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SPORTS PARTICIPATION FOR PEOPLE WITH INTELLECTUAL DISABILITIES

Section A:
A meta-analysis and systematic review of the effect of participation in integrated and segregated sports on the social competence and self-concept of people with intellectual disability.

Word Count: 7,975 (61)

Section B:

An investigation of the factors that predict the performance of athletes with intellectual disability

Word Count: 7,402 (181)

Overall Word Count: 15,377 (242)

A thesis submitted in partial fulfilment of the requirements of
Canterbury Christ Church University for the degree of
Doctor of Clinical Psychology

June 2015

SALOMONS
CANTERBURY CHRIST CHURCH UNIVERSITY

Acknowledgements

Firstly, I would like to thank the athletes and their supporters who took time out of their busy lives. I am grateful to the volunteers and staff at INAS, the Special Olympics and Inside Out for their enthusiasm, organisational, and linguistic skills. I would also like to thank INAS for providing the finances that made this project possible. Thanks also to the amazing research assistants, my fellow “rock-star scientists”. I am grateful to my supervisors, Professor Jan Burns and Dr Fergal Jones who provided me with invaluable advice and inspiration. Finally, thanks to my husband and family for their support.

Summary of Major Research Project

The literature regarding the impact of sports interventions on the social competence and self-concept of people with intellectual disability (ID) was reviewed using systematic review and meta-analysis methods. The meta-analysis found that post intervention social competence scores were higher for people who took part in sport with a medium effect size but there was not conclusive evidence of positive effects on perceived physical competence or general self-worth. There was not sufficient evidence to suggest whether segregated or integrated interventions are more beneficial.

A naturalistic, cross sectional study aimed to provide evidence to enable the International Federation for Para-athletes with Intellectual Disability (INAS) to address the potential inequalities in the way competitive athletes with ID are classified. A secondary aim was to add to understanding of the relationship between ID and physical/sensory disability. Participants ($N = 111$) were recruited from regional and international sporting events for people with ID. IQ and health measures were administered. Findings indicated a weak negative correlation between IQ and additional physical disability. The data also suggested that level of additional physical disability negatively predicts athletic performance and there is some limited support for the suggestion that IQ positively predicts performance.

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Section A

A meta-analysis and systematic review of the effect of participation in integrated and segregated sports on the social competence and self-concept of people with intellectual disability.

Words: 7,975 (61) (excluding abstract, references, tables & figures)

Abstract

The physical and psychosocial benefits of sports participation for the general population are well documented however, there has not been a recent review of the psychological effects of sport for people with intellectual disability. This review sought to establish whether sport is an effective intervention to improve the social competence and self-concept of people with intellectual disabilities. The methods used were meta-analysis and systematic review. Systematic literature searches resulted in sixteen papers for review, six of these included comparison with a control group and were included in a meta-analysis of between group effects. The outcome investigated by the meta-analysis was social competence. Findings indicated some evidence that sports interventions improve social competence. The meta-analysis found that post intervention social competence scores were higher for people who took part in sport with a medium effect size (g = 0.47, 95% confidence interval 0.15 to 0.79) but there was not conclusive evidence of positive effects on perceived physical competence or general self-worth. There was not sufficient evidence to suggest whether segregated or integrated interventions are more beneficial. The clinical and research implications are discussed.

Keywords: Intellectual Disability, Sport, Self-Concept, Special Olympics, Social Competence

Introduction

Sport and Psychological Well-being

The World Health organisation (WHO, 2005) suggests the implementation of the VicHealth (1999) framework to promote mental health and psychological well-being in its strategy for the promotion of mental health. The framework is holistic, suggesting that social inclusion, physical health and economic resources contribute equally to mental well-being. Sport is proposed by the WHO as a powerful tool in health promotion as the model suggests it encourages improvements in physical health and social inclusion that will benefit mental health (WHO, 2005).

The positive effects of sport on psychological well-being are empirically established. Meta-analyses of the literature concerning outcomes for participants with diagnoses of severe depression report that the effects of regular exercise are comparable to psychotherapeutic interventions in reducing symptoms such as low mood and social withdrawal (Cooney, 2013; Craft & Landers, 1998; Lawlor & Hopker, 2001). Similarly, the ability of physical activity and sport to help prevent and reduce symptoms of mental ill-health by promoting quality of life and improving self-concept has also been noted in the adult general populations (Caddick & Smith, 2014; Vail, 2005; Seiler & Birrer, 2001; Fox, 1999). Self-concept in particular appears to have important implications for emotional stability and overall psychological well-being throughout the lifespan (Sonstroem, 1997). Finally, according to the VicHealth (1999) model, sports organisations also have the power to improve psychological well-being by promoting social inclusion.

Sport for People with Intellectual Disability

According to the DSM-V, a diagnosis of intellectual disability (ID) can be made if a person scores two standard deviations below the mean on a valid and reliable measure of cognitive functioning, has difficulties with activities of daily living, and their problems began during the developmental period (American Psychiatric Association, 2013). Due to these differences, it may be problematic to assume that people with ID derive the same psychological benefits from sports participation as the general population. For example, there may be differences in their ability to cope with complex rules and team development. However, people with ID also experience more social inequality and discrimination than their non-disabled peers (Emerson & Gone, 2012). According to the VicHealth (1999) model therefore the community integration aspects of sports participation may have a greater positive impact on their psychological well-being. Similarly, research suggests that people with ID tend to have lower self-concepts than their peers (Ferro & Boyle, 2013), suggesting greater potential for improvement through sport.

A recent review indicates that people with ID can derive physical benefits from sports training (Bartlo & Klein, 2011). However, the most recent review regarding the psychosocial benefits of physical activity for people with ID, was conducted by Dykens, Rosner and Butterbaugh in 1998 and focussed on physical activity in general rather than sport in particular. Since then there has been considerable research suggesting that sports participation has unique qualities which may not form part of general physical activity programmes (Weiss & Bebko, 2008). However, no recent comprehensive review of this literature exists. Furthermore, there is continued debate surrounding the optimal mode of sports participation for people

with ID. Particularly, whether people with ID should ideally participate in integrated sports with their non-disabled peers or whether it is preferable for them to experience sports in a segregated environment.

Integrated and Segregated Sport

There are currently several organisations offering sporting experiences for people with ID. The most widely known of these are the Special Olympics, which provides training and competition for individuals of all ability levels, and the International Federation for Para-athletes with Intellectual Disability (INAS) which delivers elite sports competition for athletes with ID who perform at the highest level. The primary model adopted by the Special Olympics is segregated, however, they also offer an integrated, "Unified" programme where participants with disabilities train and compete in teams with non-disabled "partners," of matched sporting ability. Similarly, although the majority of INAS competitive events are segregated, they also offer competitions where athletes with physical and intellectual disabilities compete in the same events, although in different classes.

There are competing theoretical positions concerning whether integrated or segregated experiences are preferable. According to the theory of normalization proposed by Wolfensberger (1972) only experiences that are culturally normative and involve increased contact with non-disabled members of society are ultimately beneficial to people with ID as they increase their perceived value in society. Social comparison theory however, would suggest that segregated experiences may be more beneficial as they provide opportunities for positive social comparisons with less able peers and fewer opportunities for unfavourable comparisons with non-disabled peers, which may lead to erosion of self-esteem (Festinger, 1954; Wills, 1981). Recent research in this area has suggested that the process of social

comparison may have direct implications for identity. Stets and Burke (2014) posit that people seek to verify, through comparison with others, whether their behaviour is congruent with the meaningful characteristics and roles that are attached to the identity they hold in a given situation. Significant psychological distress may occur when feedback from the social environment is incongruent with the person's identity. An athlete that has previously competed successfully in a segregated environment may therefore find their sporting performance in comparison to non-disabled peers is incongruent with the identity of a "successful athlete" and become distressed. Similarly, Tajfel and Turner (1979) propose that social group membership leads to the formation of a positive or negative sense of self. Subsequently, people who are frequently in situations where they are forced to occupy a de-valued "outgroup," as people with ID may be in traditional sports settings, are likely to develop negative social identities (Tajfel & Turner, 1979). This theory suggests that people who are likely to be marginalised would benefit most from segregated sports environments where they can create their own group with values that celebrate their difference (Tajfel & Turner, 1979).

The strongest base of empirical research concerning the integration or segregation of people with ID is from the field of education, where research findings are mixed. One review of the benefits of integrated education concluded that inclusive educational practices benefit students' social competence and skill acquisition (McGregor & Vogelsberg, 1998). However, more recent studies have suggested that children with ID educated in inclusive settings may be disadvantaged (Hornby & Kidd, 2001; Hornby & Witte, 2008). Overall, it appears that an adequate evidence base for either integrated or segregated education has not been

established (Hornby, 2011). There is therefore no clear guidance for the design of sports interventions based on existing theory or research.

Self-Concept

In order to assess the effect of sports interventions on psychological well-being it is necessary to operationalise this concept. The existing literature has used self-concept as a measure of psychological well-being (Weiss & Bebko, 2008). Self-concept refers to an individual's sense of self-worth and perception of competence in social, physical and cognitive domains (Weiss, Diamond, Demark & Lovald, 2003). Sonstroem (1997) highlights the importance of a positive self-concept in maintaining emotional stability and positive adjustment. Negative self-concept has also been linked to mental illness in the general population and anger, depression, low motivation and anxiety in individuals with ID (Benson & Ivins, 1992; Simons, Capio, Adriaenssens, Delbroek, & Vandenbussche, 2012). People with ID are more likely than their age matched peers to hold negative self-concepts (Ferro & Boyle, 2013), possibly due to negative social comparisons, experience of failure and social stigma (Weiss et al., 2003). For this reason self-concept is the outcome most frequently evaluated in the literature regarding the effect of sport on psychological well-being for people with ID. There is evidence that self-concept develops from a global sense of self-worth to a more differentiated appreciation of competency in areas such as social competence, physical competence and general self-worth (Weiss, Diamond, Demark & Lovald, 2003). Recent measures of self-concept therefore separate the three domains. Hence, for the purposes of this review, the impact on the three domains of self-concept, perceived social competence, perceived physical competence and general self-worth will be considered separately.

Social Competence

High levels of actual skills, particularly social skills, are believed to be positively related to self-concept as improvements in adaptive abilities are hypothesised to lead to increased perceptions of competence and consequently overall self-concept (Weiss et al., 2003; Dykens et al., 1998). In addition, social competence facilitates social inclusion, which is vital to psychological well-being according to the VicHealth (1999) model. For the purposes of this review measures of actual and perceived social competence have been considered together, reflecting an amalgamation present in the existing literature. The problematic nature of this conflation will be discussed as a limitation later in this review.

Aims

This review aimed to determine whether sport is an effective intervention for improving the self-concept, including social competence (both actual and perceived), perceived physical competence, and general self-worth of people with intellectual disability. A secondary aim of the review was to investigate whether integrated or segregated sports are more effective.

Methodology

In order to ensure all relevant studies were reviewed, searches of the online databases Psych Info, the Cochrane Database of Systematic Reviews, the Cochrane Database of Randomized Control Trials, Medline, Web of Science and Sport Discus were conducted. Searches ranged from the inception of the databases until January 2015. The following search terms were used:

[Intellectual disab* *or* mental retard* *or* learning disab* *or* intellectual development disorder *or* low IQ] *and* [sport *or* athlet*] *and* [social inclusion *or* well-being *or* mental health *or* quality of life *or* social integration *or* self-concept].

The titles and abstracts of articles were read. Articles were included that used a measure of self-concept or social competence as an outcome measure. Articles that did not directly assess the effect of sport participation, did not contain a measure of self-concept or social competence or were not available in English were excluded. Articles that did not have a control group in the design or did not provide sufficient data for analysis were excluded from the meta-analyses but were retained for systematic review. Where papers provided insufficient data the authors were contacted. Any key words associated with relevant articles which were not included in the original search terms were added and the search was repeated. In addition, the references of all relevant articles, including related conceptual articles, which were not selected for review, and a Special Olympics research reference list, were hand-searched (Special Olympics Regional Research Collaboration Centre, 2011). Figure 1 illustrates the articles found at each stage of the literature search. After the application of criteria six studies were selected for meta-analysis and a further ten were included in the systematic review.

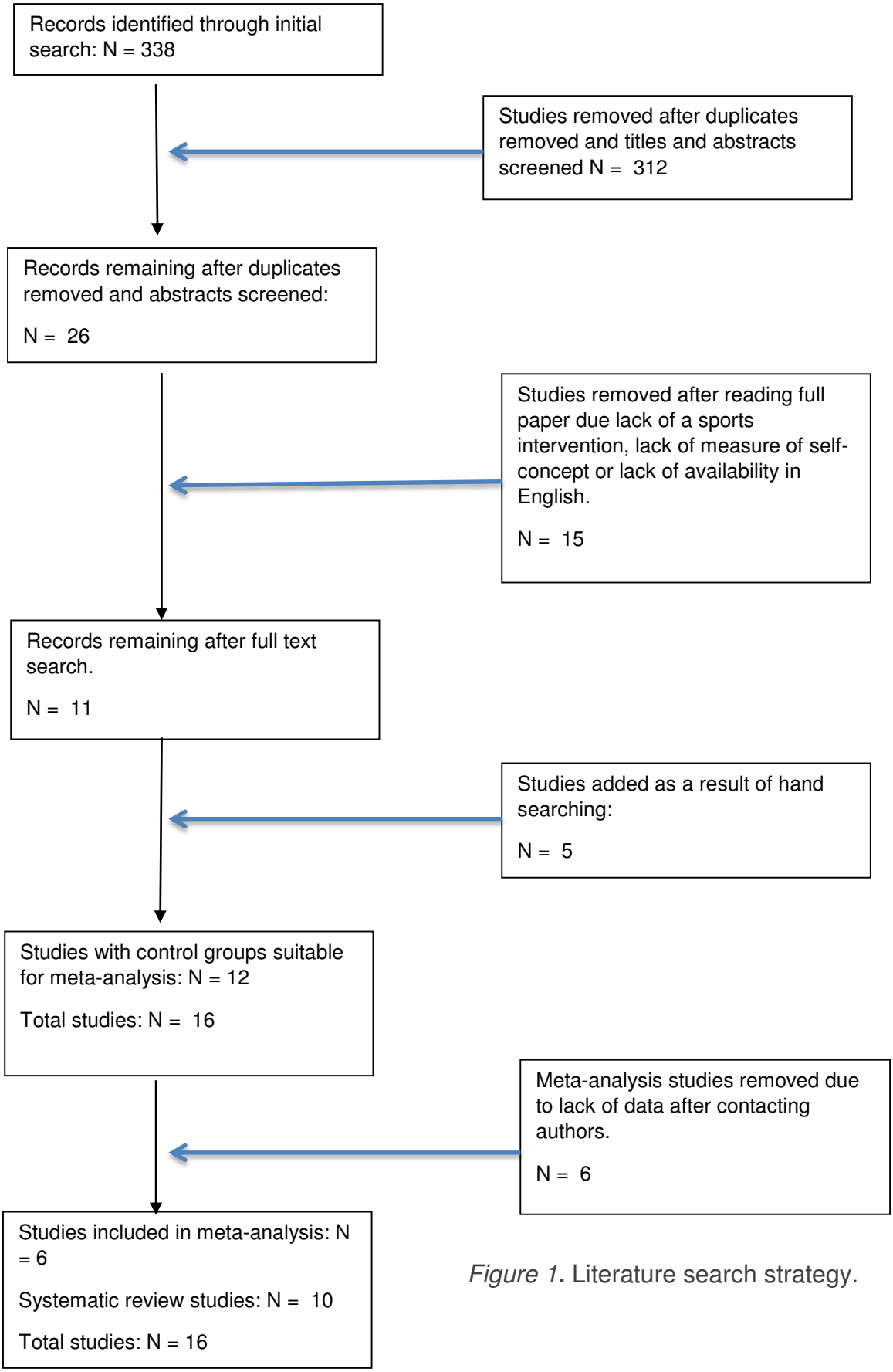

Figure 1. Literature search strategy.

The review begins with a brief description of the included studies. Appendix A includes tables summarising reviewed papers. The findings will then be discussed and critiqued in relation to the aims. The guidelines for evaluating the quality of research suggested by Kmet, Lee and Cook (2004) were utilised for all studies, except Ozer et al. (2012) which was evaluated using the CONSORT criteria as it is a Randomised Control Trial (RCT) in design (see appendix B for a replication of the quality criteria applied). This involved the systematic application of criteria, which resulted in an overall quality score that can be compared across studies. The question of whether segregated or integrated interventions are more effective will be evaluated for each outcome. Finally, a discussion synthesising the findings will situate the results within the theoretical background and the clinical and research implications of the findings will be considered.

Description of Included Studies

Six studies were homogenous enough, and provided sufficient data, to be included in a meta-analysis for the outcome of social competence (Gibbons & Bushakra, 1989; Grafius, 1986; Ilhan et al., 2013; Ozer et al., 2012; Riggen & Ulrich, 1993 & Valkova, 1998). These studies will be described first, followed by a table summarising the studies not included in the meta-analysis. Meta-analysis was not possible for the other outcomes due to lack of data. Table 1 summarises key information about the meta-analysis studies.

Table 1

Studies Included in the Meta-analysis

Reference	Sample	Design	Control Group	Intervention	Measures Used	Measure of social competence	Quality score
Gibbons and Bushakra (1989)	*N* = 48 children with ID (aged 9-12)	Cross sectional	Active (registered for SO but activity levels not known)	Segregated 1.5 day SO athletics meet	Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter et al., 1984)	PSPCSA – peer acceptance scale	16/28
Grafius (1986)	*N* = 66 adults (no age specified)	Quasi experimental Repeated Measures	Sedentary	Segregated 12 week SO gymnastics programme with 3 month follow up	Piers-Harris Children's Self-concept Scale (Piers and Harris, 1969)	CSCS summary	16/28
Ilhan et al (2013)	*N* = 145 children (aged 8-12)	Quasi experimental Repeated Measures	Sedentary	Segregated 5 week physical education programme. 2 hour long sessions a week.	Paediatric Quality of Life Inventory (PedsQL, Varni, Seid & Rode, 1999)	PedsQL social functioning scale (parent rated)	12/28
Ozer et al. (2012)	*N* = 76 male children (aged 12-15) 38 with ID 38 no ID	RCT	Active (educational activities)	Integrated 8 week SO football training programme, 3 1.5 hour sessions per week	Child Behaviour Checklist (CBCL, Achenbach, 1991) Adjective Checklist (ACL, Siperstein, 1980) Friendship Activity Scale (FAS, Siperstein, 1980)	CBCL competence score (parent rated)	25/37
Riggen and Ulrich (1993)	*N* = 75 adult males (aged 18-40)	Quasi experimental Repeated Measures	Sedentary	Compared segregated and integrated SO basketball programme	Perceived competence scale for children, (PCSC, Harter, 1982)	PCSC social competence	11/28
Valkova (1998)	*N* = 76 adults (ages not specified)	Cross sectional	Sedentary	Mixed SO interventions	Vineland Adaptive Behaviour Scales – Screener (Cicchetti, Sparrow, & Carter, 1991)	Vineland social functioning	6/28

Meta-analysis Studies: Sampling

Sample sizes ranged from 48 -145. In total the studies recruited 423 participants. Two hundred and thirty five of these were allocated to sports interventions, 188 formed the control group. All participants were recognised by the researchers to have an ID, methods by which this was assessed varied significantly, and this limitation will be discussed later.

The quality of the sampling strategies used was generally low. Only one of the studies employed randomisation when allocating participants. The remaining studies (n = 5) used convenience and purposive sampling strategies, drawing participants from databases of sports clubs or activity providers. This ensures high ecological validity, as the participants reflect the population taking part in sports programmes, however this also limits the internal validity of the findings and introduces potential confounding variables.

Meta-analysis Studies: Study Design

Only one of the studies adopted a RCT design but all studies compared participants who had taken part in a sports intervention to a control group on at least one measure of social competence. The majority of interventions involved training sessions and regular competitions in a specific sport such as basketball (n = 1), football (n = 1), swimming (n = 1) or gymnastics (n = 1). One study included participants from a mix of sporting clubs and one study included participants who were taking part in a physical education programme that involved several competitive sports.

Three studies evaluated segregated sports programmes, where participants trained with and competed against other people with ID. One paper evaluated an

integrated programme where, following the Special Olympics Unified Sport protocol, participants joined sports teams with both disabled and non-disabled peers (called partners) of matched athletic ability. One study included both segregated and integrated sports conditions. In this case only the segregated condition was used for analysis in order to make the interventions as homogenous as possible. One study included a mix of participants taking part in integrated and segregated sports programmes. Frequency and length of training sessions and competitions varied (see Table 2 for details).

Lack of randomization introduces bias to five of the studies. However, the majority of the studies attempted to compensate for this with reasonable attempts to control differences between participants. There were some problems with design, however. One intervention consisted of only a single athletics meet, the sports taken part in by participants within this event could have varied significantly, which compromises validity. One study did not provide sufficient data about their intervention to allow replication and there was no discussion of how confounding variables were controlled for. In addition one study, which took participants from a mix of sports clubs has limited validity, as the types of interventions employed are not clear. All studies however, utilised existing sports intervention packages, ensuring high ecological validity.

Meta-analysis Studies: Measures

Of the six studies included, three used self-report measures to assess participants' perceived social competence. One study used the Perceived Competence Scale for Children (PCSC, Harter, 1982) with acceptable psychometric properties (Harter, 1982). However, this measure was intended for use with a

paediatric population and was used with adults. The authors modified and piloted the measure on an adult sample from of people with ID and reported good reliability and variability in scores (Riggen & Ulrich, 1993). One study used the Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (PSPCSA, Harter & Pike, 1984), designed as a simple extension of the PCSC (Harter, 1982). However, this measure had not been validated on an ID population specifically. One study used the Piers-Harris Children's Self-concept Scale (CSCS, Piers, 1969) which also has acceptable psychometric properties (Wolf, Hunter, Webber, & Berenson, 1981) and provides a global measure of self-concept. However, factor analysis has shown that of factors it measures, "behaviour", "popularity" and "intellectual and school status" appear to relate to perceived social competence (Wolf, Sklov, Hunter, Webber, & Berenson, 1982, p.512). As the remaining factors, "physical appearance, anxiety and happiness," do not clearly fit a definition of physical competence or general self-worth it has been considered for the purposes of this review as a measure of social competence (Wolf et al.,1982, p.512).

Three of the studies utilised parent/caregiver report measures to assess the social competence of participants. One study used the Vineland Adaptive Behaviour Scales (Cicchetti, Sparrow, & Carter, 1991), another used the Child Behaviour Checklist (CBCL, Achenbach, 1991) and one used the Paediatric Quality of Life Inventory (Peds-QL, Varni, Seid & Rode, 1999). All three measures have good psychometric properties, although it is unclear from the article which version of the Vineland Adaptive Behaviour Scales was used by Válková (1998).

Meta-analysis Studies: Quality

Five of the studies were awarded a score out of 28 based on the Kmet et al. (2004) quality criteria, with a mean quality score of 12.2. One study (Ozer et al., 2012) was evaluated out of 37 using the CONSORT criteria and was awarded a score of 25/37. The quality scores reflect the criticisms of sampling, design and measurement made above. Please see Appendix A for a table detailing key criticisms of each study. The quality scores awarded are listed in Table 2.

Meta-analysis Method

The number of participants in each condition and the between group post intervention means and standard deviations on the measures of social competence were entered into Review Manager version 5.2 (RevMan, Cochrane Collaboration, 2014) software. The standard mean difference (SMD) for each of the studies was calculated using the following calculation: SMD = Difference in mean outcome between experimental and control groups / Standard deviation of outcome among participants. The effect size was then pooled.

Description of Systematic Review Studies

Eleven studies were not suitable for meta-analysis. Key information is described in Table 2.

Table 2

Description of Studies Included in the Systematic Review

Reference	Design	Sample	Intervention	Measures	Quality Score
Wright & Cowden (1986)	Quasi experimental Repeated Measures	*N* = 50 People with ID aged 12 - 18	Segregated 10 week SO swim training programme 2 x 1 hour sessions per week Active controls took part in adapted physical activity	Children's Self-concept Scale (CSCS, Piers & Harris, 1969)	16 / 28
Ninot, Bilard, Deligniers & Sokolowski, (2000)	Quasi experimental Repeated Measures	*N* = 48 females with ID aged 13 - 17	Integrated and segregated basketball. Integrated and segregated swimming Adapted physical activity All programmes were 8 months long and involved a minimum of 2 hours training per week and 6 competitive meets.	Self Perception Profile for Children (SPP, Harter, 1985)	16 / 28
Ninot, Bilard, & Sokolowski, (2000).	Quasi-experimental Repeated Measures	*N* = 48 females with ID aged 13 - 17	Integrated and segregated basketball. Integrated and segregated swimming Adapted physical activity All programmes were 14 months long and included 6 competitive meets. Frequency and duration of training not specified.	SPP	15 / 28
Ninot, Bilard & Delignieres (2005)	Quasi-experimental Repeated Measures	*N* = 32 females with ID aged 13 - 17	Integrated swimming Segregated swimming Adapted physical activity All programmes were 32 months long and included 16 competitive meets. Frequency and duration of training not specified.	SPP	12 / 28
Ninot & Maiano (2007).	Quasi-experimental Repeated Measures	*N* = 48 females with ID aged 13-17	Integrated and segregated basketball. Integrated and segregated swimming Adapted physical activity All programmes were 21 months long and involved a minimum of 2 hours training per week and 12 competitive meets.	SPP	15 / 28
Maiano, Ninot, Bruant & Bilard, (2002)	Quasi experimental Repeated Measures	*N* = 24 males aged 11-18	Alternated integrated/segregated 13 month basketball programme, 12 meets over 13 month period, 6 segregated SO events and 6 integrated school events.	SPP	14 / 28

Castagno (2001)	Repeated measures	*N* = 58 24 with ID, 34 partners All males, grades 6 - 8	Integrated 8 week SO basketball programme. 3 x 1.5 hour sessions per week	Adjective Check List (ACL, Siperstein, 1980) Friendship Activity Scale (FAS, Siperstein, 1980) Self-esteem Inventory (SES, Zigler, 1994 as cited in Castagno, 2001) Unified Sports Questionnaire (Special Olympics, 1994).	15 / 28
Dykens & Cohen (1996)	Cross sectional Repeated measures	*N* = 104 from SO Team USA aged 9 - 37 *N* = 32 controls with ID	Segregated SO athletes from team USA given repeated measures and then compared with matched ID controls. 4 month follow up for team USA athletes	CBCL – activity and social competence, Vineland screening Sentence Completion test (Harter, 1985)	21 / 28
Weiss, J., Diamond, T., Demark, J., & Lovald, B. (2003).	Correlational	*N* = 97 people with ID Aged 9.3 - 42.5	Mix of SO participants from a range of SO interventions	Perceived Competence Scale for Special Athletes (Riggen & Ulrich, 1993) Adaptive Behaviour Scales – Residential and Community Edition (ABS-RC2; Nihira, Leland & Leland, 1993)	23 / 28
Weiss & Bebko (2008)	Longitudinal .	*N* = 49 people with ID Aged 9.3 - 42.5	Mix of SO participants from a range of SO interventions given repeated measures from Weiss, Diamond, Demark & Lovald (2003) after 42 months.	Involvement in SO as standard score Perceived Competence Scale for Special Athletes (Riggen & Ulrich 1993) Adaptive Behaviour Scales – Residential and Community Edition (ABS-RC2; Nihira, Leland & Leland, 1993)	23 / 28
Wickiser (2002)	Cross sectional	*N* = 35 adolescents with ID. Aged14-17	SO segregated sports programme SO integrated sports programme Frequency and duration of training unspecified	Behaviour Assessment System for Children (BASC) (Reynolds & Kamphaus, 1992 as cited in Wickiser, 2002). Social Skills Rating System (SSRS) (Gresham & Elliot, 1990	12 / 28

Review Findings

Is Sport an Effective Intervention to Improve the Social Competence of People with ID?

The results of the meta-analysis are reported followed by consideration of the remaining studies.

Meta-analysis. Post intervention means and standard deviations for the experimental and control groups were extracted from the six papers included. Heterogeneity in the study populations and interventions was present, therefore a random effects model was employed. Figure 2 shows the data entered into the meta-analysis and a forest plot for post intervention between group effect sizes for the outcome of social competence. The *x* axis indicates the size and direction (positive or negative) of the effect. The squares indicate individual effect sizes and the associated lines indicate 95% confidence intervals for this, while the diamond represents the pooled effect size, with the width of the diamond showing the 95% confidence interval for the pooled effect size.

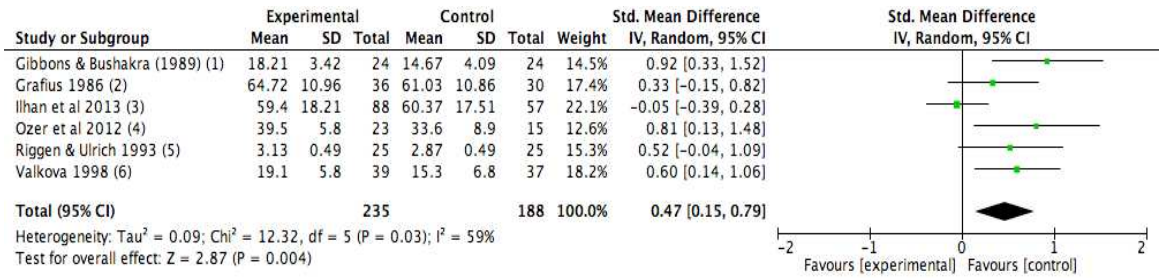

Figure 2. Meta- analysis data and forest plot for the outcome of social competence.

Post intervention social competence scores were higher for participants who took part in sports programmes than for the control group (z (5) = 2.87, p =.004) with a medium effect size (g = 0.47, 95% confidence interval 0.15 to 0.79). The effect size was not significantly heterogeneous (X^2 (5) =12.32, p < .05) and the number of studies included was relatively small. Therefore no moderator analyses were conducted. It is notable that the studies investigating an integrated sports programme (Ozer et al., 2012) and a mixed group of participants from both segregated and integrated programmes (Valkova, 1998) both demonstrated positive effect sizes that were close to the mean. In addition, there does not appear to be a systematic difference in effect sizes between studies that utilised a parent rated outcome measure (Ilhan et al., 2013, Ozer et al., 2012 & Valkova, 1998) and those that used self-report measures. Figure 3 shows a funnel plot of effect sizes (x-axis) by standard error (y-axis). Studies with larger sample sizes (and therefore lower standard error) would be expected to have effect sizes closer to the mean if there was no bias present, creating a symmetrical inverted funnel.

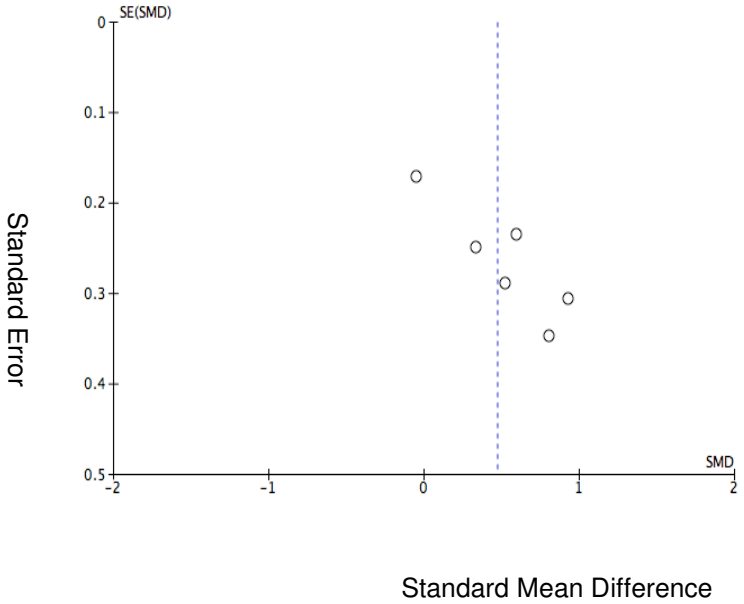

Figure 3. Funnel plot showing post intervention effect sizes by standard error.

The mean SMD is represented by the broken line. The plot is skewed and asymmetrical indicating potential bias as the studies with the largest effects also have the largest standard error/smallest sample sizes. This is likely to be due to discrepancies in methodological rigor. However, due to the small number of studies included this is not definitive. This will be expanded upon in the limitations section.

Overall the meta-analysis shows a significant positive effect of sports interventions on social competence.

Findings of the Systematic Review

Segregated sports interventions. Wright and Cowden's (1986) comparison of adolescent participants ($N = 50$) in a Special Olympics swim training programme and an active control group found the intervention had a positive effect on the CSCS scores. As mentioned above, there are some concerns regarding the construct validity of the CSCS. However, a key strength is that participants across conditions were compared for age and IQ prior to participation. Unfortunately, it is not stated how IQ and diagnosis of ID were measured and demographic details that could potentially confound results, including socioeconomic status, were not collected. The experimental sample was a convenience sample drawn from individuals who had expressed an interest in participating in the Special Olympics, this combined with the adherence to the widely available Special Olympics training model, gives this study high ecological validity. However, the lack of randomization in participant allocation means causation cannot be established. Overall therefore, this study provides some support for the positive effect of a segregated swim training programme on the perceived social competence of participants.

Dykens and Cohen's (1996) regression analysis of the factors predicting scores on the parent rated CBCL social competence domain for team USA athletes (*n* = 104) found that time involved in Special Olympics was the strongest predictor when age was controlled for. However, IQ was found to be the only predictor of social functioning as measured by the Vineland Adaptive Behaviour Scales – Screener, Socialization Domain. When Team USA results were compared with data from the control group (*n* = 32) Team USA participants scored significantly higher than controls on both measures. These scores were maintained at four month follow up. The sample sizes in each part of the study were adequate and thorough attempts to reduce systematic bias between groups were made. However, the athletes included were participating at a high level and the sample size included in the comparison was small, the sample therefore cannot be assumed to represent the ID population and the findings have limited generalizability. This study therefore provides tentative support for the positive effect of segregated sports interventions on social competence.

Weiss et al. (2003) and Weiss and Bebko (2008) performed a regression analysis of the factors that predict social acceptance in 97 people participating in Special Olympics. They found that Special Olympics involvement alone was not a significant predictor of perceived social competence at 42 month follow up, as measured by the Perceived Competence Scale for Special Athletes (PCSFSA), a self-report measure. Perceived social competence was solely predicted by level of perceived social competence at baseline. Perceived social competence at baseline however, was predicted by the number of medals received, suggesting that factors unique to sports competition may affect perceived social competence. The PCSFSA and the ABS-RC2 both have good psychometric properties (Riggen & Ulrich, 1993;

Nihira, Leland & Leland, 1993). However, Weiss et al. (2003) and Weiss and Bebko (2008) found that participants' self-report ratings of perceived social competence were significantly higher than their parents' ratings of their social competence. This suggests that assumed similarity of raters could be problematic. The representativeness of the sample is a key strength of these studies. Participants were randomly selected from a Special Olympics database and included a wide range of IQs (40 - 90), ages (9 - 43) and individuals living with parents, in institutional care, and independently. Participants were also explicitly included with additional diagnoses of Autistic Spectrum Disorder (ASD) and Down Syndrome. The correlational design however does not allow for conclusions of causality and the sample size in the Weiss & Bebko (2008) follow up study (n = 49), owing to attrition, was lower than optimal to detect all possible effects.

Integrated sports interventions. No studies of only integrated interventions specifically evaluated effect on social competence.

Comparative studies. Wickiser (2002) found no significant differences between groups of adolescents taking part in integrated and segregated Special Olympics sports programmes and controls (N = 35) on a combined measure of social competence integrating the BASC social skills domain and the SSRS parent report social skills scale. Wickiser (2002) provides a comprehensive summary of the psychometric properties of the measures, however, the quality of the study in other areas is questionable. Firstly, the measures were administered as questionnaires, given to interested parents at a Special Olympics event, limiting control of confounding variables and introducing response bias due to the self-selection of the sample and a potential lack of accessibility to some parents. No attempts were made to reduce or explore this bias by collecting demographic information. In addition, the

groups were uneven and small which can be problematic when the MANOVA statistical test is used. Therefore effects may not have been detected due to lack of statistical power. Box's statistic was not reported so it is not possible to evaluate the likelihood of this (Field, 2009). Finally, the measures were administered at a single time point and therefore change as a result of the programmes was not directly assessed. The results of this study should therefore be considered tentatively.

Ninot and colleagues conducted several studies comparing integrated and segregated sports conditions with active and sedentary controls. Due to the similarities in their designs they will be reviewed together. Ninot, Bilard and Delignières (2005) compared integrated and segregated swimming interventions for adolescent females against active and sedentary controls. They did not find any differences between groups in terms of self-reported social acceptance as measured by the Self Perception Profile for Children. Ninot and Maiano (2007), Ninot, Bilard and Sokolowski and Ninot, Bilard, Delignières and Sokolowski (2000) compared conditions of different sports (swimming and basketball), different programmes (integrated and segregated) and used two types of control (active and sedentary). The three studies did not find any differences between groups or over time, (21 months, 14 months and 8 months respectively) for perceived social acceptance on the SPP. Maiano, Ninot, Bruant and Bilard (2002) investigated the impact of an alternating programme of integrated and segregated sports participation. No significant effects were reported for perceived social acceptance as measured by the SPP. These studies have several collective strengths. The SPP has good psychometric properties and was validated on a similar population to the sample (Granleese & Joseph, 1994). In addition, in all cases, participants across conditions were compared in terms of IQ, educational placement and experiences of

competitive success and no significant differences were found. Therefore, although a convenience sampling strategy was used and socio economic factors could continue to confound results, the bias introduced appears to be limited. The design of the studies, allowing for comparison with both active and sedentary controls also allows for discrimination between the effects of sport and physical activity which is a key theoretical issue. However, all of the studies have relatively small samples (N = 24 - 48) split across a high number of conditions. This presents a key problem as type II error is likely to occur when ANOVA is used and less than 20% of the overall sample size is represented in each condition (Field, 2009). Finally, the fact that three of the studies solely studied adolescent females and the remaining two studies recruited mixed gender adolescent groups, all from special educational schools, limits their generalizability. In addition, it is unclear in the papers whether the samples for all the studies are different or whether the same sample was used in multiple studies. The first author did not provide clarification on this point when contacted. Taken together these results suggest that neither segregated, integrated nor alternating sports programmes impacted on perceived social competence, although this may be due to the methodological issues described.

Summary. Overall, it appears that there are significant methodological issues with the literature reviewed investigating the impact of sports interventions on social competence. The use of both self-report and parent/caregiver report measures is a particularly troubling issue as the concurrent validity of these concepts is questionable (Weiss et al., 2003). In addition, samples have been collected by convenience and purposive sampling which limits the generalizability of the findings. Despite this, the findings of the meta-analysis and the systematic review tentatively show a positive effect, indicating that sport is a potentially beneficial intervention for

improving the social competence of people with ID. It is disappointing that six of the studies that included control groups did not provide enough information for inclusion in the meta-analysis. The aggregation of these studies may have allowed more sophisticated statistical analysis of the findings, including investigation of the impact of the type of measure and type of intervention employed. Similarly, there has not yet been enough research conducted directly measuring the impact of integrated sports programmes on social competence to compare this with the research around segregated sports.

Is Sport an Effective Intervention to Improve the Self-reported Physical Competence of People with ID?

Segregated interventions. Dykens & Cohen (1996) found that for the team USA athletes included in their regression analysis of factors predicting perceived physical competence, time involved in Special Olympics was the strongest predictor of scores on the parent rated CBCL activity domain when age was controlled for. When compared with data from the control group, team USA scores were significantly higher and were maintained at four month follow up. The authors note that they excluded sport related items on the CBCL activity scale in order to ensure that participation in activity outside of Special Olympics involvement was being measured, adding validity to their findings. However, as noted above, despite their attempts to eliminate systematic bias from their sample, their findings are difficult to generalise beyond those with the highest level of involvement in the Special Olympics.

In line with their findings for perceived social competence, Weiss et al., (2003) and Weiss & Bebko (2008) found that change in level of involvement, number of

years in the Special Olympics and number of sports participated in, rather than involvement itself were significant positive predictors of Special Olympics participants' perceived physical competence as measured by the PCSFSA (Riggen & Ulrich, 1993). Mothers' ratings of physical competence as measured by the ABS-RC2 were predicted by the number of medals obtained and the number of sports participated in, whereas fathers' ratings were predicted only by the number of sports participated in. As described above the representativeness of the samples is a key strength. While the correlational design employed means that causation cannot be implied these findings illuminate the components of Special Olympics involvement that facilitate improvement in perceived physical competence.

Ilhan et al. (2013) administered the PedsQL, a parent rated assessment of children's' quality of life, pre and post participation in a segregated physical education programme involving competitive sport (n = 88), compared to a control group (n = 57). The dependent t-test showed a significant increase on the physical functioning domain of the PedsQL for the experimental group. This was however, not significantly different from the post intervention scores of the control group. There were some methodological issues with this investigation. No attempt to control for systematic differences between groups was made. In addition, some of the parents were administered the PedsQL via interview whereas others completed a paper version, potentially introducing a confounding variable. The study was high quality in some other respects however, as the PedsQL has been specifically validated for use with Turkish children and has good psychometric properties (Memik, Agaoglu, Coskun & Karakaya, 2008). In addition, Ilhan, et al. (2013) describe how their participants were identified as having an ID. Therefore, although there are problems

with generalizability, it appears that, for the population studied, sports interventions had no effect.

Integrated interventions. There were no studies solely investigating integrated interventions.

Comparative studies. Riggen and Ulrich (1993) compared the self-reported self-perceptions of adults taking part in an integrated Special Olympics basketball intervention with a traditional segregated basketball intervention and a control group. Measurements of physical self-concept using a modified version of the PCSC were taken pre and post intervention. They found no significant improvements in participants' ratings of physical self-concept in either condition. Riggen and Ulrich (1993) adapted the original PCSC, which has strong psychometric properties, to fit their population. The modified measure was piloted and psychometric properties reported as good. Although a convenience sample was used, differences in between groups in terms of IQ and age were tested for and discussed. Overall this study does not provide any evidence for the effect of unified or segregated sports on perceived physical competence.

The group of studies conducted by Ninot and colleagues have mixed findings in this area. Ninot, Bilard, Delignières and Sokolowski's (2000) suggest that neither segregated or integrated sport participation had any significant impact on perceived physical competence as measured by the SPP at 8 month follow up. However, they report that the integrated basketball group had significantly lower perceived physical competence than the sedentary control group. Ninot, Bilard and Sokolowski (2000) followed the same protocol but found no significant differences in perceived physical competence at 14 month follow up. Ninot and Maiano (2007) also followed this

protocol and found perceived physical competence scores significantly decreased over 21 months for both integrated groups. They also found that the integrated basketball group had significantly lower scores post intervention than both the segregated swimming and segregated basketball groups. Ninot, Bilard and Delignieres (2005) found that participants in the experimental conditions did not improve significantly more than controls however, they reported that participants in the integrated sports conditions scores on perceived physical competence decreased over the 32 month period. Overall, the studies utilising this protocol appear to indicate that segregated and integrated sports programmes have no positive effect on perceived physical competence but that integrated sports, particularly basketball, may have a negative effect. As discussed, the studies are of high methodological quality in many respects. However, these studies would benefit significantly from aggregation as the sample sizes in each condition were very small (n = 8) meaning that important effects may not have been detected.

Maiano, Ninot, Bruant and Bilard (2002) found that an alternating basketball programme had no significant effect on the perceived physical competence domain of the SPP. Similarly to the other comparative studies reviewed however, each condition was small (n = 8) so again, it is possible effects were not detected.

Summary. The findings of the systematic review indicate that on balance there is not conclusive evidence that sports interventions, either integrated or segregated have a positive impact on perceived physical competence. While there is some limited support for the positive effect of segregated sports programmes, it appears that factors other than simply participation itself, such as number of sports participated in and recent change in involvement, may be crucial in determining positive effects. There is also some tentative suggestion that participation in

integrated sports programmes may have a negative effect. This appears to be particularly relevant for basketball, where high levels of tactical skills are required and social comparison is expected to be more prevalent than in swimming interventions. There was not enough data available to complete a meta-analysis of these findings. The lack of aggregation of multiple studies with small sample sizes however means that further research, and ideally meta-analysis, is necessary before reliable conclusions can be drawn.

Is Sport an Effective Intervention to Improve the Self-worth of People with ID?

Segregated sports interventions. Dykens and Cohen (1996) found no predictors of overall self-perception as measured by the sentence completion task for their sample of team USA athletes (n = 104). Compared to controls (n = 32), the team USA athletes group did however produce higher scores on the self-perception sentence completion test which remained high at four month follow up. These findings indicate that Special Olympics involvement may lead to increased overall self-perception, although due to the design employed causation is unclear.

The regression analysis produced by Weiss et al. (2003) indicated that numbers of competitions participated in by Special Olympics participants *(*N = 97) predicted self-reported general self-worth as measured by the PCSFSA. This suggests that competing in events, rather than simply being involved in the organisation, effected participants' self-worth. Father's perceptions of the general self-worth of their child were predicted by the number of sports participated in. Weiss and Bebko (2008) report that self-reported general self-worth at forty two month follow up was predicted by change in involvement in Special Olympics over the

follow up period but not by level of involvement at baseline when baseline general self-worth was controlled for. This indicates that Special Olympics may have a positive effect on general self-worth, as perceived by participants and parents, but that different factors influence this depending on self or parent reporting. This again highlights the problem of conflating these two types of measures. The study has several methodological strengths however, described above, and thus provides a useful suggestion that opportunities for regular competition and diversity in the sports participated in may be particularly beneficial in improving the self-worth of people with ID.

Integrated sports interventions. Castagno (2001) reports that Special Olympics athletes ($N = 58$) showed a significant increase in self-esteem on the SEI post participation in a unified basketball programme. Partners also reported a statistically significant increase in self-esteem with a large effect size. Results from the Unified Sports Questionnaire indicated that the majority of coaches believed that self-esteem; self-confidence and desire to make friendships had increased during the programme. The design of the study however, limits the conclusions that can be drawn. The lack of comparison with controls for example makes it unclear whether the intervention specifically led to the observed increases or whether other factors were implicated. In addition, methodological flaws limit the generalizability of conclusions.

Comparative studies. Riggen and Ulrich (1993) found no significant improvements in participants' ratings of general self-worth on the modified PCSC post participation in a Special Olympics basketball intervention for the integrated, segregated or control groups. As discussed above, despite the convenience sample, the overall quality of the study was good therefore these findings suggest

that neither integrated nor segregated interventions had an effect on general self-worth.

The studies carried out by Ninot and colleagues, comparing segregated and integrated sports conditions with active and sedentary controls, seem to suggest no effect in this area. Ninot, Bilard and Delignières (2005) found that self-reported general self-worth scores on the SPP were not significantly different between integrated and segregated swimming groups and active and sedentary controls. Ninot, Bilard, Delignières and Sokolowski (2000) did not find any significant differences post intervention in general self-worth between integrated or segregated basketball, integrated or segregated swimming, and active or sedentary control groups. Ninot, Bilard and Sokolowski (2000) however, found significant differences in general self-worth using the same protocol. Interestingly, post hoc analysis revealed an overall decline in scores over the 14 month follow up period and that the two integrated sports groups showed significantly lower scores than the adapted physical activity control group. Ninot and Maiano (2007), also following this protocol, found lower levels of general self-worth at final follow up for unified basketball players in comparison to the controls taking part in physical activity and those taking part in unified or segregated swimming conditions or segregated basketball. As discussed above the methodological quality of these studies is good however, the small sample sizes could lead to misleading statistics. Taken together these studies indicate no effect on general self-worth, however, there is a suggestion that there could be a negative effect for integrated team sports. Maiano, Ninot, Bruant and Bilard (2002) found no significant effects on general self-worth for participants who took part in an alternated sports programme when compared with controls.

Summary. In summary, it appears that the evidence for the effect of sports interventions on general self-worth is extremely mixed. Of the ten studies reviewed three suggest positive effects and two suggest a potential negative effect. The majority suggested no effect. It is clear that aggregation would be beneficial in these circumstances as it is likely that small sample sizes, particularly in the comparative studies, have meant that meaningful effects may not have not been fully illuminated. Interestingly two studies have suggested a potential negative effect of integrated basketball programmes. This could be due to differences in the skills required, and opportunities for social comparison in basketball as opposed to swimming training. If further more rigorous research were to confirm this trend this could have potential implications for both theory and the development of future sports interventions.

Discussion

This review sought to investigate the evidence that sports interventions had a positive effect on the social competence and self-concepts, including perceived social and physical competence and general self-worth, of people with ID. The findings indicate evidence for positive effects on social competence, both actual and perceived. There is not conclusive evidence however of any positive effects for perceived physical competence or general self-worth. A secondary aim of the review was to investigate whether segregated or integrated sports are preferable. There was not sufficient evidence to fully answer this question. However, there is a tentative suggestion that some integrated sports interventions may have negative effects on perceived physical competence and general self-worth.

Theoretical Implications

The positive effects found for social competence, both actual and perceived, indicate that both segregated and integrated interventions have some value. Interestingly, two studies have suggested that factors such as participation in a wide range of sports and competitive events are crucial in fostering positive effects across all three areas of self-concept (Weiss, et al. 2003; Weiss & Bebko, 2008). These studies were carried out in the context of the Special Olympics, where competition is far from a culturally normative experience as all participants receive medals for taking part and there is little emphasis on winning and losing. Wolfensberger's (1972) theory of normalisation therefore does not appear to account for these findings easily, perhaps because its focus is on positive change on a societal rather than an individual level. These effects are successfully explained however, by Tajfel and Turner's (1979) social identity theory, as Special Olympics participants can be seen to be creating their own norms and a value system within which they can experience success. It is also possible that participants benefit from the range and diversity of participants in the Special Olympics, as, according to social comparison theory this would provide opportunities for both upward and downward social comparisons with those more and less able, thus providing both enhanced aspiration and a positive objective evaluation of self (Festinger, 1954; Stets & Burke, 2014). In addition, there is likely to have been more opportunity for affirmation of positive identifies held by athletes in the social environment at segregated events, thus leading to increased positive social interactions (Stets & Burke, 2014). Over time, this is likely to have directly impacted on both actual and perceived social competency.

There was also a suggestion that integrated basketball, but not swimming, interventions may have a negative impact on self-concept, particularly in perceived physical competence and general self-worth. This can be explained in terms of social comparisons, as it is likely that team mates have more ability to evaluate themselves against other players in the context of basketball, which involves complex physical skills and tactical thinking, as opposed to swimming which is a relatively simple sport that is completed on an individual basis. The fact that negative findings were not present across all studies may be explained by the Special Olympics policy of matching participants with partners of similar athletic ability where possible. Stets and Burke (2014) suggest that where individuals view themselves as similar in some characteristics to a person who is generally classed as superior to them socially this results in optimism and positivity. Where matching was done successfully negative effects would therefore not be expected. However, where ability matching was not perfect, participants may have experienced significant contrast between themselves and their non-disabled partners and this, according to Stets and Burke (2014), is likely to result in feelings of depression. This theory may also account for the mixed findings reported in education settings.

Limitations

A key limitation of this review is the lack of aggregation of five of the comparative studies with small sample sizes. It is imperative that future research papers include the required information to enable meta-analysis to be conducted as it seems likely that important effects have been missed. Similarly, only one study reviewed utilised randomization, meaning the remaining 15 studies may have been subject to systematic bias in the way that participants were allocated. In addition, only one study included in the systematic review reported effect sizes.

The amalgamation of caregiver rated and self-report measures has also limited the conclusions of this review. This is of particular concern in the review of social competence as actual social competence and perceived social competence have been conflated. There is research to suggest this is a problematic amalgamation (Piers, 1972; Weiss et al., 2003) however, given the limited literature in this area it was considered valuable to provide an inclusive evaluation of whether social competence and self-concept are effected by sports interventions based on as much information as possible. Likewise, for the purposes of this review both studies of adults and children with ID were considered. This reflects the amalgamation of age groups that occurs within the Special Olympics and was necessary as the majority of studies sampled from Special Olympics programmes and several (n = 4) included both adults and children in their samples. Similarly, there was some diversity in the interventions and measures included in the meta-analysis of social competence that would ideally be separated out and potential mediating effects analysed.

A further limitation is the disparate definitions of ID utilised across studies. Many studies did not provide IQ data for participants and some included broad ranges, including some participants that would not meet DSM-V (American Psychiatric Association, 2013) criteria for a diagnosis of ID. This compromises the validity and generalizability of the findings to the intellectually disabled population.

It should also be acknowledged that people with severe ID are likely to be unrepresented in the studies reviewed due to the convenience sampling strategies widely employed. The fact that the majority of studies included were Special Olympics based also introduces bias as there are cultural practices intrinsic to the Special Olympics movement, for example the rewarding of all participants with

medals, that may in themselves impact on the self-concept of participants. The high ecological validity of the studies however, is also a strength of this review as the findings can be confidently applied to Special Olympics interventions.

Implications for Research and Practice

Further, more rigorous, research is required to address the limitations described above. In particular further investigation of the impact of age and level of ID on the effectiveness of interventions is required. There is some tentative evidence that level of ID may mediate the effects of sports interventions (Wilhite & Kleiber, 1992). It was not possible to address this topic in this review as several of the studies did not record information regarding ID assessments. In addition, more research on the impact of integrated interventions on all areas of self-concept would be beneficial to strengthen the conclusions that can be drawn. It is also crucial that any future studies provide sufficient data for aggregation. Further research into creating valid measures of self-concept, including comparison of self-report and caregiver rated measures would also be valuable. One area that is not considered in the papers reviewed is the impact of additional physical and sensory disabilities on participation in, and the effectiveness of, sports interventions. Further research to determine whether groups such as individuals with Down Syndrome or ASD are accessing sports interventions and whether these are effective for them would be beneficial.

Conclusions

The findings of this review suggest that there is some evidence that sports interventions could have a positive effect on social competence for people with ID but there is not conclusive evidence of positive effects on perceived physical

competence or general self-worth. There is not sufficient evidence to indicate whether segregated or integrated interventions are more beneficial, however, there is some tentative evidence that indicates potential negative effects of some integrated sports interventions on perceived physical competence and general self-worth. It is possible to explain this ambiguity in terms of social comparison theory however, there is insufficient data to draw firm conclusions. Further research in order to establish the possible differences in effect between segregated and integrated interventions on self-concept is therefore required.

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Section B:

An investigation of the factors that predict the performance of athletes with Intellectual Disability

Words: 7,402 (181)

For Submission to Adapted Physical Activity Quarterly

Abstract

There is little literature that explains the relationship between intellectual disability (ID) and physical and sensory disabilities. A review conducted in 1987 indicated increased prevalence of physical health problems amongst people with ID. The current classification system used by the International Federation for Para Athletes with Intellectual Disability (INAS) does not take into account any relationship between ID and physical or sensory disabilities . The present study aimed to provide evidence to address the potential inequalities in the INAS classification system and to add to understanding of the relationship between ID and physical and sensory disability. Participants (N =111) were recruited from regional and international sporting events for people with ID. IQ measurements were gained either from records or by administration of an assessment. All participants, with a trusted adult, were administered a semi-structured health interview. Findings indicated a weak negative correlation between IQ and additional physical disability. The data also suggested that level of additional physical disability negatively predicts athletic performance and there is some limited support for the suggestion that IQ positively predicts performance. The findings have implications for INAS and health/social care services.

Key Words: *Intellectual disability, sport, IQ, performance, physical disability*

Introduction

The World Health Organisation (WHO) defines intellectual disability (ID) as the presence of significant impairment in intelligence, for example understanding new or complex information and learning new skills, which results in a reduced ability to live independently and function socially. These difficulties must have begun before adulthood (WHO, 2015). In the UK and US individuals are classified with either "mild", "moderate" or "severe" ID depending on the severity of impairments in cognitive and adaptive functioning using the DSM-V (American Psychiatric Association, 2013). Intelligence, which is commonly measured by the Intelligence Quotient (IQ) therefore forms an important, although not sufficient, part of a diagnosis of ID (Clements, 1987).

A theoretical link between IQ and physical health has been proposed for many years (Kreitler, Weissler, & Barak 2013). This has been supported by statistics showing a higher mortality rate for people with ID in the UK compared to the general population (Heslop et al., 2013). Recently this issue has become a political priority, resulting in the publication of Valuing People Now (Department of Health, 2009) a policy that aims to promote equality and quality of life for people with disabilities in the UK.

The theorised mechanisms by which the relationship between IQ and health operates remain unclear, with research suggesting both that lower IQ results in less health promotion behaviour (Ciarrochi, Heaven, & Skinner, 2012; Lahtinen, Rintala, & Malin, 2007) and that people with ID are not treated equitably by professionals (Redley, Banks, Foody, & Holland, 2012). There is very limited literature concerning

the relationship between ID and co-morbid impairments. This deficit represents a gap in the theory of the causality of ID. In a review of 21 epidemiological studies, McLaren & Bryson (1987) provided some insight into the etiology of severe ID. They reported that ID is most likely to be accounted for by pre-natal factors, with Down Syndrome being the most common cause (20-40%) while perinatal factors such as hypoxia account for around 11% of cases. Post natal factors presented an inconsistent picture appearing to represent between 0.8 and 12% of cases. McLaren and Bryson (1987) could not draw conclusions about the etiology of mild ID as only three studies recorded these data and the majority of cases were recorded as "unknown etiology".

McLaren and Bryson's (1987) review suggests that many cases of ID have a cause, such as genetic differences or hypoxia, which would realistically be expected to have implications for both intellectual ability and other biological systems. This is further implied by their finding that 15-30% of the ID population studied were diagnosed with neurological conditions such as epilepsy, while between 20 and 30% were diagnosed with a psychiatric disorder.

There is no information, however, on the relationship between level of ID and prevalence or severity of health problems. Therefore, although McLaren and Bryson (1987) provide a good starting point for epidemiological research in this area, there are clear gaps in the understanding of the etiology of both mild and severe ID and their associated health problems that remain unaddressed. It is also concerning that no further research in this area has been carried out in the past 27 years, resulting in a recent review of the physical health conditions associated with ID citing McLaren and Bryson (1987) as the most recent source (Hatton, 2012). It is therefore important

for the development of theoretical understanding of ID that the relationship between IQ and physical and sensory disabilities is investigated.

Competitive sport is one arena in which the lack of understanding of the relationship between physical health and ID has become problematic. There are several movements in the UK that promote sporting activities for people with ID. The most prolific of these is the Special Olympics movement, which provides experiences of sports training and competition for approximately 8,000 adults and children with intellectual impairments in the UK (Special Olympics Great Britain, 2013). The physical and psychosocial benefits of involvement in sport for people with ID are well documented (Bartlo & Klein, 2011; Hutzler & Korsensky, 2010; Weiss & Bebko, 2008). The place of people with ID within the higher echelons of competitive sport however, is less well established.

The London 2012 Olympic Games saw the re-introduction of ID athletes to the Paralympics after difficulties with accurate classification at the Sydney 2000 games had seen the ID category removed from competition completely. In order to be eligible to compete in the Paralympics, an athlete must first prove their diagnostic status to INAS (The International Federation for Para-Athletes with Intellectual Disabilities) by providing evidence that meets WHO diagnostic criteria. This includes a standardised test of intellectual functioning, a valid assessment of adaptive functioning, and evidence that impairment has existed since the individual was a child. For Paralympic competition, they must then take several “classification” tests that have been developed to show that their impairment directly impacts on their performance in their chosen sport. Despite the sophisticated classification process, athletes with ID are expected to compete in one category with no reference to any additional physical impairments. This is at odds with the way athletes with physical

impairments are classified. The system for physically disabled athletes matches competitors of a similar level of impairment to ensure that competition is based on training, effort, and skill rather than level of disability. As a consequence of the rudimentary classification system for ID athletes it seems likely that many people continue to be excluded from competing at the highest level because the classification system does not take into account the degree of variation in their co-morbid physical and sensory disabilities.

Down Syndrome is the most common cause of ID in developed countries (Frid, Drott, Lundell, Ramussen, & Anneren, 1999). Compared with other causes of ID, the physical implications of Down Syndrome are relatively well understood. Common physical abnormalities include congenital heart defects, hypertension, malformations of the gastrointestinal tract (Frid et al., 1999), respiratory problems (Määttä et al., 2011), and reduced muscle tone (Down Syndrome Research Foundation, 2013). DSActive, a project set up by the Down Syndrome Association to cater for people with Down Syndrome who wish to participate in sport, has now developed forty tennis and football clubs throughout the UK. It is clear therefore that a significant group of people with Down Syndrome regularly participate in sports. However, there were no Down Syndrome athletes represented in the 2012 Paralympics, suggesting that Down Syndrome athletes are missing from the highest levels of sports competition. This is potentially linked to their higher levels of additional physical disability.

The current INAS classification system also does not distinguish between those with a mild ID and those with severe difficulties. Although a review by Dexter (1999) suggested no direct relationship between academic ability and sporting performance, it is questionable whether the measurement of academic ability represents the

diverse set of skills and abilities captured by IQ assessments. Burns (in press) highlights that there is more recent evidence that specific cognitive abilities such as visuo-spatial skills, and reaction times, which are not directly tested in IQ assessments, discriminate successfully between athletes with and without a diagnosis of ID (Van Biesen et al., 2010). Burns (in press) also reports that "game intelligence," which involves using meta-cognition, self-regulation and executive functioning in order to analyse the sporting situation and play tactically (Williams, Williams, & Reilly, 2000), has been shown to have an impact on sports performance in the non-disabled population. It is therefore reasonable to expect that a positive relationship might exist between athletic performance and these cognitive abilities. Burns (in press) concludes that physical impairments, cognitive impairments and social factors are all likely to contribute to the performance of elite athletes with ID. If there is therefore a link between certain cognitive abilities, physical/sensory disability and athletic performance, athletes with "severe" ID may be at a clear disadvantage for both physical and cognitive reasons.

The present study aimed to address the apparent inequalities in the current classification system. This involved gathering evidence concerning the sporting performance, IQ levels and levels of co-morbid physical and sensory disabilities of athletes with Down Syndrome and other ID athletes competing in sports at both an international and regional level. It also aimed to draw conclusions about the likelihood that athletes are missing out on the opportunity to compete in international sport due to their physical/sensory impairments or their level of cognitive ability. It was hoped that this might help make the case for INAS to develop a stratified classification system that allows for fair competition amongst athletes with ID. It was also hoped that developing an understanding of the relationship between IQ and

physical and sensory disability would begin to rectify the gap in the literature concerning the physical and sensory problems of people with ID. Three research questions were investigated.

Research Question 1: Is there a relationship between IQ and level of additional disability?

Research Question 2: Do IQ and level of additional disability independently predict athletic performance, as measured by category membership (elite or regional level) and a standardized performance score, in people with ID?

Research Question 3: Is Down Syndrome a significant predictor of athletic performance when physical disability and IQ are controlled for?

Hypotheses

Hypothesis1: Although there is very little recent research in this area, the scant existing literature suggests there will be a negative correlation between IQ and level of additional disability as measured by a total disability score from a health interview.

Hypothesis 2: The limited available research suggests that level of physical / sensory disability, but not IQ alone, may negatively predict athletic performance. Total physical / sensory disability score, as measured by a health interview, was therefore hypothesised to be a significant predictor of performance while IQ was not expected to predict performance directly.

Hypothesis 3: While Down Syndrome is the leading cause of ID in the UK, relatively few people with Down Syndrome compete in elite sport. The reasons for this had not been previously investigated. However, the existing literature concerning the physical presentation of Down Syndrome suggests that this should be accounted for

by the increased levels of physical disability associated with Down Syndrome compared to other causes of ID. A diagnosis of Down Syndrome was therefore not expected to predict performance when physical disability was controlled for.

Method

Design

The study was naturalistic and cross-sectional in design. In order to test the hypotheses health, performance and IQ information was collected from participants in two pre-existing groups: elite athletes competing with INAS and regional level athletes taking part in local sports training and competition. Relationships in the data were then examined using correlation and regression methods.

Participants

Participants were athletes competing at INAS or regional sporting events (N = 111). Twenty eight INAS athletes and 83 regional level athletes were recruited. Four events were attended between August 2014 and November 2014, including an international event held in the Czech Republic, a European regional level event held in Italy and two regional level events in the UK. A handful of participants were recruited as a result of expressing interest in the study after it was advertised on the INAS website and via word of mouth at INAS events (n = 4). All participants were adults and were accompanied by a trusted adult who helped them answer questions about their health. Key characteristics of the participants recruited are tabulated in Table 1.

Table 1

Characteristics of Participants

Group (*n*)	**Sports (*n*)**	**Nationalities *(n*)**	**Gender (*n*)**
INAS athletes (*n* = 28)	Swimming (*n* = 19) Tennis (*n* = 8) Table tennis (*n* = 1)	Italian (*n* = 6), Czech (*n* = 3), Polish (*n* = 4, Spanish (*n* = 3), French (*n* = 2), Austrian (n = 2), Brazilian (*n* = 2), Portuguese (*n* = 2), Hungarian (*n* = 1), Australian (*n* = 2) German (*n* = 1)	Male (*n* = 21) Female (*n* = 7)
Regional athletes (*n* = 83)	Swimming (*n* = 19) Tennis (*n* = 23) Athletics (*n* = 59) Table tennis (*n* = 1) Football (*n* = 2) Basketball (*n* = 1) Boccia (*n* = 3) Dance (*n* = 2)	British (*n* = 63), Italian (*n* = 5), French (*n* = 5), Polish (*n* = 3) , Bangladeshi (*n* = 3), Australian (*n* = 2), Swedish (*n* = 1), Indian (*n* = 1)	Male (*n* = 60) Female (*n* = 22)

Participants were required to be: an athlete who has taken part in at an INAS or regional level sport event in the past 12 months; over 18 years of age; eligible to compete as an ID athlete according to the definition provided by the WHO (including having an IQ below 75 on a standardised measure); accompanied by a supporter who they trusted and who was familiar with their medical history; and able to provide

informed consent. No potential participants needed to be excluded on the basis of lack of involvement with INAS or regional level sports events due to the recruitment methods used. However, several participants were excluded due to failure to meet the other criteria listed, as detailed in Figure 1.

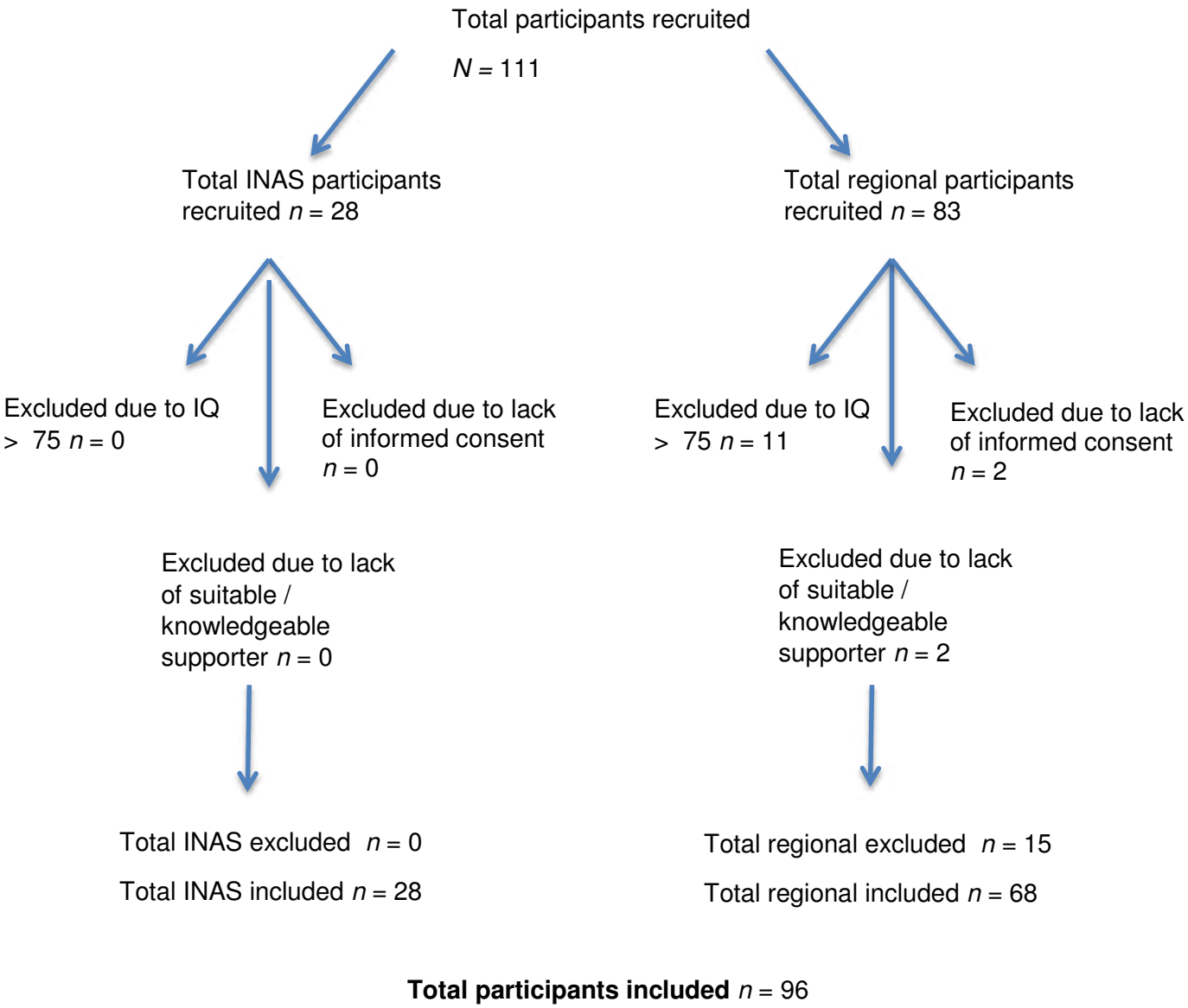

Figure 1. Flow diagram showing the application of inclusion/exclusion criteria

Measures and Materials

Health measure. The WHO is responsible for promoting, shaping and disseminating research concerning public health globally. It produces frameworks and measurement tools for research in order to ensure consistency in public health research**.** The International Classification of Functioning, Disability and Health (ICF) is the WHO framework for the measurement of health and disability. The ICF was designed to complement the diagnostic framework currently used in the UK to classify disorders (International Statistical Classification of Diseases and Related Health Problems 10, ICD-10, WHO, 2011).

The ICF has two associated measurement tools that are widely used in health research globally (WHO, 2002). The ICF checklist of impairments was designed as a comprehensive health assessment tool. It is intended for use by physicians for both research and clinical purposes (WHO, 2002). The World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0) was designed to measure the severity and impact of disability on adaptive functioning. The WHODAS 2.0 has been extensively field tested across 19 countries and was found to perform well across cultures. The internal consistency was found to be very good with Cronbach's alpha co-efficient for the domains measured ranging between 0.84 and 0.98 (Utsun, et al., 2010). Test-retest reliability intraclass correlation coefficient was 0.98 overall (Utsun et al., 2010).

It was not possible to use either of the measures associated with the ICF directly to test the hypotheses of this study. The terminology of the ICF checklist would not have been suitable for people with ID and administration of the checklist requires medical expertise that was not available for this study. The WHODAS 2.0

also could not be used in its original form due to its focus on adaptive functioning as, in order to answer the research questions, separation of physical impairment from intellectual impairment was required. The literature was reviewed and no other suitable measures were available (Bowling, 2005; McDowell, 2006). The ICF checklist was therefore adapted, with reference to the WHODAS 2.0, to meet the needs of the study. This maximised concurrent validity with these measures.

Participants and a trusted adult, usually a parent or sports coach, took part in a 30 minute semi-structured interview based on the ICF and WHODAS 2.0 (see Appendix C). The interview consisted of questions about health impairments and their severity. Table 2 provides an example of how items from the ICF and WHODAS 2.0 were adapted.

Table 2:

Example of How Questions Were Adapted from the ICF and WHODAS 2.0

ICF Item	WHODAS 2.0 Questions that relate to this impairment	Health Measure Question
B210 – seeing (function) B230 – hearing (function) S2 – structure of the eye, ear and related structures	In the past 30 days how much difficulty did you have in: – Moving around inside your home? – Getting out of your home? – Washing your whole body? – Getting dressed? – Staying by yourself for a few days? – Taking care of your household responsibilities? – Doing most important household tasks well/quickly? – Going to work/school? – Doing work well/quickly? – Joining in community activities? – Living with dignity? – Doing things by yourself for relaxation or pleasure?	Do you have any problems that make it hard for you to see or hear properly?

	How much of a problem do you have because of barriers or hindrances in the world around you?

Some specific health problems were also asked about directly in order to reflect the fact that certain diagnoses have been found to have significantly increased prevalence in people with intellectual disability. These included epilepsy, autism spectrum disorders (ASD) and attention deficit hyperactivity disorder (Carr & Reilly, 2007). A table demonstrating how interview questions map onto the ICF and which were added to test our specific hypotheses was included as part of the marking grid. This can be seen in Appendix D.

The interviewer rated the severity of each impairment on a scale of 0-4 (0 representing no impairment, 4 representing complete impairment) using qualifiers taken from the ICF checklist. The questions that were asked to gain sufficient information to assess severity and the corresponding ICF qualifiers are shown in Table 3.

Table 3:

Severity Questions Asked in the Health Measure and the Corresponding Severity Qualifiers Taken From the ICF

ICF Severity of Impairment Qualifiers	**Health Measure Severity Questions**
0 No impairment means the person has no problem	- Have you seen a doctor or health professional about it?
1 Mild impairment means a problem that is present less than 25% of the time, with an intensity a person can tolerate and which happens rarely over the last 30	- How often do you notice the problem? - When it is bad does it stop you doing what you were doing or can you carry on? If you carry on do you have to

days. 2 Moderate impairment means that a problem that is present less than 50% of the time, with an intensity, which is interfering in the persons day to day life and which happens occasionally over the last 30 days. 3 Severe impairment means that a problem that is present more than 50% of the time, with an intensity, which is partially disrupting the persons day to day life and which happens frequently over the last 30 days. 4 Complete impairment means that a problem that is present more than 95% of the time, with an intensity, which is totally disrupting the persons day to day life and which happens every day over the last 30 days.	change what you were doing to fit around your problem? - How many times has it bothered you over the past month?

In order to score the interviews objectively a marking grid (see Appendix D) based on the ICF was used and a presence of disability score, reflecting the number of disabilities held by an individual, and a severity of disability score, summing the severity of each reported impairment, were generated. Both scales were continuous and unbounded, producing ratio level data. These two scores were summed to create an overall disability score.

Prior to data collection the measure was piloted on five individuals from the population of interest. This was primarily to ensure the face validity and feasibility of the measure as well as checking that the language used was accessible to people with ID and their supporters.

Interviews were carried out by the author or by research assistants who had been trained in the administration of the measure. Inter-rater reliability of disability presence scores was maximised as all marking grids were completed by the author. This was due to the complexity of the ICF system in which some conditions are rated as both structural and functional impairments.

Disability severity scores however, were decided by the person administering the interview as it was not possible in all cases for sufficient information to be recorded to make this judgement after the interview had been completed. Double rating of disability severity scores was carried out where possible. Tests of inter-rater reliability of disability severity scores were not possible due to the number of raters (N = 11) and the sample size. Percentage agreement levels for a sample (n = 26) that were double rated by both the author and a research assistant were calculated. At least one interview marked by each research assistant (N = 10) was double marked in order to ensure the sample was as representative as possible. Perfect agreement was found in 65% of cases while 88% of cases fell within two points difference. This indicates acceptable inter-rater reliability (Stemler, 2004).

Some difficulties with validity of the health measure were encountered due to problems with obtaining accurate self and carer report. These are discussed in the limitations section of this report.

Performance measure. A standardized performance score was generated for each athlete by taking a recent result from a competitive sporting event and creating a percentage score based on the world record for that event for the appropriate gender.[1] The following formula was used where a = athlete's time and w = world record time: Performance = (a / w) x 100

Where possible, the result was taken from the athlete's best performance at the sporting event from which they were recruited. If this was not possible, a "personal best" taken from a recent competitive event was accepted. If participants competed in more than one sport, the sport in which they had the highest performance level was selected. It was not possible to create standardized performance scores for athletes whose sole sporting activity did not produce an outcome that was measurable in time (for example, football and tennis players). These participants (n = 46) could not therefore be included in analysis of performance, but were nevertheless include in the analysis of the correlation between IQ and additional physical disability.

IQ measures. INAS records were accessed, with permission from participants, in order to gain IQ scores for the INAS athletes group. INAS requires that all athletes have an IQ below 75 on a standardized measure of IQ in order to compete. The measures used are tabulated below with a brief summary of their psychometric properties.

[1] Swimming world records were taken from the Federation Internationale De Natation (FINA) website. They were retrieved from: http://www.fina.org/H2O/docs/WR_Dec2014.pdf Athletics world records were taken from the International Association of Athletics Federations. They were retrieved from: http://www.iaaf.org/records/by-category/world-records. All records were correct as of August 2014.

Table 4

A Summary of IQ Measures Reported for the INAS Athletes Group

Measure Used	***n***	**Psychometric Properties**
Wechsler Adult Intelligence Scale - international translation (WAIS-IT)	12	It is not clear which versions of the WAIS were translated and referred to in the INAS record as WAIS-IT. However, it can be assumed that either WAIS II or WAIS IV was used for this purpose. Please see below for their respective psychometric properties.
Wechsler Intelligence Scale for Children – Revised (WISC-R, Wechsler, 1974)	3	Split half reliability co-efficients for the subtests range from acceptable (.57) to excellent (.90). Conger, Conger, Farrell and Ward (1979) report that the structure of the WISC-R subscales is stable and that FSIQ comparisons are reliable across age groups. Please see Conger et al. (1979) for a review.
Ravens Coloured Progressive Matrices (Raven, Raven & Court, 1998)	3	The matrices have been found to have different levels of reliability for different age groups but reliability between ethnic groups has been found to be good (Kazem et al., 2007). Eid (1999) as cited in Kazem et al., 2007) found reliability coefficients ranged from .63 to .89 and found significant correlation between scores on RPM and scores on other achievement tests.
Wechsler Adult Intelligence Scale, Fourth Edition (WAIS-IV , Wechsler, 2008)	2	Reliability co-efficients for subtest scores ranges from acceptable (.78) to excellent (>.90). The FSIQ has a reliability coefficient of .98. Tests re-test reliability has also been assessed and found to be excellent for the FSIQ (.96) and ranging from adequate (.74) to excellent (.90) across subtests. Inter rater agreement is reported as high (.98 to .99). Please see Climie (2011) for a review.
Wechsler Intelligence Scale for Children, Third Edition (WISC-III, Wechsler, 1991)	5	The WISC-III was standardised on a comprehensive sample and provides excellent norms (Kaufman & Lichtenberger, 2000). The split half reliability co-efficients for individual subtests across different age groups range from .69 to .87. The average reliability value for the full scale IQ is .94. The factor structure has been validated through factor analytic studies for a review see Wechsler, 1991 and Kaufman & Lichtenberger, 2000).
WISC-IV (The Psychological Corporation, 2003)	2	Average internal consistency co-efficient ranging from .88-.97 are reported for the indices measured. The co-efficient for FSIQ is .97. The internal consistency coefficients for individual subtests range from .72 to .94 across the age groups. Test-retest coefficients suggest stability. The average for FSIQ was .93 (The Psychological Corporation, 2003). The structure of the WISC-IV is supported by factor analytic studies. The FSIQ has high concurrent validity

		with other Wechsler scales. See The Psychological Corporation, 2003 and Flanagan & Kaufman, 2004 for a review.
Wechsler Adult Intelligence Scale, Third Edition (WAIS-III , Wechsler, 1997).	1	Average split half reliabilities for verbal, performance and full scale IQs are reported as strong across all age groups co-efficients range from .94-.98. Test re-test reliability is also strong ranging from 0.91-0.96 across all three composites (Wechsler, 1997). Norms appear to be valid across age ranges. Please see Wechsler (1997) and Kaufman and Lichtenberger (1999) for a review.
Stanford-Binet Intelligence Scales (Terman & Merrill, 1960)	1	The Stanford-Binet is judged to be an excellent test of crystallised ability in a review by Kline (1991) who points out that there are high correlations between the vocabulary subtests and the overall mental ages the test generates. No other psychometric data appears to be available.
The Leiter International Performance Scale – Revised (Roid & Miller, 1997)	1	The Leiter-R has strong internal consistency with co-efficients ranging from 0.88 to 0.93 (Roid & Miller, 1997). The Leiter-R has shown some evidence of concurrent validity with verbal measures of intelligence (Phillips, Wiley, Barnard, & Meinzen-Derr, 2014).

Participants from the regional events who did not compete with INAS were administered either the Wechsler Abbreviated Scale of Intelligence (WASI, n = 22) or the WASI second edition (WASI-II, n = 32). These measures consist of four subtests, vocabulary, similarities, matrix reasoning and block design intended to give an estimate of full scale IQ in minimal time. Due to the time constraints of sporting events, the two subtest full scale IQ, consisting of the vocabulary and matrix reasoning subtests was used. Both the WASI and WASI-II have strong reported psychometric properties (Psychological Corporation, 1999; Homack & Reynolds, 2007; McCrimmon & Smith, 2013). Split half reliability co-efficients have been found to be excellent for the two subtest full scale IQ for the WASI and for the individual subtests, ranging from .84 to .98 for the verbal subtests and .88 to .96 on the performance subtests using an adult sample. The split half reliability coefficients for the WASI-II for the subtest scores and the Verbal Comprehension Index, Perceptual

Reasoning Index, FSIQ-4 and FSIQ-2 were also judged to be excellent, ranging from .90 to.96 (McCrimmon & Smith, 2013).

The WASI II was used, where possible, due to its improved concurrent validity with the WAIS IV (McCrimmon & Smith, 2013). However, both tests have demonstrated excellent convergent validity with the other standardized tests commonly used to assess IQ, such as the WISC III and WAIS III and the WISC IV and WAIS IV, for the WASI and WASI-II respectively. For a full summary of the properties of the WASI and WASI II please see Homack and Reynolds (2007) and McCrimmon and Smith (2013). If English was not the athlete's first language the Perceptual Reasoning Index (PRI) was taken as an estimate of IQ (n = 16). There is strong rationale for using the PRI as an estimate of FSIQ for research purposes, as the subtests required to generate the PRI are deemed to be less reliant on spoken English and western acculturation while still providing an estimate of ability (Razani, Murcia, Tabares & Wong, 2007).

Procedure

Participants were asked to complete the health interview with a trusted adult to support them in remembering their medical history. This took around 15-30 minutes depending on the health problems disclosed. This was all that was required of INAS athletes, as their INAS records were later accessed in order to establish their FSIQ. Regional level athletes who did not compete with INAS were then asked to complete either the WASI or the WASI II. Competition results for all athletes' were gained from the event organisers or lists of results published online.

Interviewers

Health interviews and IQ assessments were carried out by the first author or by research assistants (*N* = 10) trained in the use of these instruments. All interviewers had experience and training in working with people with ID.

Ethical considerations

The study gained ethical approval from a university ethics panel prior to the commencement of recruitment (see Appendix E). In order to ensure that athletes were given adequate time to understand the nature of the study and to make an informed decision about participating, specially designed information sheets were distributed to the coaches of sports clubs that were due to attend events from which recruitment was due to take place (see Appendix F). Written consent to participate was taken by the author or a research assistant, who sought to ensure that participation was voluntary and that the participants understood the contents of the information sheet prior to providing consent (see Appendix G for an example consent form). Any concerns were addressed at this point. It was made clear to all participants that if they chose to end their interview or cognitive testing this would be respected. In addition, if the interviewer felt that the participant was becoming distressed at any point, the interview or testing session was terminated and the participant invited to return later if they wished. All athletes were accompanied by a trusted adult who helped to ensure communication between the athlete and the interviewer was meaningful. Both athletes and their trusted adults were asked to consider the timing of their interviews and testing sessions in order to minimise any possible distress, disruption to training or competition that could arise. The author and research assistants used clinical judgement to terminate interviews or cognitive testing sessions if they believed the participant was distressed. This happened twice

and on both occasions this was due to factors outside of the research process (e.g. not being entered for the correct races at their events). Participants whose interviews or testing sessions were terminated were considered to have withdrawn consent and their data was destroyed.

Data analysis

The data were analysed using the SPSS statistical analysis software, version 22 (IBM Corp, 2011). Firstly, descriptive statistics and simple t-tests comparing the INAS and regional groups' standardized performance, total disability and IQ scores were generated. Hypothesis 1 was tested by performing a simple correlation between IQ scores and total disability scores. A one tailed test of significance was used as a negative relationship between these variables was hypothesised based on previous empirical work (i.e. McLaren & Bryson, 1987).

Two regression analyses were carried out for both Hypothesis 2 and Hypothesis 3. A linear regression with standardised performance score as the outcome variable and a logistic regression with level of competition (INAS or regional) as the outcome variable were conducted, with both IQ and level of additional disability (total disability score) entered as predictors to address Research Question 2. In order to address Research Question 3, Down Syndrome was then entered into both analyses as a predictor and the predictive power of the model re-assessed. Based on the tables produced by Miles and Shevlin (2001) a sample size of 80 was considered optimal to detect a medium sized effect (power of 0.8). Unfortunately, due to difficulties in obtaining performance scores for some of the sample, the linear regression ($n = 65$) was only sufficiently powered to detect a large effect. The logistic regression however, had a sufficient sample ($n = 85$) to detect a medium effect (power of 0.8).

Results

There were missing health data for six of the regional athletes. There were no missing health data for INAS athletes. There were missing IQ data for 24 of the regional athletes. IQ data was available for all INAS athletes. There were missing performance standardized score data for 26 of the regional athletes and nine of the INAS athletes. Where there were missing data relevant to an analysis the participant was excluded from that analysis. There were no drop-outs once data were collected.

Descriptive statistics for the two groups and the results of an independent *t*-test comparing the means of the two groups are presented in Table 5.

Table 5:

Descriptive Statistics and t-tests for Performance Standardized Score, Total Disability and IQ scores

	INAS (*n* = 28) Mean (SD)	Regional (*n* = 68) Mean (SD)	T-test statistic *t* (df)
Performance standardized score	158.43 (25.29)	186.98 (65.29)	*t* (74) = -1.85
Total Disability score	12.11 (16.78)	21.9 (18.44)	*t* (103) = -2.46*
IQ score	58.86 (10.34)	53.42 (8.04)	*t* (85) = 2.68*

* $p = < .05$

The statistics show that mean performance standardized score was higher for regional level athletes than for INAS athletes, although variability of scores was very high so this did not reach statistical significance. The mean total disability score was

significantly lower for INAS athletes than regional athletes. The mean IQ score was significantly higher for INAS athletes than for regional level athletes.

Hypothesis 1: There will be a negative correlation between IQ and total disability score

Spearman's rho was selected as a non-parametric correlation co-efficient as significant skew and kurtosis were detected for the total disability variable. This was to be expected, as the data were collected from a population with known high levels of disability. There was also slight kurtosis in the IQ score data meaning that the data were not suitable for parametric tests.

There was a significant, negative relationship between total disability scores and IQ scores, r_s = - .22 (95% CI = - 0.39, 0.02), p (one tailed) < .05 which is illustrated in Figure 2. This indicates that as level of IQ decreases, level of additional disability, as measured by the total disability score, increases. The first hypothesis that there would be a negative relationship between IQ and physical/sensory disability was therefore supported.

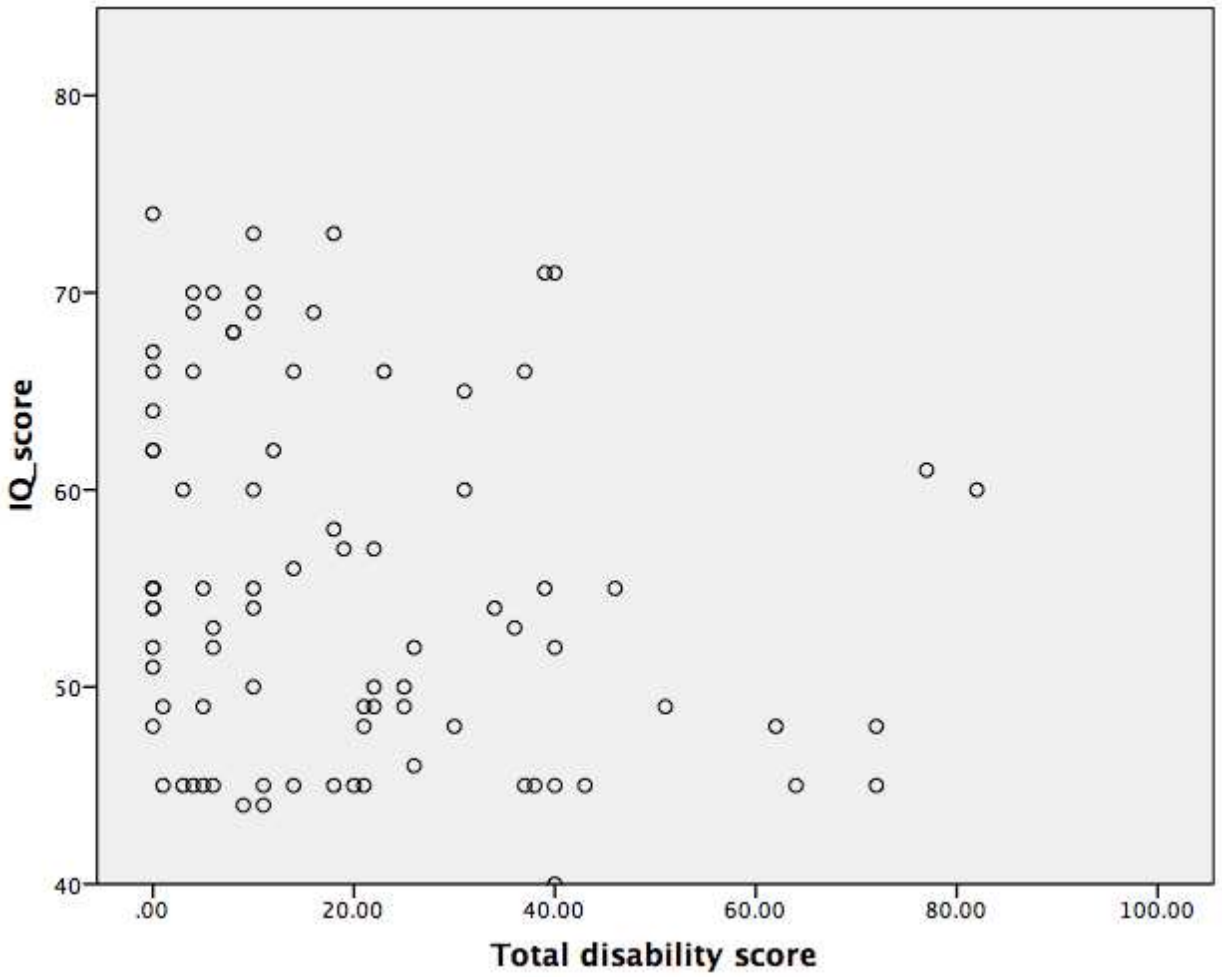

Figure 2. Scatterplot of IQ score and total disability score

Hypothesis 2: Total disability score, but not IQ alone, will negatively predict athletic performance

A linear regression with standardized performance score as the outcome and a logistic regression with level of competition (INAS or regional) as the outcome were carried out. In order to test the hypothesis IQ scores and total disability scores were entered as predictors to both models

The linear regression model was significant (see Table 6). The model R^2 indicated that 26% of variance in performance standardized scores could be

predicted by total disability score and IQ. With high levels of disability and low IQ predicting worse performance standardized scores. The model also showed that total disability score was a significant predictor of performance standardized score. There was a non-significant trend suggesting a negative relationship between IQ and performance standardized score.

The model was assessed for fit using the guidance provided in Field (2009). No significant problems were found upon inspection of the standardized residuals. Although one outlier was identified using Cook's distance, removal of this case did not significantly improve the predictive power of the model so it was retained. Assumptions were checked and no multicollinearity was found according to the Durbin Watson test, and the assumption of homoscedasticity was met. The Kolmogorov-Smirnov test revealed that the assumption of normality had been violated ($p < .05$). Bootstrapping was therefore applied as a robust form of regression that does not rely on the assumption of normality (Field, 2009). The results confirmed the findings of the linear regression as the confidence interval produced for disability total score did not cross 0 [95% CI = (0.28, 2.68)] indicating it was a significant predictor of performance standardized score. The confidence interval for IQ crossed zero, confirming that IQ was not a significant predictor [95% CI = (-2.06,0.44)]. The regression was then run again with IQ removed as a predictor. The results indicated that that the removal of IQ did not significantly effect the overall fit of the model, with or without bootstrapping. The confidence interval for disability total score did not cross zero [95% CI = (0.27,2.66)]. Table 6 shows the betas (B), standardized betas (β) and the standard error values of the betas (SE B) for the constant and predictors at both stages of the regression analysis.

Table 6

Results of Linear Regression for Hypothesis 2

	B	**SE B**	**β**
Step 1			
Constant	199.47	43.40	
IQ	-0.83	0.74	-.13
Disability total score	1.44	0.35	.47*
Step 2			
Constant	152.05	9.44	
Disability total score	1.49	0.35	.49*

$n = 61$

$R^2 = .26$ ($p < .001$). Change in $R^2 = -.02$ for step 2 ($p > .05$)

*$p < .001$

The results of the logistic regression showed that the model including both IQ and total disability score was significantly better at predicting the level at which an athlete competed than the constant, as shown by the model chi square statistic (see Table 7). Three R^2 effect sizes were generated which indicated that total disability score and IQ accounted for between 11 and 18% of the variance in performance as measured by category membership. This variability is usual and is due to debate among statisticians as to the most accurate way to produce an effect size for logistic regression (Field, 2009). In addition, both IQ and total disability score emerged as significant predictors of level of competition, with people with higher IQs and lower levels of additional disability being more likely to compete with INAS and those with

lower levels of IQ and higher levels of disability more likely to compete in regional sports competitions. The model was assessed for fit using the guidance provided in Field (2009). No significant problems were found upon inspection of the standardized residuals, although one outlier was identified using Cook's distance, removal of this case did not significantly improve the predictive power of the model so it was retained. Assumptions were checked and the assumption of linearity of the logit was met. No multicollinearity was found. Table 7 shows the betas and associated standard errors for the constant and predictors with the odds ratio of the predictors and their confidence intervals.

Table 7

Results of logistic regression for Hypothesis 2

	B (SE)	**Odds Ratio (95 % CIs)**
Included		
Constant	3.267 (1.60)	
IQ	-0.06* (0.03)	0.946 (0.897, 0.998)
Disability total score	0.03* (0.2)	1.034 (1.001, 1.068)

n = 85

R^2 **=** 0.11 (Hosmer & Lemeshow) 0.13 (Cox & Snell), 0.18 (Nagelkerke). Model x^2= 11.56, p <.05

*$p < .05$

In summary, the hypothesis that total disability score would predict performance was supported. The hypothesis that IQ would not be a significant predictor was only partially supported, as it didn't predict the performance standardized measure but did predict competition category membership. Reasons for this will be considered in the discussion.

Hypothesis 3: Down Syndrome will not be a significant predictor of athletic performance when total disability score is controlled for.

The significant linear regression model with total disability score as sole predictor was repeated. Down Syndrome was then entered into this model at step two to test Hypothesis 3. The new linear regression model indicated that the addition

of Down Syndrome as a predictor did not significantly improve the model and it is not a significant predictor itself as the change in R^2 was not significant (see Table 8). As with the previous linear regression the assumption of normality was violated and bootstrapping was applied as a robust form of regression that does not rely on the assumption of normality (Field, 2009). The results confirmed that level of additional disability remained the only significant predictor of performance, as the confidence intervals produced for this predictor did not cross zero [95% CI = (0.10, 3.286)] while the confidence interval for Down Syndrome did cross zero [95% CI = (-57.53,17.89)].Table 8 shows the betas (B), standardized betas (β) and the standard error values of the betas (SE B) for the constant and predictors at both stages of the regression analysis.

Table 8

Results of linear regression for Hypothesis 3

	B	**SE B**	**β**
Step 1			
Constant	152.05	9.44	
Disability total score	1.49	0.35	.49*
Step 2			
Constant	154.16	9.52	
Disability Total Score	1.74	0.40	.58*
Down Syndrome	-21.48	16.37	-.17

n = 61

R^2= .24 for step 1, Change in R^2= .02 for step 2 ($p > .05$)

*$p < .001$

The significant logistic regression model was also repeated and Down Syndrome added as a predictor at step two. The results of the new logistic regression showed that the addition of Down Syndrome only increased the model chi square statistic (x^2) by 0.59 (see Table 9). This was not statistically significant, indicating that Down Syndrome did not account for significantly more of the variance than total disability score and IQ alone. In this model IQ and disability total score no longer emerged as significant predictors. This is likely to be due to lack of power after the addition of Down Syndrome into the model. Given that Down Syndrome did not improve the model, the original logistic regression with total disability score and

IQ as significant predictors was retained. Power issues will be considered in the limitations. Table 9 shows the betas and associated standard errors for the constant and predictors with the odds ratio of the predictors and their confidence intervals.

Table 9

Results of logistic regression for Hypothesis 3

	B (SE)	**Odds Ratio (95% CIs)**
Step One Included		
Constant	3.27 (1.60)	
IQ	-0.05 (0.03)	0.95 (0.90, 1.00)
Disability total score	0.03 (0.2)	1.03 (1.00, 1.07)
Step two included		
Down Syndrome	0.51 (0.67)	1.67 (0.45,6.20)

n = 85

R^2 = 0.11(Hosmer & Lemeshow) , .13 (Cox & Snell), .19 (Nagelkerke). Model $x^2(3)$ = 12.15, p < .007. Change in x^2 (1) = 0.59, p > .05

In summary, the hypothesis that Down Syndrome would not add predictive power to the model was accepted.

Discussion

The present study aimed to test the following hypotheses. Firstly, that there would be a negative relationship between IQ and level of additional disability. Secondly that additional disability, as measured by a total disability score, would predict athletic performance but that IQ alone would not. Finally, that Down Syndrome would not be a significant predictor of performance. The findings of the present study will now be discussed in relation to each of the hypotheses with reference to the existing literature and theory.

The results suggest that there is a weak negative relationship between IQ and level of additional disability, as measured by the total disability score. This therefore provides limited support for the first hypothesis, although the nature of this relationship remains unclear. The findings of McLaren and Bryson's (1987) review of the epidemiological literature suggested a stronger relationship than has been observed in this study. This could potentially be due to sports competition acting as a selector, biasing the sample, as people with the most severe intellectual and physical impairments are less likely to participate. This could also however be caused by the more limited validity and reliability of the health measurement instrument used in this study, in comparison with the medical information available to epidemiological researchers. This limitation will be discussed further in the limitations section of this report. The fact that a relationship has been found however, despite the limitation, strengthens the argument that there is a need for more research in this area to investigate the causality of this relationship. This will help to develop the theoretical understanding of ID as a condition potentially involving a range of cognitive, physical and sensory impairments proposed by McLaren and Bryson (1987) and Hatton (2012).

Level of additional physical disability, as measured by a total disability score, was found to be a significant predictor of performance, both as measured by standardised performance score and level of competition, with greater levels of physical disability predicting reduced performance. The hypothesis that level of additional disability negatively predicts performance was therefore supported by the data. This fits with the existing literature and the conclusions drawn by Burns (in press) in her recent review of elite performance in athletes with ID. The potential implications of this for INAS and other sports organisations will be outlined in the practice implications section of this report.

IQ was found to be a significant predictor of level of competition but not of standardised performance score. The hypothesis that IQ would not significantly predict performance, based on Dexter's (1999) findings, is therefore challenged for one of the performance criteria. There are at least two possible explanations for this. Firstly, this result could indicate that the level of competition (i.e. INAS or regional level) engaged in by an athlete does not accurately represent performance. This is possible as there are many reasons that individuals may not compete at elite level, despite athletic skill. For example, an individual may not be in a position to commit to the regularity or training and competition required of INAS athletes. Equally, it may be that some athletes are not aware of the opportunities that are available, or are not interested in this type of competition. The latter explanation seems plausible as regional competitions, particularly those affiliated with the Special Olympics, place much less emphasis on the competitive element of sports participation. This could mean that some talented athletes, capable of competing with INAS, are choosing to compete at regional level because they enjoy the informal setting and more relaxed view of competition. Secondly, it may be that there is a weak relationship between IQ

and performance that is not always evident in samples due to Type II errors. This possibility cannot be dismissed, as recent literature has tentatively suggested a link between intelligence and performance. For example, the role of specific cognitive abilities shown to be linked to sports performance, such as visuo-spatial processing skills and “game intelligence,” must be considered. In a recent review Burns (in press) concludes that the current evidence concerning elite sport performance indicates complex interrelationships between physical, cognitive and socioeconomic factors. It may be therefore that all of the explanations offered here are in some way contributing to the inconsistent findings concerning the link between IQ and performance. Further research is required to investigate these potential explanations.

Finally, the hypothesis that Down Syndrome would not add any additional predictive power to the models is supported. This is perhaps unsurprising given the links between additional physical disability, IQ and performance described above. The findings provide further evidence that it is likely to be the increased levels of physical disability associated with genetic conditions such as Down Syndrome that prevent athletes with these diagnoses reaching elite level in their sports. The implications of this for classification of athletes with ID in elite sports competitions such as the Paralympics are presented below.

Limitations

A strength of the present study is that the sample represented the international community of athletes with ID more fully than many other studies in this area. There are however, several methodological limitations that should be acknowledged.

The health measure devised was based on reliable and valid tools developed by the World Heath Organisation. The fact the findings generally concur with those reported by McLaren and Bryson (1987) also tentatively suggests validity. However, the reliance on the self-report of athletes and information provided by their supporters limited the validity of the measure. It was noticeable that cultural barriers prevented discussion of some particular disabilities, for example epilepsy and mental health diagnoses, and so the numbers of participants with these conditions seems likely to be underestimated. In addition, many people who appeared to be coping with a variety of complex physical health problems did not report these as they did not subjectively view them as problematic. This attitude was often mirrored in their carers who may have adaptively learned to focus on achievement rather than taking a problem orientated view of the person with ID. This was particularly noticeable for the Down Syndrome athletes interviewed, as they often viewed their physical health difficulties as simply part of life rather than problems. This seems also likely to have led to an under reporting of health conditions. Overall, the effects found suggest that this tool provided a useful assessment of the additional disabilities held by participants. However, further research in this area should ideally involve trained medical professionals who may be able to carry out more accurate health assessments, although the ethics of this must be considered carefully.

The two scores (severity and number of disabilities) generated by the health measure were combined to create a total disability score for the purposes of this project. This allowed the required power to conduct statistical analysis that was necessary to answer the research questions. Relationships between type of disability held by athletes, numbers of disabilities and severity of disability and performance could not however, be explored. It would be useful to understand these relationships

as it is likely that some disabilities impact on sports performance more than others. Further research with larger sample sizes would be needed to explore this further.

Similarly, there were four occasions when no adequate translators were available to assist with the administration of the IQ measures. Although, only the non-verbal subtests were used with non-English speakers and the majority of participants appeared not to find this problematic, the validity of the instruments is not optimal under these circumstances. In order to attempt to minimise this limitation, the researchers conducting the assessments with non-English speakers were all experienced in the delivery of neuropsychological testing and data were not recorded if it was felt that a participant had not understood the instructions fully.

There was also some difficulty in recruiting adequate numbers of INAS athletes and athletes with Down Syndrome in the timeframe of the study. This lead to less than optimal power, particularly in the linear regression. Similarly, the specific research questions of this study meant that only participants with high enough levels of adaptive functioning to permit them to take part in structured sports activities were recruited. This means that the full range of people with ID is not represented. Similarly, the INAS sample did not include any British athletes, as the UK was not represented at European events, while UK athletes were over represented in the regional sample. Both samples also included more males than females. This is a key limitation as it may be that the relationship between IQ and additional disability and between IQ and athletic performance would be clearer, or different, if a more representative sample was achieved.

Finally, the design of the study means that causation cannot be implied from the findings. Variables such as age, amount of training, socioeconomic background and family attitudes to sport could have confounded the results. Demographic data were not collected so the likely extent of this problem cannot be assessed. However, the fact that the regression models only predicted 11 -24% of the variance in level of competition and performance standardized scores respectively indicates that additional factors are playing an important role. Further controlled, longitudinal research would be necessary to address this issue, however this may be problematic due to practical and ethical challenges.

Future Research

There is little clarity surrounding the genetic, environmental or psychosocial origins of ID and associated physical and sensory health problems. Further research utilising medical records or physical examination by medical professionals may be able to provide more certainty about this relationship and allow a greater theoretical understanding of ID itself. Further exploration of the link between additional physical disability and ID is also required in order to clarify the role of cognitive ability in athletic performance, as under reporting of additional disabilities may have led the data to suggest IQ as a predictor of performance when in fact unreported additional disabilities could have accounted for the findings.

The mixed findings of this study suggest the relationship between IQ and performance is complex and further research investigating whether the cognitive abilities utilised in sports performance are well represented by IQ assessments would also help to clarify this matter.

Qualitative research exploring the impact of socioeconomic and wider systemic factors on elite sports participation would help to identify factors other than individual

ability that play a part in determining whether an individual competes in elite or regional sporting events.

Finally, further research in the areas described above should attempt to recruit a sample that represents the full spectrum of people with ID. This may alter the trends that are observed as people with lower levels of adaptive functioning are included.

Practice Implications

Promoting inclusion and quality of life for people with ID is an important part of the role of clinical psychology. Sport provides a valuable platform for social inclusion and the promotion of positive role models through the increased visibility of athletes with ID. These results indicate that performance is likely to be impacted upon by level of physical disability. The INAS classification system should therefore be modified to provide a more equitable system for athletes with ID and additional physical disabilities.

The results also hold wider clinical implications by beginning to address the research gap of the relationship between IQ and co-morbid conditions, outside of specified genetic disorders. Although, due to the limitations discussed above, it is necessary for further work to be carried out to explore the relationship between ID and physical disability more thoroughly, the findings suggest that this relationship exists and should be accounted for when formulating the difficulties faced by individuals with ID and when planning health and social care service provision for these people.

Conclusion

In conclusion, the findings of this study suggest that there is a negative relationship between IQ and additional physical disability. Although further research is required to clarify the nature and extent of this relationship, there are implications for the provision of services, both in sports organisations and in health and social care more generally. The data also suggest that level of additional physical disability negatively predicts athletic performance and there is some limited support for the suggestion that IQ positively predicts performance. This indicates that the current classification system utilised by INAS may discriminate against people with lower cognitive ability and higher levels of additional physical disability. In order to ensure that sport for people with ID acts as a platform for social inclusion it would seem helpful to reform this practice.

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Section C:

Appendices

Appendix A: Tables of Reviewed Papers

Table A 1: Meta-analysis Studies

Reference	Sample	Design	Intervention	Measures Used	Key Findings	Key critique	Quality score
Gibbons and Bushakra (1989)	N = 48 children with ID (aged 9-12)	Cross sectional	Segregated 1.5 day SO athletics meet	Pictorial Scale of Perceived Competence and Social Acceptance for Young Children	Experimental group improved significantly more than the control group across all subscales ($F(4, 43)= 59.03$, $p<.001$). The peer acceptance (discriminant function coefficient = -.584) and physical competence (discriminant function coefficient = -.533) subscales contributed most to the group differences .	Convenience sample, possible intrinsic differences between groups not explored. Control group not true controls as were also registered with SO. IQ ranges recorded and quit wide 48-70 but scale for 7 year olds used for all. No reliability data for ID population. Good statistical analysis MANOVA plus discriminant analysis	16/28
Grafius (1986)	N = 66 adults (no age specified)	Quasi experimental Repeated Measures	Segregated 12 week SO gymnastics programme with 3 month follow up	CSCS	No significant differences in self-concept between groups at any time point.	Conclusion that programme was successful anyway and that the scale wasn't sensitive enough. Control group from urban area and experimental group from urban area. No information about how IQ was assessed. Pre testing may have effected the experience of the programme.	16/28

						Limited information about recreation activities. Lack of random allocation – selection bias. No wheel chair users included. All participants had accessed county ID services and that is how they were recruited.	
Ilhan et al. (2013)	N = 145 children (aged 8-12)	Quasi experimental Repeated Measures	Segregated 5 week physical education programme. 2 hour long sessions a week.	PedsQL	No significant differences between the experimental and control group were found at pre or post testing. Dependent t-test showed only a significant increase on the physical functioning domain of the PedsQL ($t=2.036$, $p < .05$)	Turkish validity and reliability of RedsQL assessed as good (Memik, Agaoglu, Coskun and Karakaya, 2008). Participants selected by educational psychologists, all from special schools. No other demographic information collected. No analysis of similarity of experimental and control group at outset. Allocation of participants is not discussed.	12/28
Ozer et al. (2012)	N = 76 male children (aged 12-15)	RCT	Integrated 8 week SO football training programme, 3 1.5 hour sessions per week	CBCL ACL FAS	Total competence scores increased only in the group of athletes with ID taking part in the Special Olympics programme ($F_{1.22}= 4.48$, $p= .04$). FAS scores increased significantly for SO athletes with ID but not for the control group with ID ($F_{1.22}=11.04$, $p=.003$).	Some PedsQL were done as interviews, others on paper - Measures not ID specific and administered via interview. - Undue weight given to positive findings - Unrepresentative sample	25/37

					The Adjective checklist results for the youth without ID did indicate a significant increase in positive adjective scores for participants in the sports programme ($F_{1.21}$= 27.40, p<.001, η^2=.57). Post-participation, the experimental group also had significantly higher total scores on the Adjective Checklist, (t_{36}=4.30, p<.001).		
Riggen and Ulrich (1993)	N = 75 adult males (aged 18-40)	Quasi experimental Repeated Measures	Mixed SO basketball programme	PCSC	No significant differences between groups or over time for self perception.	Programmes not described but are called “similar” by the author. Lack of control in design, differences between interventions could have confounded results Lack of reporting of stats and effect sizes as were not significant – small sample size, effect size needed	11/28
Valkova (1998)	N = 76 adults (ages not specified)	Cross sectional	Mixed SO interventions	Vineland	Time point 0 (1995) significant differences between groups on all Vineland and Reiss scale on t-tests (P<0.05) with SO group scoring higher. These differences remained stable at time point 1 with both groups showing an increase in social behaviour, this was slightly more pronounced for the SO group. Ratings of problem behaviours measured on the Reiss screen of	Participants matched on age, gender, height, weight and IQ but details of how this was measured and compared are not given. No demographic details. Sampling strategy not described but must be convenience sample as were already taking part in SO. No analysis of variance or interaction of group over time. Incomplete sentences doesn’t	6/28

	behaviour were qualitatively seen to rise for both groups but no statistical analysis was completed.	seem to be reported. Inadequate description of intervention. Mixing of integrated and segregated sport.

Table A 2: Systematic Review Studies

Reference	Design	Sample	Intervention	Measures	Key Findings	Key Critique	Quality Score
Wright & Cowden (1986)	Quasi experimental Repeated Measures	N = 50 People with ID aged 12-18	Segregated 10 week SO swim training programme 2 x 1 hour sessions per week Active controls took part in adapted physical activity	Children's Self-concept Scale (CSCS, Piers & Harris, 1969)	Difference between groups significant ($F(1,48) = 7.18$, $p < .05$) Difference due to time significant $F(1, 48) = 23.05$, $p < .05$) Group by trial interaction significant ($F(1, 48) = 23.37$, $p < .05$)	+ inclusion of female participants, - Lack of randomization in allocation	16/28
Ninot, Bilard, Deligniers & Sokolowski, (2000)	Quasi experimental Repeated Measures	N = 48 females with ID aged 13-17	Integrated and segregated basketball. Integrated and segregated swimming Adapted physical activity All programmes were 8 months long and involved a minimum of 2 hours training per week and 6 competitive meets.	Self Perception Profile for Children (SPP, Harter, 1985)	No changes in perceived social acceptance Perceived athletic competence showed a significant difference only for time, $F(3,191)=15.32$, $p<.0001$). Significantly lower perceived athletic competence for the integrated basketball group compared to the sedentary group. No significant changes in self-worth.	+comparison with active and sedentary controls +attempts to establish similarity of groups at outset - convenience sample - small sample	16/28

Ninot et al. (2000)	Quasi-experimental Repeated Measures	N = 48 females with ID aged 13-17	Integrated and segregated basketball. Integrated and segregated swimming Adapted physical activity All programmes were 14 months long and included 6 competitive meets. Frequency and duration of training not specified.	SPP	No changes in perceived social acceptance The integrated basketball group showed a decrease in perceived physical ability. Significant differences in general self-worth between groups ($F(5,239)=3.93$, $p=0.0006$, time ($F(4,239)=6.98$, $p=0.0005$, and interaction ($F(20,239)=1.656$, $p<0.05$). There was an overall decline over the 14 months. The two integrated groups showed significantly lower scores that the APA and the integrated basketball group was lower than the segregated swimming.	+comparison with active and sedentary controls +attempts to establish similarity of groups at outset - convenience sample - small sample - frequency and duration of training not specified.	15/28
Ninot et al. (2005)	Quasi-experimental Repeated Measures	N = 32 females with ID aged 13-17	Integrated swimming Segregated swimming Adapted physical activity	SPP	SPP perceived athletic performance: significant differences between groups ($F(3,351)=3.61$, $p=0.003$)and for time	+comparison with active and sedentary controls +attempts to establish similarity of groups at outset - convenience sample	12/28

			All programmes were 32 months long and included 16 competitive meets. Frequency and duration of training not specified.		(F(10,351)=9.47, p<0.0001) but not for interaction The Student Newman-Keuls method revealed that for participants in the integrated sports group perception of athletic ability scores on the SPP decreased over time. No significant differences in social competence or general self-worth.	- small sample	
Ninot & Maiano (2007).	Quasi-experimental Repeated Measures	N = 48 females with ID aged 13-17	Integrated and segregated basketball. Integrated and segregated swimming Adapted physical activity All programmes were 21 months long and involved a minimum of 2 hours training per week and 12 competitive meets.	SPP	No changes in perceived social acceptance Significant difference in perceived athletic competence were found for group (F(5,335=2.53, p<0.05), time (F(6,335)=16.84, p<0.0001) and interaction (F(30,335)=2.77, p<0.00001). Overall there was significantly lower perceived athletic competence for the integrated groups. Significant differences in	+comparison with active and sedentary controls +attempts to establish similarity of groups at outset - convenience sample - small sample	15/28

					general self-worth were found for group ($F(5,335)=3.22$, $p=0.017$), time ($F(6,335)=1.52$, $p=0.0002$) and interaction ($F(30,335)=1.52$, $p < 0.05$). Student-Newman-Keuls method showed significantly lower general self-worth for the basketball groups compared to the PE group.		
Maiano et al. (2002)	Quasi experimental Repeated Measures	N = 24 males aged 11-18	Alternated integrated/segregated 13 month basketball programme, 12 meets over 13 month period, 6 segregated SO events and 6 integrated school events.	SPP	No significant effects were found.	+comparison with active and sedentary controls +attempts to establish similarity of groups at outset - convenience sample - small sample	14/28
Castagno (2001)	Repeated measures	N = 58 24 with ID, 34 partners All males, grades 6-8	Integrated 8 week SO basketball programme. 3 x 1.5 hour sessions per week	ACL FAS SEI Unified Sports Questionnaire	SO athletes reported a significant increase in self esteem on the SEI ($t(23)=4.94$, $p<.01$, ES = 1.14 Partners also reported a statistically significant increase in self esteem ($t(33) = 5.45$, $p<.01$, ES = .80).	+ detailed description of measures administration + good description of intervention + effect sizes reported - convenience sample - No demographic details - No control group	15/28

					SO athletes demonstrated a significant increase in positive adjectives on the ACL ($t(23)= 5.22$, $p<.01$, ES = .83), as did partners ($t(33)= 5.27$, $p<.01$, ES = .74)		
Dykens & Cohen (1996)	Cross sectional Repeated measures	N = 104 from SO Team USA aged 9-37 N = 32 controls with ID	Segregated SO athletes from team USA given repeated measures and then compared with matched ID controls. 4 month follow up for team USA athletes	CBCL Vineland screening Sentence Completion test (Harter, 1985)	Team USA athletes, time involved in Special Olympics was the strongest predictor of scores on the CBCL activity ($F(1,102)=3.85$, $p<.05$) and social ($F=(1,102)=5.74$, $p=<.001$) domains when age was controlled for . IQ was found to be the only predictor of adaptive functioning ($F(1,60)=19.05$, $p<.001$) and no predictors for self perception were found. Team USA participants scored significantly higher than controls on both domains of the CBCL ($F(3,52)=30.47$, $p<.001$). The team USA athletes group also showed higher scores	+ participants matched on range of demographic factors - Selective sample of high achieving SOs - No random allocation - Control group small - No effect sizes reported.	21/28

					on the adaptive functioning scale (F(3,52)=4.62, p<.01) and self perception sentence completion test. Team USA score held consistently or increased after four months		
Weiss et al. (2003).	Correlational	N = 97 people with ID Aged 9.3 to 42.5	Mix of SO participants from a range of SO interventions	Perceived Competence Scale for Special Athletes ABS-RC2;	Number of competitions was a significant predictor of general self-worth. (F3,36)=3.47, p<.05) Number of years in special Olympics and number of sports participated in were significant predictors of perceived physical competence (F (4,49)=5.34, p<.01) Number of medals was a significant predictor of perceived social acceptance (F(3,36)=3.34, p<.05) Number of medals and number of sports both significantly predicted mother's ratings of physical competence	+ inclusive sample + differentiates parent and self report measures - no causality due to design	23/28

				(F(4,44)=5.82, p<.001). Number of competitions significantly predicted mother's ratings of social acceptance, although the model including number of medals was non significant (F(3,45)=1.89, p>.05 Number of sports significantly predicted father's ratings of general self-worth (F(3,35)=4.45, p<.01). Number of sports significantly predicted father's ratings of physical competence		
Longitudinal .	N = 49 people with ID Aged 9.3-42.5	Mix of SO participants from a range of SO interventions given repeated measures from Weiss, Diamond, Demark & Lovald (2003) after 42 months.	Involvement in SO as standard score Perceived Competence Scale for Special Athletes ABS-RC2;	SO involvement was not found to be a significant predictor of perceived social acceptance at time 2, this was solely predicted by level of perceived social acceptance at time 1. General self-worth at time 2 was predicted by change in involvement in SO over the 42 month period but not by level of involvement at time 1	+ Differences between responders and non responders analysed +Inclusive sample + Time 2 interviewers blind to time 1 responses. - lack of control of interventions	23/28

					when baseline general self-worth was controlled for. Model R=.53; Adjusted R2=.18; (F(3,35)=2.93, p=.05. Perceived physical competence at time 2 was predicted by change in involvement in SO over the 42 month period when baseline levels of perceived physical competence and involvement in SO were adjusted for (R=.86, Adjusted R2=.71, F(3,35)=21.72, p<.001).		
Wickiser (2002)	Cross sectional	N = 35 adolescents with ID. Aged14-17	SO segregated sports programme SO integrated sports programme Frequency and duration of training unspecified	BASC SSRS	No significant differences between groups	- Convenience sample - Definition of ID unclear - Small sample and unequal groups.	12/28

Appendix B: Quality Criteria

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Appendix C: Interview Record Form

Participant no.

Interview site:

Group (International, Regional or DS):

Nationality:

Assessed pre or post event?

Age:

IQ measure used:

FSIQ:

Part 1: Open Questions

Aim: to elicit diagnoses or additional impairments

When impairment is noted, immediately transfer this to the grid at the back of the record form but do not ask the severity probes until the final section.

Thank you for coming to talk to me today. I would like to ask you some questions about your physical health and any disabilities you have. I have asked your coach/ parent/ trusted person to be here too so that they can help if there is anything you can't remember. They can also help me to explain if I say something that is hard to understand.

If you agree to take part I will ask you questions for around twenty to thirty minutes. You can take a break at any time if you need one. Just let me know. If you feel uncomfortable or unhappy you can ask to stop at any time. Again just let me, or your coach/parent/trusted person, know.

Do you have any questions?

Remember there are no right or wrong answers, we just want to know more about you.

I'm going to start by asking you some general questions. Then I will ask some questions about your health. I will be asking you about lots of problems that you don't have. This does not mean you have them it's just to help you remember any problems you do have.

1. How long have you known your coach (if applicable, do not ask if they are a parent)?

2. What sports do you take part in?

3. What is your main event?

4. How long have you been doing (your sport) for?

5. How is it going at the moment?

6. What is your personal best?

7. What is the highest level of competition you have taken part in?

8. Are you included in any world or national ranking system? If so which one and what is your ranking?

9. Is it ok with you if we keep your coach/parent/trusted person here? They might be able to help us out if there are any confusing questions or things you can't remember?

Now I am going to ask some questions about your health in general. Then I will ask some more detailed questions.

1. As a child can you remember if you were diagnosed with any health problems?

    - any others?

2. Do you currently have any health problems?

    - do you have to see a Doctor on a regular basis for anything?

    - any others?

3. Has anyone told you that you have a genetic condition such as Down Syndrome, Fragile X, Prader Willi?

    - anything else like this?

4. Are you currently taking any medication?

- Do you know what for?
- How does it help?
- How often do you take it?

Part 2: Specific Questions

Aim: To ensure all relevant diagnoses have been elicited by asking specific questions. Use the provided visual supports to ensure the participant knows which parts of the body are being referred to.

If the answer is apparent from their response to an open question do not ask all the specific questions for that item.

Thank you for answering my questions so far. I am now going to ask you some questions about different parts of your body to check we haven't missed anything.

First I have some questions about seeing, hearing, balance and pain

5. Do you have any problems that make it hard for you to see or hear properly?

   a. Problems with eyesight? Do you know why you have these problems?

   b. Problems with hearing? Do you know why you have these problems?

   c. Problems with balance or dizziness? Do you know why you have these problems?

   d. Problems with your sense of touch? Do you know why you have these problems?

   e. Any general pain? Do you know why you get pain?

Now I am going to ask some questions about your voice

6. Do you have any worried about your voice?

   a. Problems producing sound? Do you know why you have these problems?

   b. Problems forming words? Do you know why you have these problems?

c. Unusual sounding voice? Do you know why you have these problems?

Next I am going to ask some questions about your heart blood and lungs

7. Do you have any problems with your heart, blood, lungs or immune system?

a. Heart problems? Do you know why you have these problems?

b. Blood pressure? Do you know why you have these problems?

c. Blood diseases?

d. Allergies or hypersensitivities?

e. Breathing problems? Do you know why you have these problems?

Now I am going to ask you about your stomach and food

8. Do you have any problems with your stomach or eating and digesting food?

a. Any problems digesting food? Do you know why you have these problems? (inc IBS, Khrones, food intolerances and allergies)

b. Any problems with going to the toilet (bowel and urination)? Do you know why you have these problems?

c. Do you have any pain in your abdomen? Do you know the cause? Any period pains/ menstrual cramps (women only)?

d. Any difficulty maintaining a healthy weight? Do you know why you have these problems? (thyroid problems, other metabolic problems)

e. Diabetes?

e. Hormonal changes?

Now I am going to ask you about any problems that make it hard for you to move parts of your body

9. Do you have any problems that make it hard for you to move parts of your body?

a. Do you have any problems with your joints? Do you know why you have these problems?

b. Do you have problems with your muscle strength? Do you know why you have these problems?

c. Do you make any movements that you can't control**?** Do you know why you have these problems?

d. Do you have any problems moving your head and neck? Do you know why you have these problems?

e. Do you have any problems moving your shoulders? Do you know why you have these problems?

f. Do you have any problems moving your arms and hands? Do you know why you have these problems?

g. Do you have any problems moving your pelvis? Do you know why you have these problems?

h. Do you have any problems moving your legs and feet? Do you know why you have these problems?

i. Do you have any problems moving your abdomen/trunk? Do you know why you have these problems?

Now I'm going to ask some questions about your skin

10. Do you have any problems with your skin or hair?

    a. Do you have any problems with your skin? Do you know why you have these problems?

    b. Do you have any problems with your hair and nails? Do you know why you have these problems?

Now I am going to ask you about your mental health and emotional wellbeing

11. Do you have any problems with your brain or mood?

    a. Have you been diagnosed with epilepsy? (if yes, do you take medication for this? Tell me more about it)

    b. Do you have any problems with losing consciousness (fainting) or have you in the past?

    c. Have you ever seen a psychologist? If so what for?

    d. Have you been diagnosed with any neurological disorders such as MS, Parkinsons, Cerebral Palsy?

    e. Have you ever had a brain injury?

    f. Do you have any problems with your energy levels? Why do you have these problems?

    g. Do you have any sleep problems? What is the cause?

    h. Do you have any attention difficulties? Do you know why you have these problems? (ADHD)

i. Do you have any emotional problems or unusual moods?

j. Do you have any problems talking to other people and making friends? Do you know why this is? Have you ever been diagnosed with an Autistic Spectrum Disorder?

Is there anything else you think I should know about?

Part 3: Rating the severity of problems

Finally, I am going to ask you to give me an idea of how bad each of the problems you have told me about is

We are using a scale of 0 to 4 where 4 is a really bad problem and 0 is no problem at all.

For every diagnosis ask the following questions and rate using the criteria below:

- Have you seen a doctor or health professional about it?

- How often do you notice the problem?

- When it is bad does it stop you doing what you were doing or can you carry on? If you carry on do you have to change what you were doing to fit around your problem?

- How many times has it bothered you over the past month?

0 No impairment means the person has no problem

1 Mild impairment means a problem that is present less than 25% of the time, with an intensity a person can tolerate and which happens rarely over the last 30 days.

2 Moderate impairment means that a problem that is present less than 50% of the time, with an intensity, which is interfering in the persons day to day life and which happens occasionally over the last 30 days.

3 Severe impairment means that a problem that is present more than 50% of the time, with an intensity, which is partially disrupting the persons day to day life and which happens frequently over the last 30 days.

4 Complete impairment means that a problem that is present more than 95% of the time, with an intensity, which is totally disrupting the persons day to day life and which happens every day over the last 30 days.

Rate NS (Not specified) if there is insufficient information to specify the severity of the impairment. If this is done make sufficient notes that you can discuss the rating with others later.

Remember all disabilities have a structural and functional counterpart on the marking grid. Purely functional conditions (such as IBS) can be rated as such but all conditions with a structural basis must have both rated.

Special Examples:

Genetic Conditions such as Down Syndrome:

Write all genetic conditions on the grid and include as a presence score on the marking grid but do not rate severity as this is captured in other questions.

Hearing, Sight or Reduced Function of Limbs:

For hearing and sight impairments or any bodily impairment that is corrected by use of a prosthesis or wheelchair ask the participant to answer as if they did not have their glasses or hearing aids, wheelchair or prosthesis.

Muscle Tone:

For difficulties with muscle tone ask rate three as a baseline and then ask:

- Compared to others with Down Syndrome (or other condition) do you think your problems with muscle tone are better or worse than average?

Rate 4 if they say worse than average for DS.

Heart or Lungs:

For heart or respiratory conditions which are symptomatic, including reduced lung function (if the person experiences any symptoms) rate 4.

Allergies:

To rate allergies ask:

Do you carry medication for your allergy (i.e. adrenaline pen) at all times?

Do you need to take extreme measures to avoid the substance you are allergic to?

If the answer to either is YES then rate 3. If the answer is no do not rate.

Autism Spectrum Disorder:

Ask individual and coach/parent:

How much do you have to adapt training/ daily life for because of ASD?

Use percentage of activity adapted to rate 1-4.

Mood Problems:

If the person is on medication or seeing a psychological therapist regularly for a diagnosed problem rate 2 or above.

Diagnosis	Rating (0-4)	Notes	Medical Referral Sought?

Thank you very much for taking part today. We are going to use the information you have given us to build up a picture of the disabilities held by ID athletes. This might help INAS to work out a fairer classification system. You will be able to see the results when they are finished as INAS will send you a summary.

If you have not already done one you will now be asked to do an assessment of your learning.

Appendix D: Marking Grid[2]

Impairment area		**Question(s)**	**Presence (0/1)**	**Severity (0-4)**	**Notes**
Sensory functions and Pain					
	Seeing and related functions	5a			
	Auditory and vestibular	5b,c			
	Other sensory functions	5d			
	Pain	5e			
	Other:				
	Sub totals:				
Mental Functions					
	Consciousness	11a, b			
	Orientation	11a, b, c, d, e			
	Psychosocial	11h k			
	Personality	11i, k			
	Energy and drive	11f			
	Sleep	11g			
	Attention	11h			
	Memory	11c, d, e			
	Psychomotor	11d			
	Emotional	11i			
	Perceptual	11b, c, d, e			
	Language	11j			
	Other:				
	Sub totals:				
Voice and Speech Functions					

[2] Please note APA formatting was not applied to this table as it was a practical tool that was not intended for publication.

	Voice	6a			
	Articulation	6b			
	Fluency and rhythm of speech	6c			
	Alternative vocalisation	6c			
	Other:				
	Sub totals:				
Functions of the cardiovascular, haematological, immunological and respiratory systems					
	Cardiovascular system	7a			
	Haematological and immunological system	7b, c, d			
	Respiratory system	7e			
	Other:				
	Sub totals:				
Functions of the digestive, metabolic and endocrine systems					
	Digestive system	8a, b			
	Metabolism and endocrine system	8c, d, e			
	Other:				
	Sub totals:				
Genitourinary and Reproductive functions					
	Urinary functions	8b			
	Other:				
	Sub totals:				
Neuromusculoskeletal and movement					

related functions					
	Joints and bones	9a			
	Muscle functions	9b			
	Movement functions	9c, d, e, f, g, h, i			
	Other:				
	Sub totals:				
Functions of the skin and related structures					
	Skin	10a			
	Hair and nails	10b			
	Other:				
	Sub totals:				
Structures of the nervous system					
	Brain	11a, b, e			
	Spinal chord	11d			
	Meninges	11d			
	Sympathetic nervous system	11d			
	Parasympathetic nervous system	11d			
	Other:				
	Sub totals:				
The Eye, Ear and Related Structures					
	Eye socket	5a			
	Eye ball	5a			
	Structure around eye	5a			
	External ear	5b			
	Middle ear	5b			
	Inner ear	5c			
	Other:	5d, e			

	Sub totals:				
Structures of the cardiovascular, immunological and respiratory systems					
	Cardiovascular system	7a, b, c			
	Immune system	7d			
	Respiratory system	7e			
	Other:				
	Sub totals:				
Structures related to the digestive, metabolic and endocrine systems					
	Salivary glands	8a, b, c			
	Oesophagus	8a			
	Stomach	8a, c			
	Intestine	8a, b, c			
	Pancreas	8d, e			
	Liver	8b			
	Gall bladder and ducts	8c			
	Endocrine glands	8e			
	Other:				
	Sub totals:				
Structures related to the genitourinary and reproductive systems					
	Urinary system	8b			
	Pelvic floor	8b			
	Other:				
	Sub totals:				
Structures related to movement					
	Head and neck	9d			

	Shoulder	9e			
	Upper extremity	9f			
	Pelvic	9g			
	Lower extremity	9h			
	Trunk	9i			
	Other:				
	Sub totals:				
Skin and related structures					
	Skin	10a			
	Skin glands	10a			
	Nails	10b			
	Hair	10b			
	Other:				
	Sub totals:				
Specific questions outside of the ICF added for the purposes of this study					
	Genetic abnormalities (Down Syndrome, Prada Willi, Fragile X etc.)	3			
	Autism Spectrum Disorders	11j			
	ADHD	11h			
	Diabetes	8e			
	Epilepsy	11a			
	Degenerative disorders (Dementia, MS, Parkinsons, etc.)	11c,d			
	Sub totals:				
	Totals:				

Appendix E: University Ethics Approval Letter

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Appendix F: Participant Information Sheet

Information About a Study of the Health Problems Faced by Athletes with ID

We are from Canterbury Christ Church University. We are researching the health problems athletes competing with the International Federation for Para-athletes with Intellectual Disabilities (INAS) and Down Syndrome Sports Association (DSSA) have. We think it might be more difficult for people with certain health problems to get to the top of their sport.

We need to find out what health problems athletes with intellectual disabilities (ID) have. This will help us work out how to make the classification system fairer.

We would like to invite you to take part in our research study because you are an athlete competing with INAS or the DSSA.

Before you decide it is important that you know what we plan to do and what your part would be.

You should read this with your coach, parent or someone else you trust to help you decide whether to take part in this research.

Please ask us any questions you have.

What would I be asked to do?

One 20 to 30 minute interview about your health with a researcher (your coach, parent or someone else will be there with you). If you don't speak English we may also need a translator. This will involve talking about your physical health and any disabilities you have.

You will also be asked to do a test where you will be asked to look at some puzzles and answer some questions. This will help us get an idea of how you learn and work things out. Your coach or someone else you trust will be with you for this but they will not be able to help you.

What information would you need?

We would need to know some things about you such as your sport, where you are from, your personal best achievements and your world ranking (if you know it).

We would also ask you to let us know if you have had any past assessments of your learning. We might need to ask your coach, parent, sports club or INAS about this or read your registration records to get more information.

What would happen afterwards?

The researcher will make notes during your interview and test. This will help them to remember what you said.

They will write a number at the top of their notes to tell them who you are. They will not use your name. When we collect other information about you we will use the number we have given you rather than your name. This will make sure your information is kept private.

All information will be stored on special memory sticks that have passwords that only the researchers know. When the study is complete it will be put on a CD and kept in a locked cabinet in the University for 10 years to make sure it is safe.

We hope to publish our final report in a psychology journal (a magazine for psychologists). We will also give the results to INAS so they can decide whether to change the way athletes with ID are classified to consider their health problems. We will also give INAS and the DSSA a special report for you to read so you can find out the results.

What if I don't like it?

If you feel uncomfortable or unhappy at any time when you are with the researcher you can ask to stop and we will stop straight away.

You can also ask to be removed from the study if you change your mind after your interview by contacting the researcher using the details below. This will not be possible once the researcher has finished interviewing everybody so if you do change your mind please let the researcher know straight away.

Do I have to take part?

No, it is up to you. If you want to take part we will ask you to sign a consent form. This is a piece of paper you sign to say you want to take part and have been given enough information. Please ask us questions if there is anything else you want to know.

Contact Details:

Researcher: Rosanna Gilderthorp, Trainee Clinical Psychologist

r.c.trigg180@canterbury.ac.uk

(+44) 0333 011 7070 (Please leave a message stating it is for Rosanna Gilderthorp)

If you wish to complain about the research please contact:

Professor Paul Camic, Research Director

Salomons Centre for Applied Psychology, Broomhill Road, Tunbridge Wells. Kent. TN3 0TF.

Paul.camic@canterbury.ac.uk

(+44) 03330 117 114

Appendix G: Example Consent Form

Centre Number:

Study Number:

Participant Identification Number :

Please tick boxes

1. I have read and understand the information sheet dated..19/06/14...

(version...1.....) I have had a chance to ask questions. 

☐

2. I understand that I don't have to take part and that I can drop out at any time by telling the researcher or my coach that I want to stop. ☐

3. I understand that the researcher will need to find out some information about me such as the results of cognitive tests I have had and my performance in my sport. It is ok for them to talk to my sports club/team and INAS to get this information. ☐

4. I agree to take part. ☐

Name:

Date:

Signature:

Name of Person taking consent:

Date:

Signature:

Copies to: participant and researcher

Appendix H: Participant Report

Participant Report

Thank you for taking part in our research project. Here is some information about what we found out.

What was the project about?

INAS organises sports competitions for people who are very talented and train very hard. INAS is worried that the way it organises events might not include everybody who might want to compete. At the moment everybody competes together. We know that sometimes people with learning disabilities also have physical health problems. We also know that some people with learning disability find training and competing harder than others because of their problems with learning. Everyone competing together might mean that people with more problems struggle to do well at their sport, even though they train hard. We wanted to know what additional physical disabilities athletes with learning disabilities have so INAS can decide whether they should make a new system with different groups for people with different problems.

What did we do?

We talked to 111 athletes and their supporters at INAS, Special Olympics and Inside Out events. Every athlete talked to us about their health. Some people also did a quick learning assessment with us. We had a lot of fun doing this. People were very welcoming and had some great stories to tell. We also got to watch some of the sport which was fantastic!

What did we find out?

We found out that people who have more problems with learning are also likely to have more problems with their health.

We also found that if you have lots of physical problems you will probably not perform as well at sport as someone who doesn't have any physical problems.

We found that you are more likely to compete with INAS if you do not have many physical health problems.

We also found that people competing with INAS usually have less problems with learning than people who only compete with Special Olympics or Inside Out.

What does this mean?

It looks like the INAS classification system could be improved.. The results say that it would be hard for someone with lots of physical health problems and lots of problems with learning to do well at their sport.

What Happens Next

I am going to tell INAS what I have found. They will have some meetings to decide if they are going to make changes. INAS wants to make sure everyone has a fair chance to compete.

If you have any questions please contact me.

Rosanna Gilderthorp

Salomons Centre for Applied Psychology, Runcie Court, Broomhill Road.

Tunbridge Wells, Kent. TN3 0TF

r.c.trigg180@canterbury.ac.uk

Appendix I: Report for Organisations Recruited From Report for Organisations

Thank you for allowing us to recruit participants from your event. We were made extremely welcome and the research benefitted considerably as a consequence. Here is a summary of the findings of the study. If you would like a more detailed report please contact me.

Background: There is little literature that explains the relationship between intellectual disability (ID) and physical and sensory disabilities. A review conducted in 1987 indicated increased prevalence of physical health problems amongst people with ID but no subsequent research has been conducted (McLaren & Bryson, 1987; Hatton, 2012). The current classification system used by the International Federation for Para Athletes with Intellectual Disability (INAS) does not take into account any relationship between ID and physical or sensory disabilities . The present study aimed to provide evidence to enable INAS to address the potential inequalities in the classification system and to add to understanding of the relationship between ID and physical and sensory disability.

What we did: Participants ($N = 111$) were recruited from INAS, Special Olympics and Inside Out sporting events for people with ID. IQ measurements were gained either from records or by administration of an assessment. All participants, with supporter, were administered a semi-structured health interview. Sports performance scores were also calculated for people who took part in swimming or athletics based on a comparison of their recent time in a competitive event with the world record holder for their gender. We also used group membership (whether the athlete competed in INAS or regional sports events such as Special Olympics or Inside Out events) as a second measure of performance, assuming that INAS athletes would have higher levels of performance than athletes competing in regional events. This allowed us to look at the relationships between physical disability, IQ and performance using correlation and regression methods.

Results: Findings indicated a weak negative correlation between IQ and additional physical disability. This means that people with lower IQ had a higher level of physical disability. The data also suggested that level of additional physical disability negatively predicts athletic performance. This means that the more physical disabilities a person has, the less well they are likely to perform athletically. There was also some limited support for the suggestion that IQ positively predicts performance. This means that higher IQ may lead to better sports performance but we cannot be sure of this as only one of our measures of performance showed this. We also found that INAS athletes generally have lower levels of disability and higher IQs than regional level athletes.

Conclusion: This suggests that the current classification system utilised by INAS may discriminate against people with lower cognitive ability and higher levels of additional physical disability. In order to ensure that sport for people with ID acts as a platform for social inclusion it would seem helpful to reform this practice.

If you have any queries please feel free to contact me.

Rosanna Gilderthorp, Trainee Clinical Psychologist

Salomons Centre for Applied Psychology, Runcie Court, Broomhill Road.

Tunbridge Wells, Kent. TN3 0TF

r.c.trigg180@canterbury.ac.uk

References:

Hatton, C. (2012). Intellectual disability: Classification, epidemiology and causes. In E. Emerson, C. Hatton, K. Dickson, R. Gone, A. Caine & J. Bromley (Eds.), *Clinical psychology and people with intellectual disabilities, second edition* (pp.3-23). Chichester: Wiley-Blackwell.

McLaren, J. & Bryson, S. E. (1987). Review of recent epidemiological studies of mental retardation: Prevalence, associated disorders, and etiology. *American Journal of Mental Retardation, 92*(3), 243-254.

Appendix J: Letter to Ethics Board

Dear _____

Study title: Investigating the factors that predict performance in athletes with intellectual disability

This project has now been completed. Please find below a summary of the study and findings.

Background: There is little literature that explains the relationship between intellectual disability (ID) and physical and sensory disabilities. A review conducted in 1987 indicated increased prevalence of physical health problems amongst people with ID but no subsequent research has been conducted (McLaren & Bryson, 1987; Hatton, 2012). The current classification system used by the International Federation for Para Athletes with Intellectual Disability (INAS) does not take into account any relationship between ID and physical or sensory disabilities . The present study aimed to provide evidence to enable INAS to address the potential inequalities in the classification system and to add to understanding of the relationship between ID and physical and sensory disability.

What we did: Participants (N = 111) were recruited from INAS, Special Olympics and Inside Out sporting events for people with ID. IQ measurements were gained either from records or by administration of an assessment. All participants, with supporter, were administered a semi-structured health interview. Sports performance scores were also calculated for people who took part in swimming or athletics based on a comparison of their recent time in a competitive event with the world record holder for their gender. We also used group membership (INAS or regional) as a second measure of performance, assuming that INAS athletes would have higher levels of performance than athletes competing in regional events. This allowed us to look at the relationships between physical disability, IQ and performance using correlation and regression methods.

Results: Findings indicated a weak negative correlation between IQ and additional physical disability. The data also suggested that level of additional physical disability negatively predicts athletic performance. There was also some limited support for the suggestion that IQ positively predicts performance. We also found that INAS athletes generally have lower levels of disability and higher IQs than regional level athletes.

Conclusion: This suggests that the current classification system utilised by INAS may discriminate against people with lower cognitive ability and higher levels of additional physical disability. In order to ensure that sport for people with ID acts as a platform for social inclusion it would seem helpful to reform this practice.

Kind Regards,

Rosanna Gilderthorp, Trainee Clinical Psychologist

References

Hatton, C. (2012). Intellectual disability: Classification, epidemiology and causes. In E. Emerson, C. Hatton, K. Dickson, R. Gone, A. Caine & J. Bromley (Eds.), *Clinical psychology and people with intellectual disabilities, second edition* (pp.3-23). Chichester: Wiley-Blackwell.

McLaren, J. & Bryson, S. E. (1987). Review of recent epidemiological studies of mental retardation: Prevalence, associated disorders, and etiology. *American Journal of Mental Retardation, 92*(3), 243-254.

Appendix K: Author Guidance for Adapted Physical Activity Quarterly

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