathering data on physical education, sport and therapeutic recreation. In the initial stages, data within these three areas will be collected

through surveys that will be distributed to rehabilitation centres, mainstream and disability specific sport governing bodies and schools at both primary and secondary levels. In the first stage of the research we hope to establish the level of competence with APA professionals are required to achieve in order to be gainfully employed. By collating this data across Europe the larger team hopes to establish which competencies are transferrable across the continent.

The second stage of the research will be regional focus groups that will attempt to illuminate the professional competencies in each of the three areas of APA:

- Adapted physical education in schools
- Adapted sports and recreation
- Adapted physical activities in rehabilitation

After this stage of research it is hoped that we will be able to identify the needs for each APA area in all partner countries; define academic standards (subject specific competencies and learning outcomes) in the three areas of APA and develop international academic framework to guarantee the quality of professional preparations in the fields of APA at European level.

The PHC team will be reporting of the first stage of the research at the International Symposium of Adapted Physical Activity in Gävle, Sweden this coming June.

P4 Energy Expenditure in Disabled Athletes

By Louise Croft, Associated PhD Student

The average daily energy intake is ≈ 2900 kcal (for men) and ≈ 2200 kcal (for women) (McArdle, Katch and Katch, 2001). Interestingly, certain disabled ambulatory individuals have been shown to expend more energy than able bodied persons. For example, bilateral, below knee amputees expend 41% more energy when walking at a given speed compared to controls (Fisher and Gullickson, 1978). On the other hand, individuals who use a

wheelchair use a smaller muscle mass when exercising compared to ambulatory, able-bodied individuals, wheelchair athletes may require less energy for exercise. The importance of understanding energy expenditure in athletes with different disabilities is therefore paramount to obtain data that can help with nutritional strategies associated with both training and daily living.

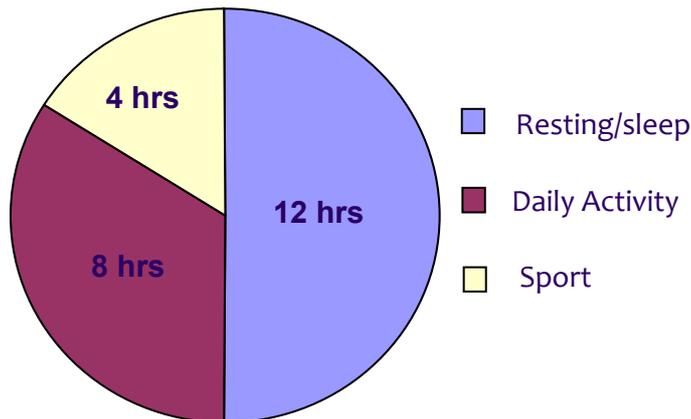


Figure 1 shown left, demonstrates that a large part of an athlete's day will be taken up by daily activities. As the energy expenditure is divided into these different components then it is important to measure resting/daily energy expenditure and energy expenditure during specific sporting activities so that an athlete can obtain an individual picture of their overall energy expenditure during a day/week.

Figure 1. Energy expenditure guesstimate of a proposed average day of a disabled athlete taking part in 4 hours sports training.

What does my study involve?

My first study requires the athlete to attend the laboratory in the morning after an overnight fast. This present study involves both individuals who use a wheelchair and amputee athletes.

- Participants are asked to lie on a bed for 30 minutes whilst expired air is collected using the portable K4b² system which involves wearing a face mask. Participants are instructed to lie still but not to fall asleep! This resting energy expenditure measure is also known as the 'resting metabolic rate'.
- The next part of the testing involves collecting energy expenditure at various walking or everyday wheelchair pushing speeds on a treadmill. This lab based location provides a repeatable and standardised setting for gaining energy expenditure data at certain speeds. The expired air samples are collected using the Douglas Bag technique, which involves the athlete using a mouth piece and nose clip whilst exercising (see Figure 2 shown right).

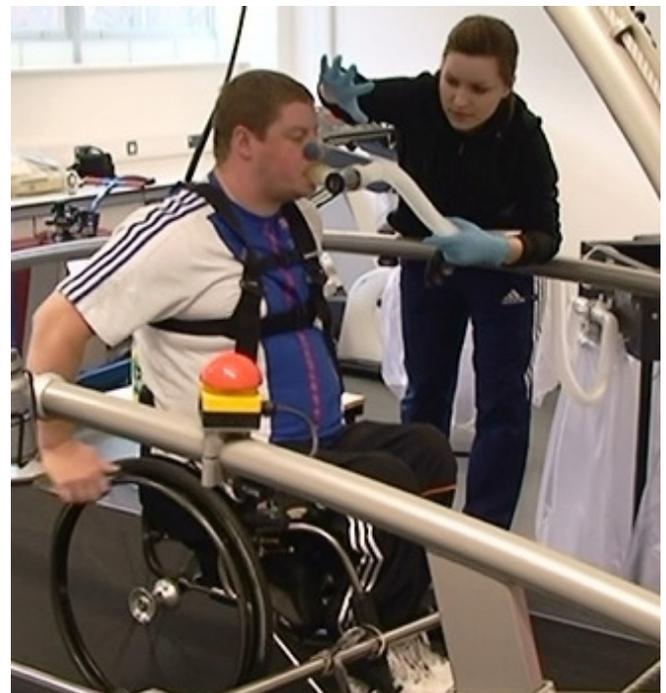


Figure 2. Louise Croft collects the expired air samples from an athlete using the Douglas Bag technique.

- Finally, the athlete completes a VO₂ peak test in their sports wheelchair on the treadmill. For the ambulant athletes, they complete the test using their preferred exercise mode. This test is a measure of how well an individual can take in and utilise oxygen at the muscles. It also helps us understand the daily energy expenditure values - taking into consideration aerobic fitness levels!

Data collected:

- Energy expenditure is then calculated from the expired air (Frayn, 1983). The information gained from the sub-maximal treadmill speeds will give the athlete an idea of how much energy they produce at a given speed and a given heart rate per hour. By gaining a measure of resting metabolic rate and daily pushing/walking energy expenditure, we can start to understand the energy requirements of wheelchair and amputee athletes on a day to day basis.

Future studies:

- We hope to extend the work of Abel and colleagues (2008) who have reported the energy expenditure of wheelchair sports. We hope to derive individual HR-VO₂ data collected in the lab and extrapolate to a competitive environment so that the sporting energy expenditure can be understood further. It is envisaged that this data collection will be collected at the Paralympic World Cup later this year with the Women's GB wheelchair basketball team.

- Future studies will hopefully include data for individuals with a wider range of disabilities. If you are interested in this research programme then please contact Louise. Her contact details can be found below.

References:

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Frayn, K. N. (1983). Calculation of substrate oxidation rates in vivo from gaseous exchange. *Journal of Applied Physiology*, **55**, 628 – 634.

McArdle, W., Katch, F. and Katch, V. (2001). *Exercise Physiology, Energy, Nutrition and Human Performance*. Philadelphia; Lippincott, Williams and Wilkins.

To contact Louise please email her at:
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Staff Profile of Christof Leicht, Research Assistant



The PHC would like to welcome Christof Leicht the latest Research Assistant to join the Sports Science research team. Christof began working at the Centre in February and the primary goal of his research is to develop the area of training science in wheelchair sport (e.g., the exploration of monitoring training intensities and innovative training strategies). This may take the form of (i) exploring the relationship between rate of perceived exertion and training intensity during upper body exercise; and (2) furthering the work of respiratory training in spinal cord injured athletes. Over the coming months

these ideas will be formulated as he meets the athletes and coaches to discuss his work for the Centre.

Christof graduated from the Swiss Federal Institute of Technology, Zurich, Switzerland 2004 with an MSc in Sports and Exercise Sciences. Prior to that he gained a BSc in Biology from the University of Berne in Switzerland in 2001.

His previous work and publications in performance diagnostics deal with exercise physiology, studying both able-bodied and spinal cord injured subjects (e.g., lactate profiling and ergospirometry).

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P6 Future work in (a) Field Testing for Wheelchair Athletes and (b) Classification

By John Lenton, Research Assistant – Sports Science

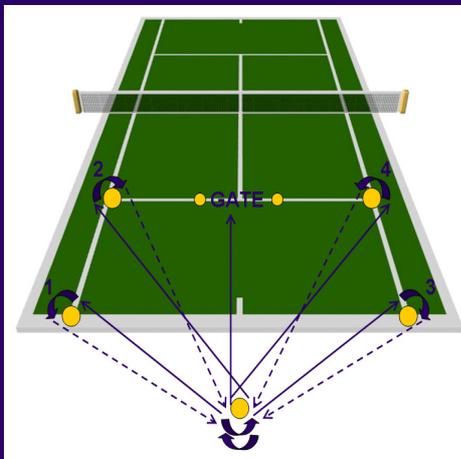
In January 2009, I began my position as a research assistant to the Peter Harrison Centre for Disability Sport. The new role has offered me the opportunity to continue my career in disability sport

research focusing on wheelchair propulsion performance. In my new role I will undertake a variety of research projects and continue some aspects of applied sports science support.

My programme of work includes the following:

Field - based testing

- Background: The assessment of wheelchair athletes aerobic and anaerobic fitness is an important component of wheelchair sports performance programmes, whereby the athletes are continually monitored on their performance and progress. Laboratory measures that allow athletes to be tested are often difficult to undertake as they require specialist personnel and equipment, which are not always readily available. Objective: To assess current field-based tests and develop new tests which wheelchair sports can rely upon in the assessment of performance of their athletes. For example, Figure 1 illustrates the 'fan drill' which is currently used in wheelchair tennis. I hope to work with tennis coaches which includes Martyn Whait (GB Wheelchair Tennis Men's National Coach) to help develop some normative data and check the reliability of administering such a test.



Execution:

- Start behind hub marker cone (9ft or 2.75m) behind baseline in line with centre T.
- Player pushes to and around Cone 1.
- Player returns behind the hub, turns and pushes to and around Cone 2.
- Player returns behind the hub, turns and pushes to and around Cone 3.
- Player returns behind the hub, turns and pushes to and around Cone 4.
- Player returns behind hub, turns and pushes through the gate on service line.

Figure 1: The fan drill used in wheelchair tennis

Classification Research

- Background: The competition in Paralympic sport relies on a classification system and current methods used for the classification of impairments are based exclusively on expert opinion. Many Paralympic athletes have reduced range of movement as a result of joint trauma, joint dysgenesis, contracture or other factors. There is very little scientific literature evaluating the relationship between impairment and athletic performance. Following discussion with Dr Sean Tweedy, the centre has committed to a project entitled "Towards evidence based classification in Paralympic athletics – reliability of methods for evaluating sports-specific range of movement". Objective: To conduct a series of range of movement tests in non-disabled participants that are specific to the main disciplines in athletics (running, wheelchair pushing, throwing). This will initially allow the piloting of test protocols, the development of the methods to measure the test outcomes, evaluating the reliability and establish norms for these measures in the non-disabled population. This is a joint venture with Professor Thomas Janssen and Dr Sonja de Groot of the Free University in the Netherlands. The outcome of this project will be the identification of sports-specific tests for the range of movement that have acceptable intra and inter-rater reliability, contributing to a new method of classification that is based upon empirical scientific evidence. Further research will then be conducted in disability populations evaluating the relationship between these measures and athletic performance.

Working with Paralympic Governing Bodies

- The PHC hopes to align its research interests with generic physiological screening and training prescription. Discussions are on-going with Alan Edge the Performance Director of the GB Wheelchair Basketball Association as to how this may be best achieved. The support will encompass the physiological assessment and monitoring of the athletes performance. Laboratory testing of the athletes ensures a controlled environment by which to compare exercise test results.

If you are interested in any of the projects described above, please email John at: J.P.Lenton@lboro.ac.uk

Jeanette Crosland, Sports Dietitian Talks about the PHC's Role in her Work

Interviewed by Charlotte Greasley, Information Officer



Jeanette Crosland (shown left) is a registered dietitian who currently works on a freelance basis with ParalympicsGB and has previously worked with the British Olympic Association. Jeanette is closely associated with the Peter Harrison Centre for Disability Sport (PHC) and has written an article about *Team Work* (below) for this month's newsletter.

CG: Working on a freelance basis, do you think that the PHC has a role to play in helping your work?

JC: "One of the invaluable things to me as a practitioner is that I can bring problems to your scientists, Dr Vicky Tolfrey or John Lenton, and they have been able to implement research that has come up with some good practical answers for me as a practitioner. This in turn has ultimately helped the athletes to improve either their health and/or their performance".

Jeanette explained that she felt it is good that the PHC has a national focus and brings together research from across the UK rather than just being Loughborough University based.

"The Centre is a focal point for disability research and science in the UK"

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Team Work! By Jeanette Crosland

Working in the field of sports nutrition, particularly in the world of disability sport, can be something of a solo experience. The number of practitioners at the elite level is limited, and for those not permanently based in a university, access to help from active researchers can be limited.

By working with ParalympicsGB, Loughborough University and the Peter Harrison Centre for Disability Sport, I have been able to combine my own expertise with that of others to provide an integrated service to disability sports. The following examples show some key areas where interdisciplinary working has helped practitioners to provide the best service to our elite athletes.

- Liaising with cutting edge scientists such as Vicky Tolfrey, Nik Diaper and John Lenton with the issues I face as a practitioner has meant that their research can be geared to providing practical answers for practitioners and hence athletes.
- Working together on projects of common interest such as hydration and temperature control, ensures that athletes get the best service by integrating all aspects of their needs.
- Working together at training camps has meant that athletes and their staff can make best use of time when they meet as a team.
- Within disability sport there are still many unanswered questions and the staff involved can support each other with their own knowledge and contacts for further information.

Issues currently being considered by a team of practitioners include hydration testing and fluid requirements, coping with travel to a wide range of climates, energy intakes and expenditures, combining diet with training to maximise body composition and performance - all tailored to the needs of disability sports. An added benefit has been that some of the practical information produced by working with teams has proven transferable from one sport to another.

My role in these areas has varied, but includes:

- Measurement of body parameters such as height and weight.
- Measures of hydration status -urine analysis pre and post training body weights.
- Assessment and analysis of dietary intakes.
- Calculation of individual nutritional and fluid requirement based on personal data, sport and disability.
- Provision of practical advice regarding achieving the necessary targets for sport.
- Provision of practical information regarding weight management.

Sound scientific information regarding some aspects of disability sport is still lacking. An integrated approach to athlete support will help improve the knowledge base and hence enhance the performance of our elite athletes.

A Qualitative Investigation into Wheelchair Configurations for Optimal Mobility Performance in Wheelchair Basketball, Rugby & Tennis

By Barry Mason, Associated PhD Student

I recently completed a study investigating athletes' perceptions and experiences of how they felt areas of wheelchair configuration can influence aspects of their mobility performance. As it stands very little scientific research has been conducted on this area and the process of configuring a new sports wheelchair is an extremely subjective one. As a result athletes often make decisions on how to set up their chairs based on trial and error or what they have observed from their peers.

In order to understand some of the reasoning behind the decisions that athletes are making, nine experienced wheelchair sportsmen from wheelchair basketball (WCB), rugby (WCR) and tennis (WCT) were interviewed.

Following the analysis and interpretation of all interview transcripts, the results of this investigation identified that all participants from WCB and WCR valued the ability to accelerate as the most important indicator of performance in these sports. Although participants from WCT agreed that initial acceleration was important they actually highlighted manoeuvrability as the most important aspect of mobility performance in their sport. This subtle difference could be fairly significant in relation to the way in which these players subsequently decide to configure their chairs.

Even though the current investigations focus on the relationship between chair set-up and sports mobility, it was apparent that players seemed to be giving greater consideration to 'match play' related factors when deciding how to configure a wheelchair for sport. For instance players would appear to be setting their chairs up so that they were in a position to maximise their ball handling skills for WCB and their groundstroke's for WCT, as opposed to maximising their mobility around the court.

Despite this, it was evident that all participants had a very good 'general' understanding of

how configuring a sports wheelchair in different ways impacted upon the various aspects of mobility performance and they appeared to be extremely united in these beliefs. For example, all participants were aware of the benefits of sitting high and sitting low in terms of sports mobility performance. However, the methods that were used to determine each individuals optimum settings were slightly vague. It was clear that optimising aspects of chair configurations with respect to the specific anthropometrics and disability level of the user was an area that required substantially more scientific research in order to assist and inform athletes about some of the decisions they are making when configuring a new sports wheelchair.

However, one area of configuration appeared to be in the most urgent need of research attention. This concerns rear wheel camber, as athletes' general understanding of this areas' contribution to mobility performance was not consistent. It was unanimously agreed that increasing the degrees of camber had a positive effect upon manoeuvrability. Yet the influence that camber had upon aspects of straight line mobility performance produced conflicting remarks. Some participants felt that increasing camber had negative effects on initial acceleration and sprinting, often citing an increased feeling of drag and resistance when they were pushing. Alternatively, other participants felt that increasing camber had negligible effects on camber as long as the wheels were well maintained in terms of their alignment.

Therefore, this investigation served to identify which areas of wheelchair configuration were most in need of future evidence based research to assist athletes with what is currently a very complex and subjective process. To this extent, the next study of my PhD will investigate the effects of rear wheel camber upon mobility performance for wheelchair athletes.

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