Special Olympics Ireland

Examining the relationship between physical activity and the health and well-being of people with intellectual disabilities: A literature review.

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Introduction

Change is central to Special Olympics. It may be change in athlete's individual fitness or sporting ability, or it may be found to changes in athlete's levels of confidence and growth of self esteem born of meeting challenges or successfully achieving goals. Change may be found in athlete's social and communication skills forged through the development of friendships and social conections. Such friendships and networks often extend beyond athletes immediate peer group as connections are made with people without intellectual disabilities who may be coaches, volunteers or partner players on unified teams. Through these networks the project to effect change is also at work, with challenges to negative attitudes towards people with intellectual disabilities effected through contact and the consequent growth of understanding and commonality. Beyond the organisation challenges to received ideas also provoke change through the showcasing the sporting strengths of people with intellectual disabilities in competition events or by increasing their presence in sports clubs and leisure centres through regular training sessions. Change may be gradual, however it can be regarded as the thread which links Special Olympics as both a sports organisation and a movement for social change.

This review is also focused on change. It aims to identify evidence for change or impact effected by engagement in physical activity across a range of outcomes, physical and psycho-social. This report outlines findings of the review in relation to three main headings:

- the impact of engagement in physical activity on health and fitness for people with intellectual disabilities,
- the impact of such engagement on psycho-social outcomes.
- the barriers to taking part in physical activities and what works in engaging people within routine sports and exercise.

Before going on to present findings, this report will first provide background context and outline the methods and aims of the review. The report will culminate in a discussion of findings and highlight areas for future research.

Note: The views expressed in this report are those of the authors and may not represent those of Special Olympics Ireland.

Background to the Review

Physical activity and health

The benefits of regular exercise to both physical health and psycho-social well being are well established with non-disabled persons (e.g. Dunn et al 2001). By contrast a sedentary lifestyle or physical inactivity are known to contribute to negative health consequences (Hamiliton et al. 2007; CDC 2003). People with intellectual disabilities are widely reported in the literature to be more likely to lead a sedentary lifestyle than the general population (Hilgenkamp 2012, Bodde 2009, McGuire 2007, Frey *et al.* 2008, 2005, Emerson 2005, Messent 1998, Heath & Fenton 1997). Moreover, people with intellectual disabilities are known to experience different, often reduced, levels of physical health and psycho-social well being compared to their non-disabled peers.

Whilst Horowitz et al. (2000) highlight the fact that health inequalities may be precipitated through unequal access to services, other contributing risk factors include high levels of poverty and social disadvantage, a lack of regular exercise or physical activity (George 2011). Increasing concern is evident in the literature in relation to the health outcomes, mortality, morbidity and behavioural determinants of health amongst people with intellectual disabilities (Emerson et al. 2008, Emerson 2005, Prasher & Janicki 2002, Sutherland et al. 2002, Walsh & Heller 2002). Indeed Emerson (2005) highlights the fact that significant deviation from normal weight – (obesity or underweight) and a lack of physical exercise have been identified by the World Health Organisation (2002) as the most significant global behavioural risks to health.

Obesity, exercise and health risks

A number of studies have pointed to the high numbers of people with intellectual disabilities who could be categorised as obese, both amongst children and adolescents (Salaun et al. 2012, George et al. 2011, Stewart et al 2009, Bandini et al 2005,) as well as adults (Henderson 2008, Emerson 2005, Marshall et al. 2003). A Japanese study with over 20,000 participants who were students with ID attending special schools reported that the prevalence of obesity was significantly higher among children aged 6–14 years with ID compared to children of the same age without ID (Takeuchi 1994). A finding that has also been replicated in Northern Ireland (Slevin et al., 2008).

The potential negative health consequences associated with obesity in young people are significant with increased risk for high blood pressure, insulin resistance as well as decreased mobility (Greaser & Whyte 2004), sleep disordered breathing as well as a range of orthopaedic complications (De et al. 2008). Liou et al. (2005) also note that obesity has also been associated with greater social isolation, as well as stigmatisation

and bullying (Reilly & Wilson 2006, Lobstein et al. 2004). A number of predisposing factors for obesity are present amongst children and young people with ID, genetic factors, use of certain medications and lack of physical activity (De et al. 2008). However, George (2005) highlights the role of parents as both role models and facilitators of healthy lifestyles for many young people with intellectual disabilities, not only in terms of their food choices but also in enabling them to take part in regular physical activity and to recognize the benefits of doing so. In a similar vein Rimmer & Yamaki (2006) have recommended that approaches to healthier lifestyles for people with intellectual disabilities involve primary carers and family members.

Obesity in adolescence can lead to the persistence of obesity into adulthood. As noted above there is a higher reported prevalence of obesity in adults within the population of people with an intellectual disability than in the general population with and trend towards an increase in prevalence (Yamaki 2005). The health risks associated with being overweight or obese remain significant and include coronary heart disease, hypertension and type 2-diabetes, ischaemic stroke, osteoarthritis and cancers of the breast, colon, prostate, endometrium, kidney and gallbaldder (World health Organisation 2002, Henderson 2008). Moreover, as well as ameliorating some of the risks to physical health, engagement with physical activity may have a positive impact on psychosocial and behaviour domains such as depression (Lawlor & Hopker 2001) challenging behaviour (Lancioni & O'Reilly).

Emerson (2005) identifies a number of lifestyle related risks to the development and persistence of obesity in the adult population of individuals with intellectual disabilities. Not least amongst these access to and engagement with regular physical activity amongst this population as well as addressing healthy diets and nutrition. However, as Emerson points out, sustainable changes to health inequalities amongst this population will require challenges to the wider determinants of health, poverty, housing, unemployment, social exclusion and undeveloped social capital in the communities in which people live (2005).

Levels of engagement in physical activity

The literature suggests that people with intellectual disabilities typically lead less active lifestyles that people in the general population. For instance; Beange et al. (1995) reported that approximately 72% of males and 75% of female individuals living in a community setting did not engage in any moderate or strenuous physical activity in a preceding two week period, compared with 49% (male) and 65% (female) in the general population (although it should be noted that these latter figures also represent high levels of disengagement). More striking figures are reported by Wells et al. (1997) who state that 49% of participants in their community based sample did not take part in any

physical activity during the past month compared with only 6% of the wider population. Philips & Holland (2011) reported that none of the 152 adults with intellectual disabilities in their sample met the recommended minimum guidelines for participation in physical activity.

Abells et al, (2008) report that people with intellectual disabilities have limited access to sport and physical activity, a point highlighted and reflected in the European Commission White Paper on Sport (2009) which states that access to sport remains a problematic issue facing people with disabilities generally, both with regard to their full access to sport activities as sports-people, and alongside that as administrators, officials and/or spectators. In particular, young people with disabilities do not enjoy the same opportunities to practice sport as their able-bodied peers, particularly in physical education classes in school with their classmates. Consequently, they may not have the opportunity to become socialized into sport at an early age in the same way as many of their able bodied contemporaries. Similarly, in the adult population, Messent et al. (1998) found that there were insufficient opportunities for people living in supported accommodation to become routinely involved in physical activities and inadequate support for them to do so on a regular basis.

The literature identifies some groups more at risk than others of low levels of physical activity. Peterson et al. (2008) reported that greater severity of intellectual disability was negatively correlated with participation in physical activity, likewise Finlayson (2009) highlighted the restricted participation of individuals with epilepsy. Living in supported settings or in a group home meant it was less likely that individuals would take part in regular physical activity than those living in their own homes (Finlayson et al. 2009, Robertson et al 2000, Rimmer et al 1995).

The benefits of taking part in physical activity

The health benefits of physical activity and sports are well known in the general population, and whilst they cannot cure all ills, a healthy lifestyle, which includes regular physical exercise is known to promote physical and mental well being (Pegg & Compton, 2004; Stumbo & Pegg, 2004. Where opportunities to play sport are available indications of positive outcomes are reported not only in terms of enhanced physical health and fitness but also in term of increased community integration, improved quality of life, greater sense of satisfaction and well-being, the development of friendships and increased social skills and increased self-esteem (Duvdevny & Arar 2004, Orsmond, Krauss & Seltzer 2004, Cummins & Lau 2003, King et al 2003; Dattilo, 2002; Driver, Brown, & Peterson, 1991). One of the key aims of this study is to examine the research evidence to support the proposition that engagement with regular physical activity promotes beneficial outcomes in the health and well-being of people with intellectual

disabilities. That people do benefit from engagement in sports and exercise is underlined by the Nice Declaration (2000), which promotes access to sports activities for all citizens:

> *'sporting activity should be accessible to every man and woman, with due regard for individual aspirations and possibilities".* It also recognises that *"for the physically or mentally disabled, the practice of physical and sporting activities provides a particularly favourable opening for the development of individual talent, rehabilitation, social integration and solidarity and, as such, should be encouraged.' (p,15)*

Special Olympics International

Special Olympics is the largest global provider of regular sports activities for people with intellectual disabilities. With more than 3 million athletes in 220 countries worldwide Special Olympics offers *year-round sports training and athletic competition in a variety of Olympic-type sports for children and adults with intellectual disabilities, giving them continuing opportunities to develop physical fitness, demonstrate courage, experience joy and participate in a sharing of gifts, skills and friendship with their families, other Special Olympics athletes and the community' (*http://www.specialolympics.org/ accessed:04.07.12). Although explicitly a sporting organisation, Special Olympics has a wider mission to use the power of sport to develop the social and emotional well-being of athletes (Dykens & Rosner 1998), to challenge negative attitudes toward people with intellectual disabilities and to promote social inclusion and equality.

For the past 34 years, SO Ireland has striven to provide sporting opportunities to individuals with intellectual disabilities and now serves over 11,000 athletes across the island of Ireland. With continued growth, the needs of an expanding older population and an increasing number of young athletes seeking opportunities, combined with changes in the structure of social care services, the organisation continues to face the challenge of making sporting activity available to people with intellectual disabilities throughout Ireland. The available research evidence may link these activities to a range of potentially beneficial outcomes for participants whilst also providing direction for programme development, programme refinement, research and evaluation.

Literature Review

Aims of the review

The overarching aim of this review is to critically engage with the assertion that regular involvement in sport and physical activity results in beneficial outcomes in terms of the health and well being of people with intellectual disabilities.

A number of questions flow from this aim:

1) What types of evidence exists for the positive impact of physical activity and sports on the health and well being of people with intellectual disabilities?

2) What barriers might people face in participating in physical activities and sports and how can they be overcome?

3) What particular features of activities / sports programmes show beneficial outcomes?

Defining the parameters of the Review

The first task of this review was to define the parameters of key concepts of interest to this work in order to determine a platform for selecting terms as part of the search strategy used to identify relevant literature. The following concepts provide the context for the review:

The concept of sport includes both organised competitive sporting activities as well as recreational sporting endeavours, for example routine swimming.

Physical activity includes organised activities that may not necessarily be considered a sport, such as regular walking or working out in a gym.

'Health' is considered both from the perspective of ill health and positive health or salutogenesis, for example factors which support being and staying in a state of good health; this latter construct is closely associated with ideas informing healthy lifestyles.

The notion of well-being is more broad and diffuse. In the context of this review outcomes relating to the psycho-social aspects of well-being, such as the confidence and self-esteem as well as the social aspects of this concept, such as the importance of making and spending time with friends and of being an active member of a social network are considered relevant. 'Well-being' also includes emotional and mental health markers and their interrogation.

Inclusion criteria

Working within these parameters the following inclusion criteria were developed papers to be selected for inclusion in the review:

a) papers should be published between 1990 and the present day but with the inclusion of seminal papers or those produced by known experts in the field published prior to that date.

b) Papers should be published in English in peer-reviewed journals.

c) Papers should refer to the population of people with intellectual disabilities and should be directly relevant to at least one of the research questions.

Searching databases

Searches were conducted on the following databases; selected on the basis that they hold a range of references across the social and medical, health and sport sciences.

- **ASSIA: Applied Social Sciences Index and Abstracts** covers topics relevant to this review including health, social services, psychology, sociology, and education;
- **Cinahl Plus** provides indexing from the fields of nursing and allied health;
- **OVID Medline** covers the international literature on biomedicine, including the allied health fields and the biological and physical sciences, humanities, and information science as they relate to medicine and health care. Information is indexed from approximately 5,400 journals published world-wide.
- **PsycINFO** provides abstracts and citations to the scholarly literature in the psychological, social, behavioral, and health sciences;
- **SPORT Discus** offers comprehensive bibliographic coverage of sport, fitness and related disciplines;
- **Web of Science** carries indexed references across 55 social science disciplines, as well as selected items from 3,500 of the world's leading scientific and technical journals.

Search Strategy

A search strategy was developed and piloted then used for online literature searches. The strategy is detailed below.

1. intellectual disbilit* or learning disabilit* or developmental disability* or learning difficult* or mental retard* or mental handicap*
2. sport* or exercise* or fitness or game* or activ* or competition or physical activity or train*
3. 1 and 2
4. health or well-being or mental health
5. 3 and 4
6. self-esteem or confidence or communicat* or psycho-soci*
7. 3 and 6
8. friend* or relationship* or network
9. 3 and 8
10. 5 and 7 and 9

This strategy was found to produce a good range of relevant results. A large number of returns was achieved because the search strategy needed to reflect the breadth of the issues being addressed in this review and because of the sensitivity of databases in picking up references of related rather than specific interest, for instance a high number of references were returned which focused on people with disabilities but not specifically intellectual disabilities. Results were screened for relevance in a two part process.

Screening references

A first screen of results from searches of databases was undertaken by carefully reading the titles of all the papers returned for the searches of databases. Those that were clearly not relevant were deleted at this stage, whilst those that appeared broadly or specifically relevant were saved to '*Refworks'* – a reference management software.

A thorough screening of the high number of results produced from the initial search led to the removal of over 3,500 references at this stage (see Table 1 below). A final stage of 1st screening is completed within *Refworks* which has the facility to remove duplicates – that is papers which have been retrieved from more than one database: 87 duplicates were removed.

References, which survived the first screen, were stored within *Refworks* for the second screening procedure, which was the next stage of the project. This process is completed through a careful reading of the abstract for each paper. Papers at this stage are again judged against the inclusion criteria and are included if they meet this criteria. Reference lists of included papers are also screened to identify any further relevant publications, which have not been found through searching databases.

Table 1: The number of papers identified in the search of each database and those kept after the 1st screen of references returned.

Database	Search results	1st screen
Sport	945	123
Ovid	27	11
Web of science	1532	67
Cinahl	643	27
Assia	772	54
Totals	**3,919**	**282**
Total after removal of duplicates		**195**

Quality appraisal of papers

As shown in Table 2, studies have been classified into the following levels of evidence, drawing on Guyatt et al. (1995) methods of grading health care recommendations. Higher ratings are suggestive of stronger evidence whereas those from studies that are rated as VI or VII may have limited applicability to the wider population. Unfortunately the great majority of studies to date fall into these categories.

I Systematic reviews and meta-analyse

II Randomised controlled trials (RCT) with definitive results (confidence intervals that do not overlap the threshold clinically significant effect)

III. Randomised controlled trials with non-definitive results (a point estimate that suggests a clinically significant effect but with confidence intervals overlapping the threshold for this effect)

IV. Cohort studies

V. Case-control studies

VI. Cross sectional surveys

VII Case reports

Table 2. Results from second literature screen

	Hierarchy of evidence							Totals
Subject of review	**I Systematic review**	**II RCT with definitive results**	**III RCT with non-definitive results**	**IV Cohort studies**	**V Case controlled studies**	**VI Cross-sectional studies**	**VII Case reports**	
1. Health and fitness	2	2	0	0	14	20	0	**38**
2. Psycho-social		3			5	12		**20**
3. Access/ barriers	1				1	12		**14**
Totals	**3**	**5**	**0**	**0**	**20**	**44**	**0**	**72**

Data extraction

Each paper was carefully read and key data extracted and entered into table format which will include the reference; sample: methods; main findings and rating. This provides a quick reference point for ease of use of this review.

Data extracted from the selected papers are also synthesized in a narrative account of the main findings across the papers reviewed and how these respond to the research questions. Limitations of the studies reviewed as well as areas for future research are highlighted.

Papers included in the review

A total of 67 papers were selected, based on the identified inclusion criteria, to be included in the review. These papers have been sorted in relation to each of the research questions they respond to and also where each of the papers can be placed within a hierarchy of evidence; this is shown in Table 2. In addition a further 69 papers were identified which were used to inform this report in terms of the background and context to the study. These are listed in the Reference list at the end of the report.

Review findings in relation to central research questions

The findings of the reviews are presented in three parts.

Part 1: The impact of physical activity and sports on the health and well being of people with intellectual disabilities.

Part 2: Psycho-social benefits of participation in physical activity.

Part 3: Barriers and facilitators to participation in physical activity amongst children and adults with intellectual disabilities.

Part 1: The impact of physical activity and sports on the health and well being of people with intellectual disabilities

Papers reviewed in the following section focus on outcomes of participation in physical activities in relation to health and fitness and outcomes relating to psycho-social factors.

Overview

A total of 38 papers were included in the review of this section and they are listed in Table 5 at the end of the Report (p.47). The majority of research designs deployed either a case controlled study (V) or a cross-sectional approach (VI), in almost identical numbers, with only two studies utilizing a randomized controlled methodology. The largest single location for this work was North America (17); that said an interesting dimension to this particular stream of enquiry is the diversity of its origin, with work emerging from a total of 14 countries, the majority of which are located in Europe, with Greece (4) proving most productive of these countries. Whilst a wide range of outcomes were considered in these studies three macro-themes emerged – the measurement of cardiovascular fitness amongst an identified ID population, concerns around designated health markers (typically obesity and heart rate variability, often concerning the young) and associated measures of strength and wellbeing, which included the recording of bone density and balance in some cases.

A number of studies undertook an intervention and measurement of aerobic fitness within a laboratory setting (typically to assess maximal oxygen uptake through a treadmill-based Vo2 max test) whilst the duration over which individual studies were staged varied markedly, with the most prolonged piece of work undertaken by Guidetti and colleagues (2010), which engaged a total of 64 participants over some nine months. Most other studies were conducted over significantly less periods of time, which is noteworthy as it may prove challenging to identify marked and certainly sustained adaptation to an individual's underlying cardio-vascular condition, particularly their aerobic capacity, following comparatively brief forms of intervention (where this was the principle purpose of the research design). Notwithstanding this the overwhelming number of studies reported positive outcomes from a variety of interventions, foremost amongst these being reduced resting heart rates, BMI scores and increased peak oxygen uptake amongst subjects, as well as (variously) improvements in lower limb strength, balance and bone mineral densities. There were no reported negative outcomes from participation in such studies or interventions identified in the published work. Finally, in spite of this valuable body of literature, a key omission remains that of a longitudinal, double-blind randomized study examining an identified and agreed set of markers with the purpose of measuring the benefits of accessible forms of physical activity intervention amongst the ID population.

Relationship between disability, health and wellbeing

Inactivity and poor lifestyle choices can lead to ill health, obesity, and other complications such as stroke, cardiovascular disease, osteoporosis and diabetes (Bartlo and Klein, 2011). Lotan et al (2004) reveals that people with disabilities are at risk of developing a number of sedentary lifestyle-associated diseases (such as those identified above) in the absence of proper and controlled forms of physical activity interventions. In concurrence, Marks et al (2010) confirm that many people with disabilities have adopted unhealthy lifestyles and are at risk of cardiovascular disease and low bone mineralisation. Advancing the specific perceived benefits of a largely accessible form of physical activity, Stanish & Draheim (2007) argue that there is a clear inverse relationship between walking and indicators of cardiovascular disease. Walking is the most commonly reported physical activity undertaken by people with intellectual disabilities but it is unclear if many members of this population walk strenuously enough to achieve any significant health benefits from doing so. Lahtinens et al. (2007) found, in their longitudinal research, that people with disabilities performed at a significantly lower level of exertion in certain exercises, based upon measures of strength, endurance and dexterity, for their age when compared to those recorded by their non-disabled peers. However in an earlier study, Stopka et al (1994) reported extremely positive effects of a supervised resistance training programme on adolescents and young adults with mental retardation and suggested that it could play an important role in any total exercise programme for such individuals. Nowadays adults with developmental disorders, specifically Down syndrome, are thankfully living longer than at any point heretofore but in the absence of sustained physical activity, continue to present with premature signs of age related illnesses, such as arthritis, self-inflicted fractures, poor balance, declining muscle tone and osteoporosis (Kaplan et al 2003). Unfortunately, as Gonzalez-Aguero et al. (2010) have identified in their recently published findings many training programmes carried out involving children and adolescents with Down syndrome do not yield the desired responses, and the reasons for this are still largely unknown. As the authors of this review conclude significantly more data on this population are necessary.

Positive Outcomes Experienced from Physical Activity Intervention

Focusing initially on methodology and outcomes, it is clear that a variety of different approaches are used to measure and assess the overwhelmingly positive response derived from physical activity intervention by individuals with intellectual disabilities.

Measuring Health – A Statistical Exercise

Most research articles reviewed as part of this disciplinary theme measured health solely from a statistical point of view – weight, height, circumferences, and heart rate (systolic and diastolic). Others used time, measuring how many minutes participants could walk on a

treadmill, and counting steps on a pediwalker and absorptiometry. Standard approaches to the measurement of health and fitness of all participants were thus largely deployed, common amongst these being the Body Mass Index (BMI) and Waist-to-Hip Ratio (WHR) approaches. Deploying standardised protocol participants were assessed pre- and post-intervention to determine its overall effect. Calders et al. (2011) found that a twice weekly exercise session for a period of 20 weeks had significant positive effects on cholesterol levels (P=0.01) as well as systolic blood pressure levels (P=0.012). Calders and colleagues compared the effects of two training groups (endurance training and combined strength and endurance training) with a non-exercise control group. Both intervention groups showed improvements over the control group however, the combined exercise training was deemed more beneficial in adults with intellectual disabilities when compared with the endurance training group, particularly in relation to improvements in cholesterol, grip strength, muscle fatigue resistance and peak oxygen consumption.

Such improvements in health related fitness scores were also confirmed by Davis et al. (2011) who found significant improvements between pre and post intervention fitness tests ($t = 2.69$, $P = 0.013$) when implementing an 8 week 'motivate, adapt and play' exercise program with children displaying mild to moderate intellectual disabilities. Chia-Ling et al. (2010) did report positive results on health related measures such as BMI score, V-shape sit and reach test and sit-up in 30s and 60s, when implementing a 6 month aerobic intervention; however no improvement in shuttle run scores were recorded, suggesting that no significant positive aerobic adaptation took place amongst this cohort. In contrast, Anchuthengil et al. (1992) found significant increases in peak oxygen uptake (38%) at the end of a 12 week treadmill exercise training program as well as a reduction in resting heart rate scores (10%).

Whilst these studies all revealed positive effects on health related fitness indicators, it is important to note that each study used different training methods, intervention periods and fitness tests, which perhaps indicates the need for standardized and agreed testing during future research studies in order that a true effect experienced following any such intervention can be measured and comparisons drawn between different forms of physical activity programmes. Also, none of these studies specifically compared different forms of intellectual disabilities or indeed different degree levels of the same. This may be an important factor in determining the most appropriate forms of physical activity intervention for people displaying different types of intellectual disabilities. For example, Baynard et al. (2008) found that people with Down's syndrome had a lower peak VO2 score when compared with their peers displaying other forms of intellectual disabilities and those without an intellectual disability. Moreover, in the case of the former group, their peak VO2 score did not alter post 16 years of age, again contrasting their responses to a physical activity intervention with those within the other groups listed above. Amongst a raft of possible

explanations for this, these results perhaps indicate that an alternative form of physical activity may be more suitable for individuals with Down's syndrome in order to improve their health related fitness. In studies motivated by similar interests Giagkoudaki and colleagues (2010) and Gupta et al. (2010) found (respectively) that individuals with Down syndrome have cardiac autonomic nervous system dysfunction, which can be improved through regular exercise, and a regular programme of resistance training aimed at the same population can derive a statistically significant improvement in lower limb strength amongst a range of separate muscle groups.

Positive Physical Outcomes

Thus**,** in almost all studies positive outcomes in relation to physical health and well being experienced by subjects were reported. For example, Lotan (2004a) noted that his results were significant in relation to improved pulse per minute and motor functioning (Lower resting heart rate) on the participants whom he recruited. Notwithstanding the nature of these results, as this particular study drew only upon four subjects it cannot be regarded as generalisable to a wider population. Similarly Tsimaras (2012) noted that Greek traditional dance can constitute effective and safe ways to improve physical and motor skills amongst subjects but the widespread use of traditional forms of dance in such settings and amongst these particular populations is still awaited. Indeed the only previously reported findings in this realm emerged from a study undertaken by Cluphf and colleagues (2001) measuring the effects of aerobic dance on the cardiovascular endurance of adults with ID. Interestingly there were very positive outcomes derived from this work even if subsequent follow up measurements revealed that the training effect had been lost 18 weeks following the initial intervention as subjects failed to adhere to the progamme after the former period had elapsed.

Remaining with Tai-Chi, Kaplan (2003) also found that regular engagement in such forms of controlled movement can derive some positive outcomes for older people with ID. This study reported notable benefits, for example, in their range of movement (upper extremities), respiration rates and balance amongst subjects. Balance and upper extremity range of movement is important in reducing the amount of falls and injuries experienced in aged people. Elsewhere, Ozmen (2007) found that regular exercise can increase one's fitness levels, in turn increasing cardio-vascular scores, whilst Ozer et al. (2005) confirmed in their study that that different types of exercise (both aerobic and anaerobic) can also deliver benefits for cardio and strength fitness levels amongst the ID population. Focussing solely on resistance training, Rimmer and Kelly (1991) revealed results indicating that a 2-day-a-week resistance training programme was effective in improving the strength levels of a group of adults with mental retardation (aged 23-49 years). Two studies, Tsimaras and Fotiadou (2004) and Tsimaras et al. (2009) revealed similar findings indicating that young adults (mean age 24.5 years) returned improved physical and kinetic abilities following a

well-designed strength training programme. Finally, and in a related outcome, Hemayattalab (2010) discovered that after 6 months of training his participants had achieved notable improvement in their bone mass density – but that a group that took calcium supplementation alongside a programme of weight training and resistance exercises benefited the most. However as he was working exclusively with children a longitudinal study would be required to ascertain, as in this case, why it was that exercise and calcium intake combined had the capacity to create the elevated oestrogenic effect reported in his findings.

Marks et al (2010) in their evaluation of community based health promotion programmes for Special Olympic Athletes employed both quantitative and qualitative methods. They used BMI, levels of flexibility, abdominal fat measurements, WHR and aerobic fitness levels to parameterise their investigations. Interestingly their evaluation also focussed on the psycho-social health status of their participants – measuring their perceived health and wellbeing in order to assess an athlete's self reported health status and then assessing this perception relative to the subject's friends. This area of investigation is important in light of earlier work conducted by Draheim et al. (2003) examining the field of cardiovascular disease risk factor differences between Special Olympians and Non-Special Olympians. Amongst a number of key findings this group uncovered lower diastolic blood pressures, body fat percentages, abdominal fat, triglycerides, and insulin than Inactive Non-Special Olympians and possessed lower body fat percentages than Active Non-Special Olympians. In this regard, alongside the recorded benefits of walking, the physical fitness of young people with ID is significantly enhanced following a period of physical activity intervention in which running is the key component, as evidenced in the work of Frey et al. (1999) and Pitetti and Fernhall (2004).

Maintenance of physical activity levels

Whilst the studies reviewed thus far have shown positive effects following the implementation of physical activity programs, only one study looked at the maintenance of such improvements following the initial testing period had elapsed. It is commonly accepted within mainstream health and wellbeing research that adherence to a physical activity programme amongst those who were previously ill disposed to exercise can be low, with large parts of the population remaining sedentary, despite being well aware of the health related benefits of regular activity. It is therefore important to reflect upon how much exercise is considered necessary to maintain the benefits achieved through an original physical activity programme.

As mentioned, only one such study looked at the effects of maintenance training following an initial physical activity intervention. After completing a 12 week exercise programme, Anchuthengil et al. (1992) moved participants onto a further 12 week treadmill training

maintenance programme, involving twice weekly workouts, the results of which confirmed that this low frequency training was indeed effective in maintaining the levels of cardiovascular fitness achieved during the initial 3 month intervention.

Athletes versus Non-Athletes

Studies undertaken by Cuesta-Vargas et al. (2011) and Guidetti et al. (2010) looked specifically at competitive athletes with intellectual disabilities, with the latter also studying the effects of sport specialization on athletic fitness. Guidetti et al. confirmed a broadly established and agreed assertion that sports participation significantly improved physical fitness amongst this population, thus decreasing health risks in people with intellectual disabilities compared with those who did not participate in sport. However Cuesta-Vargas et al. (2011) reported less conclusive results. No significant differences were found in strength, endurance and balance between those classified as 'sportspeople' compared with those regarded as 'non sportspeople'. However, this may be partly explained by the possible errors in self reported levels of physical activity by all participants in the study. Again further research is required in order to determine the effects of sports versus leisure time activity or indeed no activity at all on the outcomes of these measures.

Similar positive non-related physical outcomes experienced by participants

Whilst in an overall sense findings indicate that there were indeed significant and some insignificant health related outcomes experienced by participants, there were also other outcomes experienced by some of these individuals that were not related to physical well being. Tsimaras (2012) noted that many of the people in his study experienced both social and emotional positive effects, which had a direct positive impact on their quality of life. Similarly Marks et al (2010) also noted that many participants enjoyed new and different exercise regimes, whilst others did not want the programme to end and felt that they had made more friends on completion of the regime.

The Effects of Education

Of all the studies reviewed, only one (Ewing et al. 2004) looked at the impact made by an 8 week group education programme aimed at reducing the risk of cardiovascular disease. Those participants without an intellectual disability showed a decrease in BMI scores whilst only some of the participants with an intellectual disability (18.5%) showed a similar decrease following the 8 week education and awareness program. Notwithstanding this, a positive effect on knowledge and understanding of healthy nutritional food choices, fruit and vegetable consumption as well as levels of physical activity was found within both groups (i.e. with and without intellectual disabilities).

Finally, a systematic review of pertinent literature in this field recently published by Gonzalez-Aguero et al. (2010), looked specifically at research pertaining to the health related physical fitness of children and adolescents with Down syndrome and their response to training programs. A total of 22 journal articles were found to match the inclusion criteria set for this review and a number of key trends emerged from this process as a result. Children and adolescents with Down syndrome were found to be less active than their peers. They were also found to be less physically fit and possess a poorer overall body composition when compared with their peers. However, one particularly worrying finding revealed that despite the implementation of a physical activity intervention, children and adolescents with Down syndrome did not post improved scores on the health related physical fitness indicators measured in comparison to other participants in the study, which included both those without an intellectual disability and those with an intellectual disability but without Down syndrome.

Insignificant outcomes experienced

A very small number of research studies reviewed in this process revealed negligible positive physical fitness results. Marks et al (2010) found that after their interventions there was in fact only insignificant difference found in participants' level of abdominal fat, flexibility or aerobic fitness levels. Stanish et al (2007) also noted that in their sample the individuals who accumulated a greater number of daily steps did not, somewhat surprisingly, exhibit significantly lower blood pressure or healthier body composition when compared to those with lower step counts. They point out that while this finding appears contrary to the results of other published walking interventions (Moreau et al. 2001; Tudor-Locke et al. 2002a; Swartz et al. 2003) and to similar studies on the non-disabled population (Thompson et al. 2004), some previous studies have reported outcomes not dissimilar to theirs.

Despite this qualification, these results were not expected and may in fact be attributable to some unspecific outlier. In light of this they put forward three possible explanations for such results, a. The intensity of walking undertaken by the participants may not have been strenuous enough (i.e. inadequate to produce better health); b. Dietary intake – participants who did walk 10000 + steps may have had high fat diets; c. Care providers may have commenced some of the participants on a walking regime unbeknownst to the research team in an effort to reduce body fat. Drawing upon an emerging theme evident across a body of similar work, Stanish et al (2007) claim that a longitudinal study may be required in order that more accurate findings may be reported and substantiated. This is an important point as, once again, walking appears to be the most utilized form of exercise undertaken by people with intellectual disabilities.

Research settings and Ethics

In recent years, more and more emphasis is being placed on assisting people with intellectual disabilities to live independent lives within their communities. However a number of the studies reviewed (Anchuthengil et al., 1992; Calders et al., 2011; Chia- Ling et al. 2010) based their research around participants living within controlled environments, such as institutions for people with intellectual disabilities. Whilst this may eradicate some confounding variables for researchers, it is also possible to argue that these studies lack the generalisability to the everyday population in question that one might expect.

Moving on from this, the issue of gaining informed consent from people taking part in the research process clearly remains central to ethical research practice. This is of particular importance when carrying out research on people with intellectual disabilities. Often this cross-section of society is vulnerable and susceptible to poor practice. Most articles reviewed in this section mentioned that consent was sought from all individuals involved – some went as far as gaining permission from advocates and families, whilst the exact nature of the ethical consent/assent processes undertaken in other studies was unclear.

For example, Marks et al (2010) received signed consent from his research subjects; Kaplan (2003) also states explicitly that consent was received, whilst Hemayattalab (2010) sought consent from participants and assent from parents, verbally and in writing, prior to commencing the research process. It is crucially important that all possible ethical considerations are reflected upon and agreement reached with all stakeholders so that the benefits of research, such as those around physical activity, outweigh any established risks (if and where they exist).

This is worth emphasizing because in Lotan's (2004b) article *Improving functional skills and physical fitness in children with Rett Syndrome* subjects had to use treadmills to accurately relay the nature of their physical fitness. This involved the use of Velcro straps and 'hand held over hand' in order to undertake this study, which appeared on the face of it somewhat atypical. And in Hemayattalab's (2010) article *Effects of Physical Training and calcium intake on bone mineral density of students with mental retardation* dual-energy X ray absorptiometry was used as a means of measuring BMD. This was with full permission of the parents and associated university but again may be considered unusual in the context of this type of work.

Limitations and strengths of the studies

A significant number of the studies undertaken in this field of investigation are limited by small sample sizes, which is a common failing of work undertaken in the broader realm of physical activity interventions (Anchuthengil et al, 1993; Carmeli et al. 2002; Davis et al. 2011). That said a discrete cohort of studies have engaged with sizeable sample numbers,

notably Chai-Ling et al., 2010 (146 persons) and Cuesta-Vargas et al., 2011 (266 persons). Otherwise sample numbers typically take the form of double figures, the exception being Lotan et al., 2004 whose previously mentioned work with 4 adolescent girls displaying Rett syndrome is a reminder that bespoke, focused work of this nature still constitutes a worthwhile purpose. A number of studies draw upon convenience samples, often subjects aligned to the Special Olympics organization (Cuesta-Vargas et al., 2011, Marks et al., 2010, Ozer, 2005) or students enrolled at a nearby special schools (Golubovic et al. 2012). Defined forms of physical intervention largely correlates to the perceived abilities of the survey subjects but general physical fitness training programmes were most prevalent (Tamse et al., 2010, Ozmen et al., 2007, Lotan et al., 2004). A couple of examples of novel forms of interventions included the work, already referred to earlier in this section, carried out by Tsimaras et al., 2012 and their use of a Greek dance-training programme (measuring dynamic balance) and Kaplan et al's. 2003 focus on the physiological effects of participation in Tai-Chi by seniors with intellectual disabilities.

Areas for further research

Whilst there is much to recommend the body of work that has already been undertaken to date, reflecting upon some of its common shortcomings, it is apparent that a randomized controlled trial of at least 12 months duration, measuring the outcomes of a set of key physical activity interventions on a set of standardized health and wellbeing criteria (e.g. BMI, cardiovascular fitness, CHO) and targeted at young adolescents with ID would prove to be an extremely worthwhile investment. Testing could take place 'in field' supported by a cross section of laboratory tests in an appropriately appointed physiological and biochemistry lab – the latter facilitating blood profiles to be utilized, which again would serve to produce a robust data set. Supplementary studies examining potential barriers to participation on the part of some in this target population and/or a programme of nutrition education may also prove worthwhile, building upon some promising work referred to here. In addition there may be some value in studies utilizing novel forms of physical intervention, such as dance or similar 'fitness' programmes, to be undertaken, which reflects a possible appetite for less structured forms of sport and physical activity amongst this population.

Part 2: Psycho-social benefits of participation in physical activity

Overview

Twenty papers were included in the review of this section as described in Table 6 at the end of the Report. They provided a range of study design in terms of the Hierarchy of Evidence, three were Randomised Controlled Trials with definitive results graded 'II', five case controlled studies graded 'V', and 12 cross-sectional studies graded 'VI'. The majority of the studies emanated from the USA (9) and Canada (4), with the remainder from mainland Europe (3), the UK (2), and Israel (2). A wide range of outcomes were considered in these studies including internal measures of psycho-social well-being, including levels of anxiety, self-esteem and self-perception as well as external measures such as social inclusion and perceived social acceptability. A number of studies (9) measured outcomes in relation to an intervention delivered as part of the particular research project, others (7) measured outcomes in relation to an ongoing programme of physical activity in which participants were engaged. A number of studies (12) focused on segregated sporting activities, whilst others (5) measured outcomes in relation to unified activities. Five studies focused on activities provided by Special Olympics.

Outcomes relating to internal measures of well-being.

Confidence, self-esteem and self-perception.

A number of studies reported on the internal aspects of individual well-being in terms of psycho-social outcomes amongst the study population. Carmeli et al. (2009) conducted a randomised controlled trial around an aerobic training intervention compared with a group involved in leisure activities and a third sedentary control group, to assess whether a reduction in levels of anxiety, amongst a sample of adults with mild intellectual disabilities, could be detected as a consequence of engagement in physical activity. The study was limited by the small sample size and high levels of attrition, with only 16 of the original 24 completing the study. Nevertheless, findings did show a significant reduction in anxiety in both the aerobic and leisure activity groups.

Hellar et al. (2004) reported on psycho-social outcomes following a randomized controlled trial against a 12 week exercise and health education programme. Amongst the 32 participants who were randomized to the intervention group, findings revealed improved life satisfaction and slightly lowered levels of depression. Echoes to the previous two studies were reported by Garcia-Villamisar & Dattilo, (2010), who again conducted a randomized controlled trial around a 12 week x 3 days per week training and exercise programme. The intervention group made up of 37 adults with autism

were found to have increased scores in quality of life measures and reduced levels of stress.

Although the specifics of these three trials differ in terms of the detail of the intervention delivered as well as differences in the sample – (the final study reports on people with ASD) - there are indications of positive outcomes following physical activity interventions, which would benefit from further a large scale, double blind trial to confirm these findings. Further evidence supporting the indications given by these trials have been found in the course of this review. For example, Weiss et al. (2008) in their cross-sectional study, which included 97 Special Olympics athletes, reported an increased sense of self-worth amongst participants, this was more highly correlated with a achievement in competition in terms of the numbers of medals won. Similarly, Dykens & Cohen (2009) reported more positive self-perceptions amongst a sample of 104 Special Olympics athletes who represented the USA at the 1993 SO Winter World Games. In this study athletes were scored consistently higher, by parental report, than non-athletes in domains of social competence and activity competence in the Child Behaviour Checklist. Mactavish & Searle (1992) report on enhanced self-perception, self-esteem and locus of control, amongst participants took part in a 5-week physical activity programme; although this case-controlled study was limited by a small sample size (26) and a fairly short intervention. However, similar positive changes in self-perception are reported by Carmeli et al. (2008) amongst their sample of 31 participants who took part in a 10-month exercise programme, matched against 31 controls who demonstrated no such change.

Findings of this review revealed a number of papers (6), which reported on Unified or integrated sports programmes, where people with intellectual disabilities play sports with people who do not have an intellectual disability. Four of the programmes studied were provided by Special Olympics. In terms of internal psycho-social outcomes there are echoes in these papers in the findings described above. McConkey et al. (2012) in their cross-sectional, international evaluation of the Special Olympics Unified Sports programme in Europe/Eurasia, report that participants with intellectual disabilities developed in confidence and self-esteem through their participation in Unified Sports. Similiarly, Grandisson (2012), Castagno (2001) and Lyons & Ulrich (2009) report on the growth of self-esteem amongst individuals following participation in a Unified Sports programme. An increase in self-perception and general self-worth is reported by Riggen & Ulrich (1993) although this stands in contrast to the findings reported by Ninot et al. (2005) where there was no reported change in feelings of self-worth amongst the sample who participated in discrete groups in both segregated and integrated sports. Apart from Ninot et al (2005), there is consensus amongst studies of unified and

integrated sports programmes, reviewed here, that growth in confidence, self-esteem and a sense of self-worth can be consequent to participation in integrated sports.

Further, examination of outcomes relating to self-esteem, self-perception and confidence, with particular attention to methodological approaches may provide stronger evidence to support this proposition. Dykens & Rosner (1998) highlight an ongoing challenge of examining, through research, concepts such as self-perception and self-esteem with this population. They note that many persons with intellectual disabilities may have limited insight into their internal states, or may lack the verbal skills to express to their thoughts and feelings in response to fairly abstract concepts. Moreover, responses to standardized self esteem instruments or scales may engender limited comprehension and therefore be subject to acquiescence bias. There is a need for the development of accessible tools to address questions of self-esteem and self-perception with this population, which could present an opportunity for future research.

However Vogt et al (2012) examined a different approach to this issue. They measured electro-encephalographic activity changes in intellectually disabled individuals following a moderate running exercise for 30 min. They found significant changes in cortical current density in frontal brain areas as well as decreases in perceived physical energy. Overall motivational states (including self-confidence and social acceptance) as well as positive mood increased significantly. However, no changes could be observed for the cognitive tasks following exercise. They concluded that a self-selected, pace running exercise, enhances self-esteem, coincided with cortical activity changes in fronto-temporal brain areas. Thus bio-metric measures may offer another approach to the measurement of change.

Maladaptive behaviour

People with intellectual disabilities are reported to be more likely than the general population to be at increased risk of maladaptive behaviours. Although estimates of prevalence vary, Reiss (1990) suggest around 40 % prevalence of maladaptive behavious such as aggression, impulsivity, stereotypies and self-injurious behaviour. Much evidence of the beneficial role of exercise in reducing maladaptive behaviour is focused on individuals with ASD rather than the wider population of people with intellectual disabilities. Similar findings are also seen in studies which predate the timescale of this review, but are relevant for mention here, namely, Waters & Waters (1980) who reported a decrease in self-stimulatory behaviour amongst 5 boys with autism following their participation in an exercise (8-10 minutes of jogging), and Kern et al. (1982) who reported decreases in self-stimulatory behaviour and more appropriate academic responses following participation in mildly strenuous jogging.

Roseguard et al. (2001) examined the impact of participation in a Unified bowling programme on maladaptive behaviours, in a case controlled study of 80 Special Olympics athletes (40 intervention group, 40 control group). Following an 18-month intervention the authors reported a significant decrease in maladaptive behaviours in this group. Earlier, Elliot et al. (1994) examined the impact of vigorous aerobic exercise compared with general motor training in six adults with intellectual disability and autism, on maladaptive and stereotypic behaviour. Both interventions lasted for 20 minutes and measures were taken immediately afterwards. Those who took part in the more vigorous aerobic exercise were found to show significant reductions in the target behaviours, these findings were not matched in the general motor training group. Jones et al. (2007) also report positive effect observed in a decrease in frequency of challenging behaviours amongst 8 individuals with profound intellectual disabilities following their participation in a 3-month aerobic exercise programme.

All but one of these studies (Roseguard et al.) were limited by very small sample sizes, and it is not possible to generalize from the available evidence. Moreover, there is little understanding of the mechanisms through which exercise may be impacting on behaviours and indeed whether noted changes were sustained over time. There is scope for large-scale investigation as to the impact of participation in routine physical activity on maladaptive behaviours in people with intellectual disabilities. Since as Dykens & Rosner (1998) notes such behaviours are the primary reason for failure of living placements, justification for more restrictive levels of care and use of behaviour altering medications, it is worth examining whether routine exercise might have a long-term ameliorative impact.

Findings relating to external measures of well-being.

A number of the studies reviewed considered the impact of physical activity amongst people with intellectual disabilities on external psycho-social outcomes, such as peer acceptance and social inclusion. Carmeli et al (2008) report on the findings, which show an increase in perceptions of social acceptance and physical appearance on behalf of those 31 persons who took part in the 10-month physical activity programme delivered as part of this study. Findings presented by a number of studies related participation in physical activity to an increase in social interaction (Garcia-Villamisar & Dattilo 2010), social competence, (Dykens & Cohen 2009) willingness to make friends (Castagno 2001), peer acceptance (Gibbons & Bushraka 1989), development of enhanced social skills (Lyons & Ulrich 2009), as well as the opportunity to make friends and experience social inclusion (McConkey et al 2012). Indeed the latter study reported that participation in Unified Sports could lead to the growth of social capital for people with intellectual disabilities thus potentially leading to more embedded and sustainable opportunities for social inclusion.

Friendship and family relations

Many young people and adults with intellectual disabilities are at risk of poor peer relationships (Dykens & Rosner 1998). Cullinan et al. (1992) report that children with intellectual disabilities are more likely to be rejected or neglected than typically developing children. Whilst Siperstein et al. report that interactions between children with and without intellectual disabilities tends to show *'limited collaboration and shared decision making, a low level of cooperative play and shared laughter, and an asymmetrical, hierarchical division of roles.' (1997: 114).*

People with intellectual disabilities identify the opportunities to make friends and enjoy socializing as a motivating factor to take part in sports activities (Temple 2009, Peterson, 2008). Unified Sports programmes provided by Special Olympics, or indeed other integrated sports programmes offer particular opportunities for people with and without intellectual disabilities to meet and play sports together, with the potential to challenge negative attitudes towards intellectual disabilities and promote friendships. Indeed the SO Unified Sports programme state that the development of friendships and peer relationships is a specific aim of the programme. McConkey et al. (2012) reported that there was evidence of substantial changes in attitudes toward people with intellectual disabilities amongst the non-disabled partners, and through this, the emergence of friendships among the Unified Team participants. Importantly, in many instances this qualitative study stated that friendships were reported by many to endure outside of the sports environment. Many individuals talked of shared activities between young people with and without intellectual disabilities, which are typical of the kinds of things young people do – hanging out in the town square, going for coffee, sharing tastes in music and interests in sport. Young people with ID also talked of confiding in their peers without disabilities and asking advice. The development of peer relationships was also reported by Castagno et al. (2001) following their examination of outcomes of a Unified Sports programme, with coaches reporting that participants demonstrated a willingness to make friends as well as keenness to remain within the Unified Programme. Participation in sports and exercise was also reported to increase peer acceptance (Gibbons & Bushraka, 1989, Weiss 2003).

Two of the papers reviewed here specifically highlighted the impact on familial relationships through participation in sports activities. Grandisson et al (2012) report that parents talked of feeling proud of their sons/daughters with intellectual disabilities through their endeavours on the sports field and that they reported improvements in familial relations through the involvement of their child in sports. Mackintosh & Schleien (2004) present the benefits to families who shared in recreational sports activities with their children with intellectual disabilities. Highlighting how relationships were enhanced

through the shared activities and that the family had the chance to learn new skills through their joint participation.

A number of studies in this section highlighted evidence for greater social interaction developed through participation in sports (Garcia-Villamisar & Dattilo 2010) and lowered social isolation (Carmeli et al.2008). One significant finding presented was evidence of opportunities for social inclusion developed through sports participation and interaction with peers (McConkey et al. 2012, Grandisson et al 2012). That participation in sports programmes can produce challenges to the social exclusion of people with intellectual disabilities is an important development which could positively influence policy initiatives in this area.

Limitations and strengths of the studies

Again a number of these studies are limited by small sample size (Carmeli 2009, Mactavish & Searle 1992, Grandisson 2012) or attrition (Carmeli 2009). A number of studies rely on a voluntary or convenience sample (Carmeil 2008, Lyons & Ulrich 2009) or on samples who may already be predisposed to participation in physical activity and aware of its potential benefits (McConkey et al 2012, Lyons & Ulrich 2009). This group of studies relies on differing methodological approaches, heterogenous populations with differing experiences of physical activity, therefore whilst no meta-analysis would be possible, given the diversity described, a narrative synthesis of findings does demonstrate strength in the combined findings, which certainly suggest improved outcomes in a range of internal and external psycho-social dimensions for people with intellectual disabilities.

Areas for further research

An appropriately sized randomized controlled trial around a well-designed physical activity intervention would potentially provide robust evidence to support the findings for the diverse studies reviewed in this paper, and the proposition that participation in physical activity does enhance psycho-social outcomes amongst people with an intellectual disability.

A further area of additional research is highlighted by Heller (2011), who raises concerns regarding the sustainability of benefits gleaned from participation in activities, stating that evidence for sustained benefit over time is not available. This provides a challenge both to research, but also to those developing and implementing activity programmes.

Part 3: Barriers and facilitators to participation in physical activity amongst children and adults with intellectual disabilities.

Fourteen papers were included in the review of this section and they are described in Table 7 at the end of the report. In terms of study design, 12 were cross-sectional studies and one was a case controlled study. The final paper, which informed this section was a systematic review of evidence relating to barriers and facilitators of participation in physical activities amongst this population. Five of the studies reviewed originated in the USA and three in Canada, the remainder were from the UK (4) and Australia (2). The studies used a range of data collection approaches, both quantitative and qualitative to examine barriers and facilitators to physical activity.

This section will first discuss barriers to participation, then go on to consider factors which support participation in physical activities, before going on to highlight what works in engaging people with intellectual disabilities in sport and physical activities.

Barriers to participation

A range of barriers to participation were identified in the papers reviewed. These can broadly be divided into three categories: 1) environmental barriers, 2) structural barriers and 3) personal barriers.

1. Environmental barriers

Lack of access to facilities/equipment

Challenges of access to facilities and equipment was reported in five of the twelve studies reviewed (Howie et al. 2012, Mahy et al. 2010, Bodde et al. 2009,Temple & Walkley 2007, Messent et al. 1999). Ease of access facilities in which to participate in physical activities and the routine availability of equipment formed a particular focus of the study undertaken by Howie et al. (2012). A survey of 103 adults with intellectual disabilities revealed that approximately 2/3 of participants did not have routine access to sports or exercise equipment, almost half of those surveyed did not have access to an outdoor recreation area and almost 60% did not have access to an indoor recreation facility. Only 41.8% of participants participated in any kind of organised physical activity. Lack of access to equipment was more prevalent amongst those who lived alone or with their families, with those living in group homes being more likely to have access to equipment such as basketball hoops or bicycles.

This reported limited availability of or access to necessary resources (facilities and equipment) provides a context in which the points outlined below should be situated. Barriers consequent to limited finances and high cost of activities as well as lack of access to transport and challenges in gaining support because of the competing demands of time, are all the greater when access to facilities and equipment is not routinely or easily available to many.

Financial constraints

Nine of the twelve papers reviewed highlighted challenges faced by individuals in participating in physical activities consequent to the high cost involved in taking part (Barr & Shields 2011, Mahy et al. 2010, Robertson and Emerson 2010, Bodde et al. 2009, Temple 2007, Hawkins & Look, 2006, Frey et al. 2005, Hellar at al. 2002 and Messent et al. 1999). That financial constraints were so widely reported as an obstacle to participation in physical activities is relevant within what is known about the wider socio-economic position of people with intellectual disabilities, as Emerson et al. 2008 report, many are born into poverty and have limited economic power. Robertson and Emerson (2010), explore this matter in more detail in their analysis of data drawn from a large scale survey of the life experiences of 2784 people with intellectual disabilities living in the north of England. Statistical analysis of relevant variables, using bi-variate associations and binary logistic regression, revealed that participation in physical activity was associated with several indicators of socioeconomic disadvantage. Participants who were living in poverty, those who resided in areas of deprivation or who reported feeling unsafe in their area were less likely to take part in sports or physical activities. Findings also revealed that those who live in poverty were more likely to report a desire to take part in sports activities.

Transport, time and inclement weather

Perhaps linked to the financial constraints reported in a number of papers are the difficulties people experienced in accessing transport to travel to venues where the could take part in sport and exercise. Four of the reviewed papers identified this as an obstacle reported by participants (Mahy et al. 2010, Bodde et al. 2009, Frey et al. 2005 and Hellar et al. 2002). Additionally, pressures of time principally in relation to the competing demands on the schedules of caregivers (both parents and support workers) was identified as a barrier to participation (Barr & Shields 2011 and Hellar et al 2002). These factors also underline the dependence on others experienced by people with intellectual disabilities as many cannot access transport options independently and require the support to attend activities, which may not be available because of time pressures. Inclement weather was reported in three instances (Bodde et al 2009, Temple 2007 and Frey et al. 2005). Temple 2007 sought to identify a correlation

between lifestyle of participants and the barriers they reported to accessing physical activities. The group identified as 'sedentary' reported poor weather as an obstacle, however, this was not viewed as a barrier by the group who were reported to be 'active'.

2 Structural barriers

Eight of the twelve papers reviewed highlight a lack of adequate support as a barrier to people with intellectual disabilities engaging in physical activities (Barr & Shields 2011, Mahy 2010, Bodde et al. 2009, Temple& Walkley 2007, Hawkins & Look 2006, Frey et al. 2005, Hellar 2002, and Messent 1999). For Barr and Shields (2011) this was apparent in relation to parents not always being available to provide the 1-1 support their children with Down syndrome required in order to participate in sports or physical activities. Similar issues were reported in papers which highlighted the challenges faced in group home situations where staff ratios, or the availability of staff of the required gender, inhibited the provision of regular 1-1 support for individuals to attend activities (Mahy et al. 2010, Messent 1999).

Challenges reported in terms of available or indeed adequate support extended beyond those simply associated with numbers of staff or the competing demands of family life. Temple & Walkley (2007) as well as Messent (1999) stated that a lack of policy guidance in relation to the role of day and residential support staff in promoting or supporting service users engagement in physical activities, meant that it was not held as a priority and that indeed some staff did not see it as part of their job to engage with this aspect of service users lives. Messent (1999) reports frustration on the part of people with ID who were compelled to rely on others initiating activities and depend on others to support them to take part; stating that people would rather be able to freely participate in activities should they choose to. Instances where staff were found to lack sufficient knowledge as to where to exercise (Hellar et al 2002) or how to support individuals in pursuing physical activities (Temple & Walkley 2007) were reported. Hellar et al. (2002) reported a correlation between support staff attitude to physical activity and the likelihood that service users engaged in activities. Where support staff recognised the benefits of physical activity they were more likely to encourage service users to get involved in exercise, with the opposite also found to be the case. This point was also reflected in the findings reported by Temple and Walkley (2007) who found that support staff lacked interest, knowledge or skill in supporting people with intellectual disabilities to engage in physical activities. They reported that staff believed service users themselves were not favourably predisposed to take part in physical activities, however by contrast participants with intellectual disabilities were themselves positive about engaging in sports and exercise.

A number of studies reported barriers to participation in activities because of a lack of accessible programmes. Staff reported challenges in finding physical activity programmes, which were age appropriate to service users (Messent 2000). Parents stated that programmes did not necessarily need to be designed for people with intellectual disabilities and with small adaptations including the training of facilitators/coaches, then mainstream programmes become accessible (Barr & Shields 2011).

Personal barriers

Further barriers to participation in physical activities relate to personal matters identified by both care givers and by people with intellectual disabilities themselves. In some instances care givers reported that, in their experience, people with intellectual disabilities were disinterested in sports or exercise (Mahy et al. 2010, Temple & Walkley 2007). Whilst this may be the case for some people, as found by Temple (2007) this point was contradicted by participants with intellectual disabilities who were positive about taking part in activities (Robertson & Emerson 2010, Temple & Walkley 2007, Messent 1999). Feeling that exercise was too difficult, that they lacked skills or competence in undertaking activities were factors identified as barriers to participation by people with intellectual disabilities themselves (Temple & Walkley 2007, Hellar et al 2002). Individuals also reported that concerns about their health and having a negative body image prevented them from taking regular exercise. Some of these latter factors may explain what is interpreted by care givers as unwillingness to take part in physical activity. Dependence on others to support participation in physical activities was identified as a barrier by people with intellectual disabilities who reported being frustrated at not being able to take part freely and independently (Messent 1999). Although respondents with intellectual disabilities did report some intrinsic barriers to participation in physical activities, on the whole they were more likely to identify external factors relating to environmental and structural constraints.

A systematic review was conducted by Bodde et al, (2009) with the express aim of examining social and environmental barriers to participation in physical activities amongst people with intellectual disabilities. Seven papers were included in the analysis, each of which has been included in this review. The authors conclude that there are clear barriers to the routine participation on individuals with intellectual disabilities in physical activities and that these provide clear direction to policy makers in developing practical, environmental and personnel support to alleviate the barriers.

Finally Table 3 provides a summary of each barrier across the studies reviewed.

Table 3: Barriers to participation in physical activity.

	Financial constraints / socio-economic disadvantage	Lack of access to facilities /equipment	Lack of adequate or informed support	Limited knowledge of where or how to exercise	Medical or physiological factors /negative risk assessment	Lack of policy guidance within services	Lack of structured /accessible programmes	Lack of transport	Lack of time	Inclement weather	Not wanting to exercise / exercise too difficult
Barr & Shields 2011	x		x		x		x		x		
Mahy et al. 2010	x	x	x		x			x			x
Messent at al. 1999	x	x	x			x					
Messent et al. 2000							x				x
Temple & Walkley 2007		x	x			x					
Hellar et al. 2002	x		x	x				x	x		x
Robertson & Emerson 2010	x										
Howie et al. 2012		x									
Hawkins & Look 2006	x		x		x						
Frey at al. 2005	x		x					x		x	x
Temple 2007	x				x					x	x
Bodde et al. 2009	x	x	x			x	x	x		x	

Table 4: Factors that encourage participation in physical activity.

	Encouragement and support of family / carers & also carer givers who initiate activities	Enjoyable fun activities.	Social interaction with peers / friends	Availability of accessible / structured programmes	Personal characteristics – determination and perceived sporting ability	Routine and familiarity	Feeling competent at activities	Awards (medals) and affiliations (team colours as well as competition
Barr & Shields 2011	x	x	x	x	X			
Mahy 2010	x					x		
Messent 1999							x	
Temple & Walkley 2007								
Hellar 2002	x						x	x
Temple 2009	x	x	x	x			x	
Peterson 2008	x						x	

Encouraging participation in physical activities amongst people with intellectual disabilities.

Eight of the fourteen papers included in this review reported on factors that promote the participation of people with intellectual disabilities in physical activity. Table 4 summarises these factors across the studies reviewed.

The most commonly reported factor was the value of support and encouragement from family or care givers. This could take the form of initiating participation in activities (Mahy 2010), as well as accompanying people to activities and being generally enthusiastic and encouraging (Barr & Shields 2011). Hellar et al. 2002 report a strong link between the perspective of care givers to the benefits of physical activity and the likelihood of service users taking part in exercise. An understanding of the benefits of exercise is a strong motivator to staff to support service users in this area of their lives.

The social aspect of taking part in physical activities was reported to be an important motivator in encouraging people to participate (Temple 2009, Peterson et al. 2008). Moreover, activities were more attractive if they were fun and enjoyable but also purposeful in terms of goals and rewards rather than just activity for its own sake (Barr & Shields 2011, Mahy et al. 2010, Hellar et al. 2002). Temple & Walkley (2007) highlight the motivating influence of rewards in terms of playing in tournaments and winning medals, and affiliations in relation to wearing team colours. Mahy et al. 2010 also suggest that routine activities which become familiar encourage participation and this is linked to the reported positive influence of feeling competent and confident in the activities undertaken (Hellar et al. 2002, Messent et al. 1999). Self-efficacy, and perceived competence in activities were reported as factors which encourage individuals to sustain their engagement with exercise (Temple 2009, Peterson et al. 2008). Personal characteristics of determination and a perception of good sporting ability were also reported as factors, which encourage participation (Barr & Shields 2011, Temple & Walkley 2007).

In summary, the four factors which are associated with positive and potentially sustained engagement in physical activities include:

1. Leadership – the presence of individuals who will initiate, develop and provide ongoing support to people's participation in physical activity.

2. Competence – that individuals gain a sense of competence in the activities they undertake and therefore that they received adequate instruction and guidance in learning the skills of their chosen activity.

3. Motivation – activities should be fun, but they should also a purpose beyond simply being an end in themselves. Goals such as competition or rewards in the shape of ribbons or medals are reported to be strong motivating factors.

4. The social aspect – opportunities to make friends, see friends and be socially connected encourages ongoing engagement with exercise and activity programmes.

This review has presented evidence which supports the proposition that engagement in physical activities can have beneficial outcomes for people with intellectual disabilities both in terms of health and fitness as well as across a range of psychosocial outcomes including, emotional health as well as personal factors such as confidence and self esteem, the development of friendships, networks and the strengthening of familial relationships. When synthesized and reported together the strength of the evidence supporting the positive benefits of physical activity are striking. However, there is also evidence reported of a range of challenges in enabling individuals to access or maintain engagement with activities. However, given the numerous studies reporting on the high proportion of individuals who have a sedentary lifestyle and the health problems associated with obesity, the benefits to health and well being through taking part in regular exercise make it a priority area for policy and practice development.

Whilst in general participation in exercise and physical activity appears to provide a range of positive outcomes to varying degrees and in response to differential programmes, there are details reported in the literature, which are correlated with positive outcomes. Gibbons et al. (1998) found a correlation between longevity of engagement with a programme, in this case Special Olympics, and positive outcomes. This is endorsed by Dykens & Rosner (1998) as well as Dykens & Cohen (1996), who report a dosage effect, where length of time in a programme emerged as a powerful predictor of social competence. Having fun, developing friendships and experiencing opportunites to be more socially included are important motivating factors in stimulating as well as maintaining engagement with sports activities (McConkey et al. 2012, Grandisson et al.2012, Garcia- Villamisar & Dattilo 2010, Castagno et al 2001). Goal focused training based around competitive goals and external validation of effort such as medals or ribbons are also identified as discrete factors, which encourage engagement in sports (e.g. Weiss et al. 2003).

Limitations and strengths of studies reviewed in this section

A number of limitations are apparent in the accounts of the studies undertaken and reviewed above. The use of proxy reporting (gathering information from parents / care givers) meant that the views of people with intellectual disabilities were not ascertained in response to the particular research questions (Barr & Shields 2011, Hawkins and

Look 2006). The mode in which samples were accessed to take part in studies could have led to a bias in findings, for instance, where participants were a self-selected (Barr & Shields 2011, Messent 1999). A small sample size in relation to the methods of data collection or analysis employed also limited the quality of evidence of a number of studies (Howie 2012, Hellar 2002).

However, a central strength of the evidence produced from this group of papers, which addressed the issue of what factors pose barriers and what enables participation in physical activities, is that findings can be triangulated across papers. Studies with diverse populations and different methodological approaches have produced similar or resonating findings. It is therefore apparent that the combined evidence produces a clear response to the identification of factors that inhibit as well as those which encourage the routine participation of people with intellectual disabilities in physical activities. This evidence provides an opportunity for policy and practice responses to be developed to address the issues presented by this battery of research.

Areas of potential future research

Existing evidence does not adequately address the question of choice in relation to engagement in physical activities and tends to presume participation where activities are available. Questions regarding duty of care versus freedom of choice come to mind. It is important to take into account the needs of individuals who may not wish to take part in formalized sports or exercise but nevertheless there is also the necessity to highlight and emphasise the health needs of taking some form of exercise be it as simple as regular recreational walking.

Future Directions

The collection of research studies reviewed in this report can serve a number of purposes. First, it confirms the benefits that can accrue to people with intellectual disabilities from participating in physical activities and sports. Second, it identifies a range of methodologies that can inform future research studies. Third, it highlights the gaps in knowledge and provides some direction as to how they could be addressed.

Benefits

The gains from participating in sports for people with intellectual disability parallel those reported in the wider literature for non-disabled persons[1]. The benefits include improved physical fitness, better emotional welling and psycho-social gains such as improved self-confidence and self-esteem. These are commendable outcomes often achieved through means that stand in marked contrast to medically oriented interventions that are used by psychologists and therapists with this population, especially when they show particular deficits in functioning or maladaptive behaviours. Hence there is a growing evidence base which suggests that encouraging people with intellectual disabilities to participate in physical activities and sports is a worthwhile endeavour and one that should be supported to a greater extent than it has been in the past by families, care staff and service providers. Moreover these types of interventions fit easily into modern aspirations for inclusivity and an ordinary life for persons with intellectual disability that feature in Governmental reports from these islands as well as internationally[2].

However a number of cautions need to be entered regarding the limitations of the available evidence.

- Studies that show a positive benefit are more likely to be published than those which report little or no effect. Moreover, investigators often fail to complete planned studies because of methodological issues such as recruitment difficulties or measurement issues. Hence the extant literature may give an overly positive impression of the benefits accruing from sports and physical activities.
- All persons with intellectual disabilities may not benefit equally given their individual circumstances and characteristics. As yet there is insufficient information to identify those persons who may face particular problems in benefiting from physical activities but it is likely to include those with more severe impairments, those who are older and possibly those who come from more impoverished family circumstances.

[1] http://www.sportanddev.org/en/learnmore/sport_and_health/the_health_benefits_of_sport_and_physical_activity/

[2] Department of Health and Children, (2010) *Summary of Key Proposals from The Review of Disability Policy*. Dublin: Office of Disability and Mental Health.

- There is limited information also as to the optimal amount of activity or sports participation that is needed to produce noticeable benefits for persons. Although there are some dangers of excessive participation, the bigger issue seems to be the low levels of physical activity within this population and although a modest increase in physical activity is a start, this may be insufficient to make a difference in terms of fitness levels and health outcomes. To date the main form of exercise has been walking but this may not be done sufficiently strenuously to produce increased heart rate or sufficiently often to enable improvements in overall fitness levels. The applicability of the age-related targets set for the general population needs to be ascertained for persons with intellectual disability (e.g. at least 150 minutes of fast walking every week[3]). Further research could usefully explore other activities that are suited to this population and which may offer increased opportunities for improving fitness levels. For example dance seems worthy of further exploration as would various sporting activities within Special Olympics such as cycling. To date there has been sparse analysis of the differential benefits of participating in various sports and of the match between the person and the sports most suited to that individual.
- The evidence for benefits comes mainly from interventions that have taken place over relatively short time periods. Although it is encouraging to have evidence for immediate gains, these studies leave open the possibility that the gains are not sustained once the intervention winds down and the initial enthusiasm and extra supports fade. Further information is needed regarding the supports required to sustain improvements in fitness levels. In this respect, interventions that can be delivered on a regular basis are likely to be preferable to time-limited, special programmes that are modeled on therapeutic interventions.

Research methodologies

The dominant research methodology to date has relied on convenience samples of people with intellectual disabilities participating in designated activities over a period of time. Although such studies are considered to provide a relatively weak source of evidence, when their findings are summated in a report of this nature, they can provide more compelling evidence especially when participants come from various countries and with varying characteristics. Moreover these studies suggest that investment in further empirical research is worthwhile provided more robust methodologies are used to further our understanding of how people with intellectual disability can benefit from physical activity and sports. Three weaknesses exist in the research methodologies used to date and which future studies need to address.

[3] http://www.nhs.uk/Livewell/fitness/Pages/physical-activity-guidelines-for-adults.aspx

1. Use of representative samples

People with intellectual are a heterogeneous population and it is not easy to obtain representative samples that can reflect the diversity of impairments and socio-economic backgrounds of these individuals. One cost-effective approach is to use existing datasets of persons such as the Healthy Athlete data that is collected by Special Olympics[4]. Analysis of this data may help to identify subgroups of persons who are at particular risk of health problems such as obesity. Moreover if this data could be supplemented by records of athletes' participation in sports, then it would be possible to trace the correlates with health status; for instance the influence of gender and socio-economic background on sports participation and health. A further refinement would be to monitor changes in health status over time and examine the relationship with athletes' participation in sports. For example, is participation in certain sports more likely to produce improved health benefits?

Representative sampling as a research strategy would require an investment in data gathering and analysis but the costs of building upon an existing dataset would be very much less than those involved in creating a new cohort of persons with intellectual disabilities. The obvious criticism of this approach is that the athletes in Special Olympics are not representative of the wider population of persons with intellectual disabilities. However this can be addressed to some extent by making comparisons with existing datasets that define the wider population. In this respect the Republic of Ireland has a particular advantage as a National Database is maintained annually of persons with intellectual disability who receive or need services[5].

2. Randomised control trials

The gold standard from attesting the efficacy of interventions is the use of randomized control trials that compare two or more groups of persons who have been randomly assigned to receiving the intervention(s)[6]. In addition the persons assessing the impact of the impact are 'blind' as to the grouping of the participants in the trial. In recent years there is growing use of this methodology with persons with intellectual disability although it is not without its methodological and ethical issues[7].

However these designs also place a particular onus on the researchers to define more precisely the nature of the intervention that is provided. This dimension is often not well described in the current literature: for example, the persons delivering the interventions,

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[4] http://www.specialolympics.org/healthy_athletes.aspx

[5] Kelly, C., Craig, S. & Kelly, F. (2011) *HRB Statistics Series: Annual Report of the National Intellectual Disability Database Committee, 2010*. Dublin: Health Research Board.

[6] http://www.bmj.com/content/316/7126/201

[7] http://www.ncbi.nlm.nih.gov/pubmed/12000585

the training provided to them, the amount of time devoted to the activities; assessments of compliance by participants in the activity and drop-outs from the programme.

Equally researchers need to be more precise about the outcomes they are seeking to achieve through their intervention. Given that there are potentially many possible outcomes as evidenced by this review, a common approach is to identify primary and secondary outcomes. The former are those most directly linked to the intervention and which if achieved, might produce the secondary outcomes. Thus the primary outcomes from a cycling intervention could be improved fitness and weight loss with secondary outcomes being improved self-esteem and fewer instances of maladaptive behaviours. Conversely a dance intervention might posit improvements on psycho-social indicators as primary outcomes with health indicators as secondary. In either case, better science results from a considered and limited number of outcomes as the relationship with the features of the intervention can be more easily traced and explained.

3. Measurement

A third methodological weakness are the measures used in research studies. Two facets are worthy of further development.

- To date greater reliance has been placed on third party reports rather than obtaining data directly from persons with intellectual disabilities. In part this is due to their cognitive and communication impairments but increasingly adaptive communication strategies can enable people with marked communication impairments to contribute to data gathering[8]. Their contribution is especially necessary when assessing the impact of activity on psycho-social outcomes such as emotional well-being.

- Often so-called 'soft indicators' such as ratings scales have been used to identify changes in people's fitness and health as well as their social networks and other psycho-social attributes. This underplays the contribution that biometric measurement can make to evaluating the impact of the activity on individuals. Although there are practical limitations and possible issues around gaining consent, these are not insurmountable and future research might incorporate testing of participants in an appropriately appointed physiological and biochemistry laboratory.

Gaps in Knowledge

A literature review not only identifies what is known but also the existing gaps in knowledge as it highlights issues and aspects of the topic that past research has not addressed or done so insufficiently. Given the breadth of the issues incorporated in this

[8] http://en.wikipedia.org/wiki/Augmentative_and_alternative_communication

review, many gaps can be identified but six in particular are arguably especially relevant in Ireland at present.

- The barriers to participation in sports and physical activity are well defined in the current literature and we have some indication as to the strategies that can be used to overcome them (see pages 32,33). What is lacking is a programmatic evaluation that demonstrates a significant reduction of the chosen barriers and describes the processes used to achieve this. This evaluation might be undertaken at a local, regional or national level as resources permit. In this research the focus is less on the people with intellectual disability but rather on their support systems. Thus an example could be an evaluation of the use of existing support staff in day centres to provide an activity programme for older persons.

- To date there has been limited attempts to provide a more holistic approach to improved health of persons with intellectual which would entail incorporating other dimensions to physical activity interventions. An obvious example is nutrition and diet. The combination of these two approaches is increasingly promoted with the general population[9] but the impact on persons with intellectual disability remains largely untested. A related issue is the sustainability of improvements resulting from the time-limited intervention. Sustained change may necessitate a life-style change for persons and yet the opportunities for doing this can be quite limited for persons with intellectual disability who often lead quite circumscribed lives.

- Cultural influences around the value of sport in particular are under-explored in the present body of research which has emanated from a predominantly affluent western culture. However even within countries there are ethnic and cultural variations that may influence participation in physical activities and sports, for example female participation may be discouraged. Future research should at a minimum report the ethnic make-up of the samples and where possible examine this as an explanatory variable.

- Thus far, most of the interventions are conducted as a specialist intervention. Might they prove effective within mainstream settings and programmes? This option is attractive as it increases the accessibility of persons with intellectual disability to sports and activity programmes. However the effectiveness of this strategy is dependent on the attitudes, knowledge and skills of mainstream coaches and non-disabled participants. However there are promising indications from the Unified Sports Programme within Special Olympics that this could be a feasible strategy[10].

[9] http://www.nhs.uk/Livewell/Goodfood/Pages/Sport.aspx

[10] http://www.specialolympics.org/unified_sports.aspx

- There is a strong impression in the literature that the interventions are developed *for* rather than *with* people who have an intellectual disability. Admittedly this in keeping with most of the supports they receive but it does raise issues regarding the extent to which individuals are intrinsically motivated to attain and maintain a healthy lifestyle. Future studies should aim to incorporate their participation as a focus in the design and implementation of interventions and evaluate the longer-term as well as immediate outcomes that result. For example, self-monitoring of activity and selected health indicators may foster intrinsic motivation.

- The costs of providing the interventions has received little attention in past research. Future studies should attempt to estimate the costs of providing physical activity and sports programmes so that judgments can be made regarding their cost-effectiveness and value-for-money. This aspect may become more crucial if persons with intellectual disability receive individualised funding that enable them to receive the support and activities of their choice. Cost-effectiveness data is all the more powerful when comparisons can be drawn against other forms of interventions (e.g. programme of physiotherapy) although this is still an emerging field of enquiry.

Ongoing Issues

Finally, there are a number of issues related to further research that need to be noted.

- Obtaining the informed consent of persons to participate in both the intervention and in the evaluation of the same has not always been well addressed in the studies reviewed to date. Legislative changes will make this mandatory but in any case there is a growing literature around good ethical practice in research that future studies should embrace[11].

- The value of research is only realised when the findings are effectively disseminated to people who are make use of them. This obviously includes decision-makers in governmental and service provider agencies but equally crucial are front-line support staff and family members who are well placed to improve the lives of people with intellectual disability. More challenging but arguably the most crucial, is ensuring that persons with intellectual disability are also informed about the outcomes of the research. This is more likely to be achieved if they are active participants in undertaking the research[12]. Including people with intellectual disabilities as active researchers would bring a new dimension to research in the area of sports and physical activity.

[11] http://www.nda.ie/cntmgmtnew.nsf/0/232F61AE5397A93D802576650052B3B9/$File/ethicsfootnotes.html

[12] http://www.fedvol.ie/Inclusive_Research_Network_IRN/Default.241.html

- A recurring issue is the balance between an individual's choice not to participate in physical activity and thereby perpetuate an unhealthy lifestyle with the 'duty-to-care' that families and service personnel have to the person. This balance has to be negotiated for each individual who is given the opportunity to participate. Further learning could be obtained from those who chose not to participate in physical activity.

In conclusion, we would commend Special Olympics Ireland for commissioning this review. It has provided a unique opportunity to bring together a diverse but growing literature on an aspect of intellectual disability that has previously been ignored. As we have hopefully shown, there are clear signposts for future research which if realised promise to provide fuller and healthier lives for people with intellectual disabilities.

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Table 5: Fitness and Health outcomes associated with participation in physical activities.

(NB Studies are listed alphabetically by author)

Author, date and location	Sample	Methods	Main Findings	Level of Evidence
Anchuthengil et al. 1993, USA	Six adults with ID living in an institutional setting.	Case controlled study aimed at assessing the effect of an individualized treadmill programme on cardiovascular fitness. Subjects were randomly assigned to experimental group (n=3), or a control group, (n=3). The experimental group underwent a treadmill exercise training programme five times per week x 12 weeks. The control group received no structured exercise programme. Treadmill exercise training tests were carried out every four-week on both groups. After the 1st 12-week period the control group began the treadmill programme, whilst the intervention group embarked on a maintenance programme with exercise twice weekly.	Findings indicated reduced heartrate and significantly increased peak oxygen uptake. The maintenance programme was effective in maintaining the cardio-vascular fitness gains. This is a safe and effective programme for adults with ID developing cardio-vascular fitness.	V
Bartlo and Klein, 2011, USA	Systematic Review	Eleven clinical studies met inclusion criteria. Interventions studied included a variety of physical activity modes.	Critical review revealed moderate to strong evidence that physical activity positively affected balance, muscle strength, and quality of life in individuals with intellectual disability.	n/a
Baynard T, Pitetti KH, Guerra M, Unnithan VB, Fernhall B., 2008, USA	180 persons with MR without DS, 133 persons with MR with DS, and 322 persons without disabilities in four age categories: 9-15, 16-21, 22-29, and 30-45 yr	Aim - To investigate age-related changes in aerobic capacity in persons with MR, with and without DS, using a retrospective analysis. Subjects underwent treadmill testing with peak HR and VO2peak measurements.	Relative VO2peak was lowest for persons with DS across all age groups. VO2peak did not change after 16 yr in the individuals with DS, whereas the other groups exhibited a slight decline (approximately 10 mL x kg(-1) x min(-1)) with age. Peak HR was overall different between all three groups ($P < 0.001$), and the youngest age group had the highest peak HR versus the other three age groups ($P < 0.0001$).	VI

Calders et al. 2011, Belgium.	Forty-five adults with intellectual disabilities with an average age of 42, average BMI of 24, average IQ of 56.	A controlled trial which aimed to investigate the effect of combined aerobic and strength training on metabolic and physical fitness of adults with ID. Participants received either combined exercise training (n=15), endurance training (n=15) or no training (n=15). Groups were matched fro age, gender and degree of ID. Measures of lipid profile, physical fitness, blood pressure and body composition were made.	Compared to no training the combined exercise training revealed significant positive effects on total cholesterol levels, aerobic capacity, muscle strength and resting systolic blood pressure. Compared to endurance training, combined exercise training resulted in a significant better evolution to total cholesterol, strength, muscle fatigue resistance, sit-to-stand and systolic blood pressure thus indicating a tendency towards beneficial effects of combined exercise training in adults with ID. No decrease in BMI was reported amongst any of the sample groups.	II
Carmeli et al. 2004. Israel.	Fourteen participants with mild intellectual disabilities and arterial occlusive disease.	Cross-sectional study to evaluate the efficacy of a walking programme in fitness, pain reduction and blood parameters. Participants took part in low-endurance walking at a comfortable speed 3 times per week.	Participants showed significant improvements in walking speed, distance and duration. Pain levels were reduced. Blood hemodynamic parameters showed significant improvements. The authors conclude that low-intensity treadmill walking significantly improved functional capacities of adults with mild ID with vascular occlusion and reduced pain levels.	VI
Chai-Ling et al. 2010. Taiwan.	146 adults with ID aged between 19-67 years.	Cross-sectional study aimed at examining the effectiveness of healthy physical fitness programmes on people with ID living in an institutional setting. The programme intervention consisted of 40 min activity programme x 4 times per week. Activities include sports, acrobatics, jogging dancing and walking up stairs. Data was collected on participants BMI and physical fitness before and after the intervention.	Findings demonstrated a decrease in BMI scores and improvement in the majority of fitness tests excepting the shuttle run test. Results were positively correlated with degree of ID, with those with a mild ID showing the greatest improvements.	VI
Cluphf et al., 2001 USA	27 adults with intellectual disabilities engaged in a study to determine the	Purpose was to determine the effects of a 12-week, 3-days/week low impact aerobic dance programme. An interesting dimension to this work, aside from the positive benefits accrued to the subjects from participating in the study, was	Very positive outcomes from participating in programme but long term adherence was negligible and after 18 weeks the differences in aerobic scores between the control and experimental groups was	VI

	effects of a 12-week, 3-days/week low-impact aerobic dance programme on the cardiovascular endurance of adults within ID	that in spite of these once the 12-week programme was over, participants did not exercise.	virtually non-existant.	
Cuesta-Vargas et al. 2011, Spain.	266 adults (mean age 31.1) with intellectual disability (187 males and 79 females) who took part in the Spanish Special Olympics Games.	Cross-sectional study which aimed to describe the physical fitness profile of adult athletes with ID and highlight any differences in the physical performance of more physically active and less physically active individuals. A questionnaire was used to collect data on the health status of participants and how often they take part in physical activity. A series of fitness tests were used to assess participants flexibility, strength/endurance, balance and cardiovascular capabilities.	Assessing the frequency of physical activity, 44.3% participants were classified as sportspersons and the rest as non-sportspersons. A significant difference was found in degrees of flexibility between genders, higher for females for one test but higher for males in the other three. No significant difference was found between other variables of physical fitness, although the men's scores were higher in strength/endurance and balance. No significant difference was found in comparisons of the scores between sports persons and non-sportspersons, with the exception of one test for flexibility. Differences among groups and gender were not statistically significant in most of the tests. The findings illustrate an unclear and inconclusive relation between the scores and the declared level of physical activity, this may be due to the context in which participants for the study were selected.	VI
Davis et al. 2011, USA	Twenty-five students with intellectual disabilities – 9 boys and 16 girls with mild intellectual	Cross-sectional study aimed at testing the efficacy of a programme designed to combat childhood obesity. A health-related fitness intervention focused on cardio-vascular endurance, flexibility, muscular strength and	A significant increase in the health-related fitness scores was obtained after the 8 week intervention as well as a slight decrease in BMI although the latter was not significant.	VI

	disabilities and aged 9-10 year.	endurance activities was completed for 30 min per day x 5 days per week x eight weeks. Fitness measures were taken before and after the intervention and they included 16m shuttle run, modified curl-up test and the back-saver-sit and reach test as well as BMI.		
Draheim et al, 2003, USA	No. 145 (72 women, 73 men) adults with mild mental retardation;	The purpose of this study was to determine whether cardiovascular disease risk factors differences existed between Active Special Olympians, Inactive Non-Special Olympians, and Active Non-Special Olympians.	Resting blood pressure, total and abdominal body fat, fasting cholesterol profiles, and fasting insulin were measured in 145 adults with mild mental retardation. Active Special Olympians (n=45 possessed lower diastolic blood pressure, body fat percentages, abdominal fat and insulin than Inactive Non-Special Olympians (n=38) and possessed lower body fat percentages than Active Non-Special Olympians (n=62).	VI
Ewing et al. 2004. USA	92 individuals with intellectual disabilities and 97 individuals with no intellectual disability.	Case controlled study aimed at evaluating the impact of an 8-week cardiovascular disease risk reduction training programme. The programme emphasized exercise, good nutrition and stress reduction. BMI, levels of exercise and healthy eating choices were measured before and after the intervention.	Decreases in BMI were apparent in the non-ID group, but not for the entire ID group. 43.5 % of people with ID showed increased knowledge of good nutritional choices, there was no significant change in levels of exercise in the ID group.	V
Frey & Chow 2006, Hong Kong / USA.	444 youth with mild intellectual disabilities aged 6-18 years from 8 special schools in Hong Kong.	Cross-sectional study aimed at examining the relationship between BMI, physical fitness and motor skills in this sample. Participants were assessed for physical fitness using e.g. minute run, sit-up, isometric push-up, sit and reach and sum of skin fold. Functional motor skills were assessed using the Test of Gross motor Development 11. Participants were categorised to be of normal weight or overweight/obese according to BMI measures.	20% of the sample were categorised as overweight/obese. Findings showed that being overweight/obese is minimally associated with aerobic fitness and muscular strength in this group. BMI did not impact on non-aerobic fitness measures or on motor skills. Authors note that the high levels of overweight/obesity in this sample should have immediate attention/intervention.	VI
Frey et al 1999, USA	18 subjects (14 males and 4 females), equally divided between	The purpose of this study was to compare physical fitness levels of trained runners with mild mental retardation and those without. Measurements of Vo2 max, percentage body fat,	Knee flexion and extension strength were significantly greater in runners without MMR compared to those with MMR. It was concluded that trained runners with MMR	V

	trained runners with mild mental retardation and those without.	lower back/hamstring flexibility.	can achieve high levels of physical fitness comparable to individuals without MMR.	
Giagkoudaki et al. 2010, Greece.	20 participants - 10 people with Down syndrome (group A) aged between 22-27 years and 10 matched non-ID sedentary individuals (group B).	Case controlled study to investigate the effects of an exercise training programme on heart rate variability (HRV) in individuals with Down syndrome. At baseline all participants took part in a clinical examination and an ambulatory 24h Holter monitoring for the evaluation of cardiac autonomic nervous system (ANS). Group A took part in a 6-month exercise training programme and then underwent the same HRV measurements.	Findings indicate that individuals with Down syndrome have cardiac autonomic nervous system dysfunction, which can be improved through regular exercise.	V
Golubovic et al. 2012, Serbia.	87 school children aged between 6.5 – 12 years. 42 enrolled in special school and said to have mild or borderline intellectual disability, 45 of the children attended a mainstream school.	Case controlled study with the aim of determining whether and to what extent engagement with an exercise programme could affect the development of physical fitness in children with ID. Three groups were established, 1: 21 students with ID who took part in the fitness programme; 2: 21 students with ID who did not take part in the fitness programme, 3; 45 typically developing students who did not take part in a fitness programme. The intervention group took part in a 6-month experimental fitness programme, which was designed around the needs and abilities of each participant. The programme was delivered on a 1-1 basis. The Eurofit Physical Fitness Test Battery, devised by the council of Europe, was used with all participants at a 6-month interval, with the intervention being delivered within this six months.	Children with ID scored significantly lower on all physical fitness tests than typically developing children. Performance was associated with degree of intellectual disability. Improvements in fitness were closely related to physical exercise.	V
Gonzalez-Aguero, A., Vicente-Rodriguez,	Systematic Review	The data reviewed from the literature showed a general trend toward lower values of physical fitness parameters and worse body composition variables in children and adolescents with Down	Noteworthy in this review was the fact that children and adolescents with DS have often been described as less active or overprotected; however these factors may	Systematic Review

G., Moreno, L., Guerra-Balic, M. and Casajus, J. (2010) , Spain		Syndrome compared with the population without ID or even with the population with ID without DS.	not be the cause of their poor physical fitness. Many of the training programmes carried out in children and adolescents with DS did not yield the desired responses, and the reasons are still unknown.	
Guidetti et al. 2010, Italy.	64 total participants, 22 were track and field athletes, 19 played basketball and 23 were non-athletic (took	Cross-sectional study aimed at assessing the physical fitness of athletes with intellectual disability compared with those who take part in recreational physical activities, the contribution of sport specialization to athletes' fitness and the correlation between each fitness variable and the level of ID. Before and after a 9-month period all participants performed fitness tests assessing body composition which included: flexibility, arm muscular strength, lower and upper body muscular strength and endurance, explosive leg power, cardiovascular endurance, balance ability and motor coordination.	Findings suggested that participants' weight, BMI and balance ability were significantly affected by time. All athletes improved significantly whilst not athletic people decreased in muscular strength endurance. Track and field athletes improved significantly in motor coordination, which decreased slightly in the non-athletic group. ID level was positively correlated with motor coordination. The authors report that these findings show that physical activity improved fitness in adult athletes with ID, decreasing health risks.	VI
Gupta et al. 2010, India	23 children with Down syndrome, aged 7-15 years, attending a special school.	Randomised controlled trial aimed at determining the effect of an exercise training programme on strength and balance in this group. The intervention group (n-12) underwent progressive resistance exercise for lower limbs and balance for six weeks. The control group continued with their regular school activities. A handhled dynamometer was used to measure the lower limb and muscle strength, balance was assessed by the Bruininks Oseretsky Test of Motor Profiency (BOTMP).	Following training the intervention group showed a statistically significant improvement in lower limb strength in all of the muscle groups assessed. Balance also showed significant improvement. The study suggests that a specific exercise training programme may improve the strength and balance in children with DS.	II
Hemayttalab, 2010. Iran	Forty boys with intellectual disabilities aged between 7-10 years	Case-controlled study aimed at investigating the effects of physical training and calcium intake on bone mineral density (BMD) in this group. Participants were randomly assigned to four groups: 1) training group + calcium intake; 2) training group – calcium intake; 3) non-training group + calcium intake; 4) non-training group –	All groups showed increases in femoral neck BMD after 6 months. The increase in the training + calcium group was 10% greater than in the Training – calcium group. It was apparent that the effect of training was greater that the effect of calcium intake as the Training - calcium	V

		calcium intake. The training intervention involved 45 minutes x 3times per week x 6 months. The nutritional supplement was a calcium rich food using enriched cows milk with added vitamin D, also delivered over 6 months. Measure of femeral neck BMD were taken before and after the interventions.	group achieved a 4% greater increase in BMD over the non-training +calcium group. Overall the training+calcium group achieved the greatest increase in femoral BMD.	
Kaplan et al. 2003, USA	56 older adults with moderate to profound intellectual disabilities.	Cross sectional study aimed at examining the physiological effects of participation in Tai-Chi on seniors with intellectual disabilities. Participants took part in a 45 min x 2 times per week x 26 week programme of Tai-Chi exercises. Data were collected prior to an following the exercises, 8 physiological measures were taken, systolic and diastolic blood pressure, heart rate, upper extremity reach, body temperature, 2 measures of balance.	Significant improvements were noted in balance, upper extremity reach and respiration. Heart rate, systolic and diastolic blood pressure increased during participants engagement in Tai-Chi exercises. Body temperature was unchanged.	VI
Lotan et al. 2004 (a), Israel.	15 children with intellectual disability.	Cross-sectional study aimed at assessing the effects of a short-term daily treadmill intervention on physical fitness and functional ability. Participants used the treadmill daily for 2 months.	Findings suggest a significant improvement in the levels of physical fitness of participants, measured by pulse at rest and during effort. The improvement in physical fitness was correlated with a significant improvement in functional ability of participating children.	VI
Lahtinen, et al. 2007, Finland.	33 female and 44 male adolescents with intellectual disabilities.	Cohort study, documenting the physical performance of participants over a 30-year period. The study analysed data collected at four time points, 1973, 1979, 1996 and 2003. Participants were aged 11-16 at time 1, 17-22 at time 2 34-38 at time 3 and 41-46 at time 4.	Improvements were found in strength/endurance, static valance and manual dexterity during early to late adolescence, but these were found to decline during adulthood. On average male adults were moderately overweight, females were obese. The effect of IQ, degree of ID, was significant on balance and manual dexterity.	VI
Lotan et al. 2004 (b), Israel.	4 girls with Rett syndrome aged 8.5-11 years.	Cross-sectional study aimed at investigating the feasibility of a physical exercise programme to promote fitness and health in this group of children.	Physical fitness of the children had improved significantly at the end of the training programme. General functional abilities had also improved. The authors	

		Participants too part in a daily treadmill programme over 2 months. Data were collected at three time points, 2 months apart with the intervention taking place between tests 2 and 3. Pulse measures were taken at rest and during training. Functional assessment was taken for a 31-item motor-functioning tool designed for this study.	conclude that a daily exercise programme can improve the functional ability of children with Rett syndrome and that this programme can be delivered by a non-professional person under the supervision of a physical therapist.	
Marks et al. 2010, USA.	56 adults with intellectual disabilities, all Special Olympics athletes.	Cross-sectional study aimed at evaluating a health promotion programme aimed at improving physical fitness and lifestyle behaviours. Data were collected using interviews at baseline and after the programme with the 56 a participants and also with 54 coaches, residential staff and parents. Data was also collected from 5 programme directors after completion of the programme.	Findings suggested that there were positive health and psycho-social benefits including improved perceived health, reduced body weight and increased fiber intake, improved self-confidence and more positive attitudes towards exercise. The paper also discusses themes relating to implementing the health promotion programme many of which deal with the barriers to physical activity identified later in this report.	VI
Moreau KL, Degarmo R, Langley J, McMahon C, Howley ET, Bassett DR Jr, Thompson DL., 2001, USA	24 postmenopausal women with borderline to stage 1 hypertension at baseline, 12 wk, and 24 wk	Fifteen women in the exercise (EX) group walked 3 km.d-1 above their daily lifestyle walking, whereas 9 women in the control (CON) group did not change their activity. Walking activity was self-measured with a pedometer in both groups.	Resting systolic BP was reduced in the EX group after 12 wk by 6 mm Hg ($P < 0.005$) and was further reduced by 5 mm Hg at the end of 24 wk ($P < 0.005$). There was no change in diastolic BP with walking. The CON group experienced no change in BP at either 12 or 24 wk. Body mass was modestly reduced by 1.3 kg in the EX group after 24 wk ($P < 0.05$);	VI
Ozer, 2005, Turkey.	37 Special Olympics footballers aged and 37 peers who did not practice sport. Participants were aged between 17-20.	Case controlled study to assess physical fitness and body image of regular sports participants against non-sporting individuals. Athletes practiced for 8 weeks x 3 times per week x 1.5 hours.	SO athletes had lesser thickness of triceps folds compared to the control group. Athletes also performed better in tests of flexibility, standing long jump, hand grip strength, shuttle run and push-ups, trunk lift, as well as in body image tests.	V
Ozmen et al. 2007,	Thirty boys aged 8-15 years with mild –	Case controlled study aiming to investigate the effects of a school-based cardio-vascular fitness	Significant increases in 20 m shuttle run test were found in the experimental group.	V

Turkey.	moderate intellectual disabilities.	training programme on this sample. Participants were divided into two groups, an experimental group and control group. The experimental group took part in a I hour session x 3 times a week x 10 week training programme working at 60-80% peak heart rate.	No improvements were found in percent of body fat. No changes were found in the control group. The authors conclude that a school based training programme may prove useful in improving cardio-vascular fitness in children with intellectual disabilities.	
Pitelli and Fernhall 2004, USA	Study 1 – 119 MR/ 395 subjects without MR	Study 1 – compared youth with MR (62 males, 57 females) and without (244 males, 151 females0; Study 2 – compared youth without MR (41 males, 39 females) to youth with MR in the first study matched on age, gender, and body mass index (BMI).	Independent of other factors, youth with MR but without DS showed significantly higher running performance than youth with DS; and youth without MR showed significantly higher running performance than youth with MR, with and without DS.	VI
Rimmer and Kelly, 1991, USA	24 adults (13 women and 11 men) ranging in age from 23 to 49 years were recruited from two intermediate care facilities in North Illinois	A progressive resistance training programme was developed for a group of adults with mental retardation (aged 23 – 49 years).	Results indicated that a 2-day-a-week resistance training programme was effective in improving the strength levels of this population. It was also revealed that the resistance training programme was favorably received by the participants and could be performed with minimal assistance.	V
Stanish & Draheim, 2007, USA.	103 adults with intellectual disabilities, 38 female, 65 male, aged 19-65 years of age.	Cross-sectional study to examine the walking activity, body composition and blood pressure of adults with intellectual disabilities. Participants wore a pedometer for 7 days and were categorized into walking levels based on step counts. Measures of health variables were also taken.	@ 80% of the sample was overweight or obese. Most participants accumulated 5000-7999 steps per day. Those who walked more did not have significantly lower blood pressure of body composition. It was concluded that the intensity of walking may have been insufficient for individuals to achieve health benefits and that intake of high fat foods countered potential walking benefits.	VI
Stopka, C. et al 1994, USA	12 individuals with MR, ages 17 to 21 years	Cohort participated in a 30-min resistance training programme twice a week for 23 weeks. Approximately 40 to 45 mins of aerobics and sport skill activities supplemented each resistance training to total 75 mins of training per session.	Upon conclusion of the of the resistance training programme, those subjects with MR demonstrated significant absolute and relative strength gains in all tests of bilateral muscular strength and sit ups. The conclusion was that adolescents/young	V

			adults with moderate to severe MR can participate and experience significant improvements through a supervised resistance training programme.	
Swartz AM, Strath SJ, Bassett DR, Moore JB, Redwine BA, Groër M, Thompson DL., 2003, USA	Eighteen women (53.3 +/- 7.0 years old, 35.0 +/- 5.1 kg/m(2)) with a family history of type 2 diabetes	Subjects completed a 4-week control period followed by an 8-week walking program with no changes in diet. The walking program provided a goal of accumulating at least 10,000 steps/day, monitored by a pedometer.	During the control period, participants walked 4972 steps/day. During the intervention period, the participants increased their accumulated steps/day by 85% to 9213, which resulted in beneficial changes in 2-h postload glucose levels (P < 0.001), AUC(glucose) (P = 0.025), systolic blood pressure (P < 0.001), and diastolic blood pressure (P = 0.002).	VI
Tamse et al 2010, USA.	32 participants, 15 Special Olympics athletes and 17 typically developing individuals, age range of participants 19-14 years.	Case-controlled study to examine the effects of moderate intensity resistance training programme on strength of SO athletes. Data were collected before and after an intervention. The intervention consisted of 1 set (8-12 repetitions) over 12 sessions, using weight equipment to do rowing, leg curls, leg extensions, chest press and abdominal crunch.	The findings show that both similar and significant strength gains can be accomplished amongst Special Olympics athletes and typically developing persons. Moderate intensity training is recommended for the populations tested and may result in vocational and athletic performance gains.	V
Thompson DL, Rakow J, Perdue SM., 2004, USA	Height, weight, body fat percentage (%BF), waist circumference, and hip circumference were measured on eighty women (50.3 +/- 6.8 yr). For 7 d after testing, each subject wore a pedometer throughout the day while following her normal daily routine	Subjects were placed in groups to reflect different levels of physical activity: inactive (<6000 steps x d), somewhat active (6000-9999 steps x d), and regularly active (> or = 10,000 steps x d).	A significant correlation was found between average steps per day and %BF (-0.713, P < 0.0001); body mass index (BMI) (-0.417, P < 0.0001); waist circumference (-0.616; P < 0.0001); hip circumference (-0.278; P = 0.013); and waist-to-hip ratio (-0.652; P < 0.0001). There was a significant difference in body composition variables among activity groups, with higher values found in the less active groups	VI
Tsimaras & Fotiadou,	25 adults with Down syndrome with an	Case controlled study with the aim of evaluating the effect of training on the muscle strength and	Results showed statistically significant improvement in all measured values	V

2004, Greece.	average age of 24.5 years.	dynamic balance of participants. 15 participants took part in a 12 week training programme aimed at improving balance and muscle strength, the remaining 10 formed a control group. Measures were taken before and after the intervention and included peak torque, isokinetic muscle endurance, dynamic balance ability and leg strength.	compared with the control group. It was concluded that improvements to physical and kinetic abilities are consequent to a well-designed training programme in this group.	
Tsimaras et al. 2009, Greece.	Twenty-four adults, aged 24-25 years, with (16) and without (8) intellectual disabilities separated into three groups.	Case controlled study aimed at evaluating the effect of basketball training on muscle strength of adults with ID. Participants were divided into three groups, 1) n=8, adults with ID participating in a 4-year basketball exercise programme (the training group); 2) n=8 adults with ID who exercised occasionally (recreational group); 3) n=8 adults without ID (control group). All participants performed a leg strength test.	The training group presented higher torque scores for knee extensors and flexors whereas the recreational group presented higher antagonistic activity for knee extensors and flexors. Both groups of participants with ID presented higher antagonistic activity for knee extensors and flexors than the control group. The authors conclude that participation in basketball may be an effective strength training strategy for adults with ID.	V
Tsimaras et al. 2012, Greece.	17 participants with intellectual disabilities aged between 18-10 years.	Case controlled study to assess the effect of participation in a traditional Greek dance-training programme on dynamic balance. 10 participants took part in the training group and 7 in a control group, those in the training group expressed a desire to learn Greek dance. Training lasted 45 mins x 3 times per week x 16 weeks. Outcomes were measured using a balance deck, in 30,45 and 60 second intervals.	Individuals in the training group showed significant improvement in balance following the intervention.	V
Tudor-Locke C, Jones R, Myers AM, Paterson DH, Ecclestone NA, 2002, Canada	18 retired, older adults (6 men, 12 women; group M age = 69.0 yrs, SD = 9.5, group MBMI = 25.6 kg/m2, SD = 4.3,)	Examined the physical activity and exercise habits of independent-living older adults from a structured exercise program, noting the contribution of formal and informal exercise participation relative to total daily physical activity measured using pedometer and daily activity logs	Participation in structured exercise was an important contributor to total physical activity and the only source of resistance and flexibility training, despite frequent walking for exercise outside of class	VI

Table 6: Psycho-social benefits to participation in physical activities

(NB Studies are listed alphabetically by author)

Author, date and location	Sample	Methods	Main Findings	Level of evidence
Carmeli et al. 2008, Israel.	Voluntary sample of 62 adults with intellectual disabilities living in residential care.	Case control study aiming to measure the impact of participation in exercise on BMI, self-perception, health and quality of life. Participants divided into two matched groups, one intervention group n=31, one control group n=31. The intervention group took part in a 3 x times per week exercise programme x10 months. 3 measures applied at 3 time points – T1, baseline, T2, mid-intervention, T3, post intervention. Measures include BMI, Harpers Self-Perception Profile and NP (Hunt 1007) To access health and quality of life.	Findings suggest a positive relationship between perceived well- being and physical exercise. Participants in the intervention group were found to have enhanced perceptions of well being in terms of their social acceptance and physical appearance. Participation in exercise also showed significant positive changes in relation to the basic dimensions of NHP: energy, social isolation and physical mobility No change was found in relation to BMI measures.	V
Carmeli et al. 2009, Israel.	24 people with mild Intellectual disabilities and mild anxiety.	Randomised controlled trial to assess the impact of participation in physical activities on anxiety reduction, which may improve quality of life. Participants randomised to 3 groups: aerobic training (n=8), leisure activities (n-8) control group (n=8). The aerobic programme consisted of three bicycle or treadmill sessions per week x 6 months. Those randomised o the leisure programme participated in activities from games to general exercise. The Hamilton Anxiety Scale (HAM-A) was used to measure the severity of symptoms of anxiety and Quality of Life.	After 6 months the experimental (aerobic training) group, and the leisure group showed significant improvements. These findings would suggest that the implementation of physical training programme or a structured leisure programme may significantly reduce anxiety levels in this population. Further research is needed as numbers were low in this study and levels of attrition meant that only 16 of the original 24 participants completed the Ham-A.	II
Castagno 2001, USA.	57 males and 1 female aged between 11-14 years. 24 of these had an intellectual disability	Cross-sectional study with the aim of describing changes in athletes with and without an intellectual disability who took part in a Special Olympics Unified Sports programme. Data collected before and after their participation, which took place over an 8 week period for 1.5	Statistically significant positive change in self-esteem was found for both athletes and partners after participation in the programme. Both groups significantly improved their basketball skills.	VI

	(Special Olympics 'athletes'), 34 did not have an intellectual disability (Special Olympics 'partners')	hrs per session, x3 times per week. Data was collected using: 1) Self-Esteem Inventory (Zigler 1994) 2) Adjective Checklist (Siperstein 1980) 3) Basketball Sports Skills Assessment (Special Olympics 1992).	Both athletes and partners choose adjectives to describe people with intellectual disabilities, which were significantly more positive after participation in the programme. Coaches perceived increased self-esteem, greater willingness to make friends and desire to stay in Unified Sports amongst both athletes and partners.	
Dykens and Cohen 2009, USA.	104 Special Olympics athletes with an average age of 22	Cross-sectional design – paper report on triangulation of data across three studies; 1. Examined the relationship between athlete's time in Special Olympics and behaviour. 2. Compared the behaviour of this group who were part of Team USA In the 1993 World Games with a matched group on non-Special Olympians. 3. Assessed the behaviour of team USA before and 4 months after their participation in the World Games.	Length of time in Special Olympics was the most powerful predictor of social competence. SO athletes has higher social competence scores and more positive self-perceptions than the comparison group. Triangulation of data from the three studies suggests a link between Special Olympics and social competence more so than to behavioural domains.	VI
Elliot, et al. 1994. USA.	6 adults with autism and moderate to profound intellectual disabilities.	Cross-sectional study aimed at examining the effects of exercise on maladaptive and stereotypic behaviours. Participants took part in either aerobic exercise or general motor training activities.	The aerobic exercise group was found to reduce maladaptive and stereotypic behaviours immediately following the period of exercise.	VI
Garcia-Villamisar & Dattilo 2010, Spain.	71 adults with ASD, 37 randomly assigned to intervention group, 34 randomly assigned to waiting list group.	Randomised controlled trial to assess the impact of a group leisure programme on adults with ASD. Pre- post test measures were made using: 1) Quality of Life questionnaire (Caballo et al. 2005) and The Stress Survey Schedule for persons with Autism (SSS) (Groden et al 2001).	Findings demonstrated significant increase in the four factors of quality of life that were measured (satisfaction, independence, competence and social interaction) as well an increase in the total score for quality of life from baseline to the end of the intervention 12 months later. The control group demonstrated no significant improvements related to stress or quality of life.	II
Gibbons & Bushakra 1989,	48 children with intellectual disabilities aged	Case controlled study that aimed to examine changes in perceived competence of young people taking part in a Special Olympics athletics	Results show that children who participated in the track and field event showed significantly higher scores on the	V

USA.	between 9-13 years.	event. Each athlete took part in at least 6 track and field events and ribbons were awarded on an Olympic style podium afterwards. The total sample of 48 were comprised of two groups, the participation group n=24 (13 male, 12 female), the control group n=24 (9 male, 15 female). The Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (Harter et al. 1983), was administered with all children before the athletics meet and again afterwards.	physical and peer acceptance subscales of perceived competence than children who did not participate.	
Grandisson et al. 2012, Canada.	20 adolescents aged between 12-19 years and their parents (n=20) as well as 39 support staff	Cross-sectional design using qualitative methods of data collection namely, semi-structured interviews with young people and their parents; a self-completion questionnaire.	Main themes drawn from the data are as follows: Through participation in integrated sports reported improvements were in relation to young peoples' self-esteem, increased social inclusion, the development of motor, social and cognitive abilities. The opportunity to have fun was valued. Parents reported feeling proud of their child and that there were improvements in the parent /child relationship.	VI
Hellar et al. 2004, USA.	53 adults with Down syndrome aged 30+. (29 females and 24 males) who were randomised into a training (n=32) or control (n=21) group.	Randomised controlled trial to assess attitude change and psychosocial outcomes. The training group took part in a 12- week, 3xdays per week exercise and health education programme. Outcome measures included attitudes towards exercise (cognitive-emotional barriers, outcome expectations and performance self-efficacy) and psycho-social well-being (community integration, depression and life satisfaction).	The training group showed significant changes in attitudes towards exercise, including increased exercise self-efficacy, more positive expected outcomes, fewer cognitive- emotional barriers, improved life satisfaction and marginally lower depression.	II
Jones et al. 2007, UK (Scotland)	8 persons with profound intellectual disabilities, informant report.	Cross-sectional study using observations and standardised measures for data collection, to evaluate the impact of a physical exercise programme. Data collected before and after intervention at 3-month interval. Measures include: Physiological assessment checklist to	Participation in the exercise program was associated with decreases of frequency of challenging behaviors and increases in quality of life and alertness. The authors concluded that barriers to the development and implementation of ongoing exercise	VI

		assess physical function, Life Experience Checklist (Agar 1998) and Aberrant Behaviour Checklist (Aman et al 1985). Intervention- bespoke needs led physical exercise programme including rebound therapy using trampoline, as well as walking, swimming, hydrotherapy and team activities.	programs in continuing care settings can be overcome by trained and motivated care staff.	
Lyons & Ulrich 2009, USA.	42 parents of children with intellectual and physical disabilities who participated in the 'Miracle League' – a network of baseball organisations for children with disabilities.	Cross-sectional study aimed at understanding parents perceptions of the need for physical activity, the benefits of physical activity and the effect on families of young people taking part in the Miracle League. Parents completed a survey, which included closed and open questions.	The findings indicate that parents perceive that the children grow in self-esteem; as well as improvement in motor functions and social skills. Authors note the reliance of the League and its participants on parental initiation and ongoing support of the activities.	VI
McConkey et al. 2012, Germany, Ukraine, Hungary, Poland, Serbia	The total sample included young people with intellectual disabilities - athletes (n=156), young people without intellectual disabilities - partners (n=106) and 65 coaches. A subsample participated in qualitative data collection.	Cross-sectional study aiming to evaluate the outcomes from one sports programme which brought together players with and without intellectual disabilities (ID) with particular reference to the processes that were perceived to enhance social inclusion. Demographic data was collected on the total sample using a proforma and completed by coaches. A sub-sample 5-6 athletes, 5-6 partners, 5-6 coaches, 5-6 parents and 5-6 representatives of the local community participated in 1-1 semi-structured interviews, team interviews were also carried out.	Qualitative data analysis identified four thematic processes that were perceived by informants across all countries and the two sports to facilitate social inclusion of athletes. These were: (1) the personal development of athletes and partners; (2) the creation of inclusive and equal bonds; (3) the promotion of positive perceptions of athletes; and (4) building alliances within local communities. Unified Sports does provide a vehicle for promoting the social inclusion of people with intellectual disabilities that is theoretically credible in terms of social capital scholarship and which contains lessons for advancing social inclusion in other contexts. Nonetheless, certain limitations are	VI

			identified that require further consideration to enhance athletes' social inclusion in the wider community.	
Mackintosh & Schleien 2004, Canada.	65 families with a child with a developmental disability participated in first phase (survey) and 16 of these in 2nd phase (1interview).	Cross-sectional design used to assess the nature, benefits of and barriers to physical recreation activities in these families. Data collected using postal survey and then with a sub-sample semi-structured interview.	Recreation and physical activity usually involved mothers and their children in swimming, bike riding, walking. Parents viewed these interactions as beneficial for enhancing family relationships and providing children, particularly those with a disability, opportunities for skill and self-development within an accepting and supportive environment. Challenges identified reflect those reported in the section on barriers to physical activity namely competing schedules as well as finding activities to accommodate a wide range of ages and skill levels.	VI
Mactavish & Searle 1992, Canada.	26 older adults with intellectual disabilities (12 female, 14 male)	Case controlled study examining the effect of a physical activity programme, designed to facilitate choice and responsibility, on perceptions of competence, locus of control and self-esteem held by older individuals with mental retardation. Participants randomly assigned to an intervention or control group. The intervention group took part in a 5-week physical activity programme. Semi-structured interviews were carried with all participants before and after the intervention.	The results suggested that physical activity may provide a means through which older people with intellectual disabilities can exercise an element of control in their lives; can enhance their perceptions of self competence, locus of control, and self-esteem.	VI
Ninot et al. 2005, France.	32 adolescents aged between 13-17 years, divided into 4 homogenous groups. 2 of these groups categorised as 'athletic' and 2 as controls. The two athletic groups took	Case controlled study using repeat measures to assess change over time in relation to athletic ability, perceived physical competence and general self-worth. Data gathered on 10 occasions over a 32 month period using The Harter Self-Perception Profile for Children 11	Findings suggested that here was no change in perceived general self-worth for the four groups; and that there was significantly lower perceived athletic competence only for the integrated swimming group, despite the increase in athletic performance. It is suggested by the authors that this lowering of self-perception is the consequence of making	V

	part in either integrated swimming (n=8) or segregated swimming (n=8) the two controls took part in adapted physical activities at school (n=8) or were classified as sedentary (n=8).		comparisons within a wider field of athletes rather than those encountered within segregated environments. It is also suggested that this broader field and experience leads to a more realistic estimate of competence even though it reflects a reduced self-perception.	
Riggen & Ulrich 1993, USA	72 adults with intellectual disabilities, aged 18-40 years and all male.	Case controlled study used to compare the benefits gained by Special Olympics athletes who played Unified Sports by comparison with those who played traditional sports. Sample was comprised of three groups, 1. n=25 participating in Unified basketball 2. n=25 participating in traditional Special Olympics (segregated) 3. n=25 control group not participating in any sports. Pre- post measures were administered in relation to a 12 week basketball training session which culminated in a tournament, Measures included the Harter (1983) Perceived Competence Scale for Children designed to measure self-perception; additionally two measures of physical ability were used, one to estimate cardiovascular fitness and the second to assess basketball skills.	Findings show that amongst Unified athletes' there was an increase in social self-perception, which remained unchanged amongst traditional athletes. There were no changes in perception of physical or general self-worth for either traditional of Unified athletes. Both sporting groups demonstrated significant improvements in their basketball skills but not in cardiovascular fitness.	V
Roseguard et al. 2001, USA.	80 people with ID aged between 11 – 80 years (mean 32). Divided into treatment (n=40) and control groups(n=40). The treatment group took	Case controlled study. Data collected by parent report using the Child Behaviour Checklist, which was administered before, immediately after and 18 months after the intervention. The aim was to examine the effects of participating in a Unified Bowling programme on maladaptive behaviours amongst Special Olympics athletes.	A significant decrease in both internal and external maladaptive behaviors was reported in the treatment group for this study.	V

	part in a 12 week unified bowling programme.			
Rosenthal-Malek & Mitchell, 1997, USA.	5 adolescents males with ASD in a school setting.	Cross-sectional study aimed at examining the impact of an aerobic exercise programme, which consisted of 20 minutes jogging, on self-stimulatory behaviours and academic performance.	Findings showed a significant decrease in self-stimulatory behaviour following the physical exercise. Academic performance increased after aerobic exercise as compared to classroom performance during academic exercises.	VI
Weiss et al. 2003, Canada.	97 Special Olympics athletes and their parents. Randomly selected sample. Participants aged between 9-43 years.	Cross-sectional study. Aim to examine relations between physical activity programme (namely SO) and self-concept, perceived physical competence and self-worth. Self report and informant report. Interviews and standardised measure which included – demographic information, IQ measure using K-BIT (Kaufman & Kaufman 1990), to assess Self-concept - Perceived Competence Scale for Children and Perceived Competence Scale for Special Athletes (Riggen 1992); Competence was assessed by the Adaptive Behavior Scales- Residential and Community Edition, Second Edition (ABS-RC2; Nihira, et al.1993).	In assessing multidimensional aspects of participants' self-concept, findings indicate that different Special Olympics components are related to various facets of an individuals' view of the self. While the length of time in Special Olympics, the number of medals won, and the number of total competitions were all related to athletes' sense of general self-worth, only the latter of the three was found to be a significant predictor. The more athletes participate in competition, from local to international level events, the more positive their general self-worth, after controlling for age and IQ. However competition, when combined with peer acceptance, parental support, and a positive coaching style, can lead to improvements in athlete self esteem.	VI
Vogt et al. 2012, Germany	12 males with intellectual disabilities aged between 18-16years.	Cross-sectional study which aimed to localise changes in brain cortical activity in relation to mood and cognition after moderate exercise which constituted a 30 run.	Significant changes in cortical current density in frontal brain areas as well as decreases in perceived physical energy could be shown. Overall motivational states (including self-confidence and social acceptance) as well as positive mood increased significantly.	VI

Table 7: Barriers and supports to participation in physical activity amongst people with intellectual disabilities.

(NB Studies are listed alphabetically by author)

Author, date and location	Sample	Methods	Main Findings	Level of evidence
Barr, M. & Shields, N. 2011. Australia.	20 parents (16 mothers and 4 fathers) of 18 children aged 2-17, with Down syndrome (10 girl and 6 [sic] boys). Sample self – selected and drawn from members of a voluntary sector advocacy organisation	Cross-sectional study, aiming to explore the barriers and facilitators to physical activity in this group. Qualitative methods using semi-structured interview technique and thematic analysis of verbatim transcripts.	**Main facilitators to participation:** 1.Familys' have an important role in supporting and encouraging participation. 2. Young people are encouraged to participate through enjoyment of social interaction with peers. 3. Young people's personal determination to succeed combined with 'good' physical and communication abilities. 4. The availability of structured accessible programmes. **Main barriers to participation:** 1. Characteristics associated with Down's syndrome – hypotonicity, heart conditions, weight and physique, communication abilities. 2. Competing family responsibilities – lack of parental involvement, time constraints, safety concerns, cost/financial constraints. 3. Reduced physical/behavioural skills. 4. Lack of accessible structured programmes.	VI
Frey G.C. 2005. USA.	12 adults with intellectual disabilities	Cross- sectional design used to examine barriers to physical activity, qualitative study guided by interpretative ethnography – data collected using semi-structured interviews, 7day activity diaries and informal observations.	Barriers to participation in physical activity included: 1. Lack of guidance from care givers 2. Comments made by care givers being interpreted negatively and becoming	VI

			detrimental to motivation to take part in physical activity 3. Financial constraints 4. Lack of transport 5. Inclement weather. Authors report that 1 + 2 reflect the most salient barriers.	
Hawkins A. & Look R. 2006. UK.	19 Support staff in day and residential services	Cross-sectional design aiming to explore barriers to participation in physical activity, qualitative study – daily diaries and semi-structured interviews.	Identified barriers to physical activity included: 1. Staff not knowing where to participate in physical activity 2. Financial constraints 3. Risk assessment – concerns about clients' safety.	VI
Hellar, T. et al. 2002. USA.	44 adults with Down syndrome age 30-57 (avg.40) 41% female Data collected directly and by proxy from carers	Cross-sectional design focused on determinants of physical activity participation, using quantitative survey and scales supplemented by interviews	The study indicates low levels of physical activity among adults with Down syndrome with only 41% taking regular exercise and for most this was walking. Social and environmental factors were found to play a key role in determining exercise participation, carers perception of the benefits of exercise influenced how much the person with DS exercises. When carers perceived greater benefits, the individual with DS was more likely to exercise. **Access barriers included**– cost, lack of transport, lack of knowledge of where to exercise, no one to exercise with. **Cognitive-emotional barriers** perceived by adults with DS were, lack of time, exercise being too difficult, concerns about their health. These were not reported by the carers as barriers, with ¼ of carers reporting that the persons with DS lacked energy or were lazy. This points to a need to educate re; benefits of exercise. One	VI

			possible motivator is that activities should be fun, enjoyable, stimulating and offer social opportunities.	
Howie E.K. 2012, USA.	103 adults with intellectual disabilities	Cross-sectional design, aimed at describing physical activity resources available to adults with ID in home and day programmes. Demographic data was collected as well as survey data focused on the physical activity environment at participants' homes and the facility or workplace were they spent their days.	Approximately 2/3 of the adults in the survey lacked routine access to sports or exercise equipment, almost half of those surveyed did not have access to an outdoor recreation area, almost 60% did not have access to an indoor recreation facility and only 41.8% took part in organised physical activity. Those who lived in group homes were more likely to have access to equipment than those living alone or with their families. Lack of resources is a barrier to regular physical activity amongst adults with intellectual disabilities.	VI
Mahy J. et al. 2010. Australia.	6 adults (5 female, 1 male) with Down syndrome, 12 support people – 4 mothers of adults with Down syndrome and 8 care staff (2 male, 6 female)	Cross-sectional study, to explore barriers and facilitators to physical activity among this group. Qualitative methods using semi-structured interview technique. A phenomenological theoretical framework and grounded theory method were used to underpin data analysis.	**Main facilitators of participation:** 1. Support from others – that physical activity participation was initiated by a support worker/parent and that support was enthusiastic and encouraging. 2. Physical activity should be fun and purposeful in terms of rewards and goals rather than just activity for its own sake. The social aspect is important. 3. Routine activity that is familiar facilitates participation. **Main barriers to participation:** 1. Lack of support – either in terms of practicalities – transport/finances, or in relation to supervision at an individual level; additionally lack of community support in terms of availability of suitable activities or limited acceptance/awareness of needs.	VI

			2. Individuals not wanting to engage in physical activity. 3. Medical or physiological factors e.g. overweight, poor body image, gout, heart conditions.	
Messent P.R. et al. 1999. UK.	24 adults with ID (10 female and 14 male) who participated in a 10 week community based exercise programme and12 day and residential managers and care staff.	Cross-sectional study qualitative methods using semi-structured interview technique, content analysis of transcribed interviews.	**Barriers identified by care staff:** 1. Lack of clarity regarding policy provision for residential and day services re: physical activity for people with intellectual disabilities 2. Limited financial resources within the services or in the personal budgets of individuals with ID. 3. Staff ratios to low to enable 1-1 support to attend physical activities, also gendered support not always available e.g. male staff to support male client to swimming. 4. Access to leisure facilities, geographical location **Barriers identified by participants with intellectual disabilities:** 1. Dependence on others to initiate and support their access to and participation in physical activity. 2. Participants expressed frustration at the fact that they enjoy physical activity but were unable to freely do so. 3. Participants recognised benefits of participation in exercise classes and each had activities that they preferred.	VI
Messent P.R et al. 2000. UK.	24 adults with ID (10 female and 14 male) who participated in a 10 week community based exercise programme and12 day and	Cross-sectional design to assess barriers to participation in physical activities. Data collected using qualitative methods namely, semi-structured interview technique, content analysis of transcribed interviews.	Staff concerns that in striving to find activities that were age appropriate to clients meant that fun opportunities were excluded. Staff posited that clients preferred integrated rather than segregated (only for people with ID) activities.	VI

	residential managers and care staff.		Balance between promoting physical activity and healthy lifestyle with clients right to choose.	
Peterson, J.J. et al. 2008. USA	152 adults with mild/moderate intellectual disability living in a community setting.	Cross-sectional design used to test perceptions of social support and self-efficacy for leisure physical activity participation amongst adults with intellectual disabilities. Data collected using standardised measures and checklists to assess self-efficacy and social support by self-report. A self-reported checklist was used to measure frequency of participation in physical activities.	Degree of self-efficacy and available social support significantly predicted participation in physical activities.	VI
Robertson J. & Emerson E. 2010. UK.	2784 adults with intellectual disabilities	Cross –sectional design to examine factors associated with sports participation. Data collected using a survey instrument gathering data on a range of life experiences of people with intellectual disabilities. Completed in person by interview or by proxy where necessary. Statistical analysis of relevant variables using Bivariate associations and Binary logistic regression.	Participation in physical activity was influenced by personal characteristics and environmental factors but not found to be related to the support needs of individuals. Participation was linked to indicators of socio-economic disadvantage. Participants who were poor, those living in deprived neighbourhoods and those who felt unsafe in their homes were less likely to participate in physical activities. However, those from reduced backgrounds were found to be more likely to indicate that they would like to participate in sports.	VI
Temple V.A. 2007, Canada	37 adults with ID	Case control study quantitative correlational study design, data collected using pedometers and survey.	Two groups identified – one sedentary, one active. Barriers identified differed for each group – sedentary group highlighted feeling lazy, feeling they were prohibited from exercise, health concerns and the weather as barriers. The active group identified the cost of physical activities as prohibitive.	V
Temple, V.A. 2009,	13 adults with intellectual	Cross-sectional study aimed at identifying factors associated with high levels of physical activity.	Three main themes were identified as factors which encourage and support	VI

Canada	disabilities aged between 18-46 (mean 34) who were deemed to be physically active – showed 10,000 +steps per day on a 7-day pedometer test.	Data collected using in-depth semi-structured interviews.	engagement in physical activity amongst this group: 1. Leadership – key individuals are important in fostering initial interest in taking part in physical activity and encouraging skill development. 2. Know how – coaches, staff and parents are important in showing people how to do the activities, and also how to access activities, such as travelling to leisure facilities. 3. Motivation – key factors are the associated friendships and social connections.	
Temple V.A & Walkley J.W 2007. Canada.	**9 people with intellectual disabilities** aged between 18-41 years, 6 male, 3 female; **5 day care centre workers** with 2 -20 yrs experience, **15 group home supervisors**, 9 rural, 6 urban, **4 group home managers** with between 6 – 21 years experience, **7 parents** of people with intellectual disabilities, one male and 6 female.	Cross sectional design to explore factors, which enable or inhibit participation in physical activities. Data collected using qualitative methods, namely focus group interviews, six focus groups carried out, one for each group of participants. Nvivo software used for data management and for coding and data analysis.	Staff and parents reported that the majority of people with ID are not favourably predisposed to participation in physical activity. Parents and staff largely focused on psychological and emotional factors such as attitudes to exercise as barriers to participation, rather than social or environmental factors. By contrast participants with ID were positive about engaging in physical activity, this was particularly the case where appropriate supports were available and where participants felt they were themselves competent at the activity. Additionally rewards and affiliations were viewed positively, wearing team colours, playing in tournaments and winning medals were reported as motivational. Factors that undermined engagement were reported by the group with ID; these included lack of support in undertaking activities and uncertainty as to how to for example use fitness equipment.	VI

			Amongst staff there was a lack of interest, knowledge or skill in supporting people with ID to access physical activity/sports. Parents suggested that staff lacked confidence in promoting/supporting physical activity. Attempts to outsource this work to people in the sports / leisure industry were sometimes made but they lacked the skills in working with people with ID. Staff and parents reported that for change to happen in service delivery, policy changes were required to provide guidelines to staff in supporting people with ID to access physical activities. Without a policy directive residential support staff did not consider it their responsibility to provide routine access to physical activity for the residents with ID.	