HEALTH-PROMOTING PHYSICAL ACTIVITY OF ADULTS WITH MENTAL RETARDATION

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ABSTRACT

This review of literature describes the physical activity behavior of adults with mental retardation consistent with the U.S. Surgeon General’s recommendation of 30 minutes of moderate intensity physical activity on 5 or more days per week. The proportion of participants achieving this criterion ranges from 17.5% to 33%. These data are likely to be generous estimates of activity as individuals included in physical activity studies to date have been relatively young and healthy volunteers with mild to moderate limitations. Major sources of physical activity were walking and cycling for transport, chores and work, dancing, and Special Olympics. There is a pressing need to conduct studies using appropriately powered representative samples and to validate measures that assess physical activity less directly; including methodologies where proxy respondents are used. Accurate information about existing patterns of behavior will enhance the development of effective strategies to promote physical activity among persons with mental retardation.
1 Key Words
2 Mental Retardation; Physical Activity; Health Promotion

4 Callouts
5 1. The U.S. Surgeon General recommends that adults accrue 30 minutes of moderate intensity physical activity on most, preferably all, days of the week.
6 2. The proportion of adults with mental retardation achieving 30 minutes of moderate intensity physical activity on 5 or more days per week ranged from 17.5% to 33%.
7 3. A majority of participants were not accumulating sufficiently long bouts, or enough minutes per day, of physical activity to meet the Surgeon General’s recommendation.
8 4. Major sources of physical activity were walking and cycling for transport, chores and work, dancing, and Special Olympics. Walking for transport was by far the most prevalent form of physical activity; however, the intensity was often low or low-moderate.
INTRODUCTION

Over the past 10 years government agencies have identified physical activity as a leading health indicator directly correlated with the development of certain chronic diseases such as obesity and diabetes. The standard recommendation is that accruing 30 minutes of moderate intensity physical activity on most, preferably all, days of the week serves as a preventative health measure [U.S. Department of Health and Human Services, 2000; World Heath Organization, 2003]. Moderate intensity physical activity corresponds to 3.5-7 Kilocalories/min or 3.0-6.0 metabolic equivalents (METs), which are multiples of resting energy expenditure (i.e., 3.0 METs = 3 x the cost of resting energy expenditure). This shift toward moderate intensity physical activity as a public health message is potentially more inclusive and realistic for the general population than previous recommendations that focused on vigorous exercise. From a public health perspective, physical activity has been clearly defined and operationalized as an attainable health behavior.

While it is well documented that people with mental retardation (MR) experience high rates of morbidity and mortality associated with hypoactive diseases [Sutherland et al., 2002], little is known about physical activity as a preventative health behavior in this population. Individuals with MR comprise a subgroup that is considered predominantly sedentary and at elevated risk for health problems associated with inactivity [Rimmer and Braddock, 2002]. People with MR have higher rates of diabetes and high blood pressure than adults without MR [Draheim et al., 2002a; Janicki et al., 2002; Rimmer et al., 1995], low physical fitness levels [Fernhall and Pitetti, 2001; Graham and Reid, 2000], and high
obesity rates [Rimmer et al., 1993]. These health profiles are attributed to and suggestive of highly sedentary behavior, but there is a paucity of data to support this conclusion. People with MR are typically not included in large-scale population studies and there have been few attempts to document physical activity patterns or identify factors that influence activity in these individuals [Temple et al., in press]. Adults with MR have also received relatively less attention in health promotion efforts or physical activity campaigns. In 2001, the U.S. Surgeon General held a conference to address health disparities in people with MR and set an agenda to reduce these disparities. The resulting Closing the Gap document provided a national blueprint outlining goals and action steps to improve the health of this population segment [U.S. Public Health Service, 2002]. It is noted in the document that individuals with MR have fewer opportunities for exercise, and exercise and fitness were identified as a potential targets for health promotion. However, the term “physical activity” is not mentioned anywhere in the resource, which highlights a major disconnect from the health priorities specified for the general population [U.S. Department of Health and Human Services, 2000; World Health Organization, 2003].

People with disabilities are specifically mentioned in 5 of the 15 Healthy People 2010 physical activity goals. According to baseline data in this document 56% of people with disabilities engage in no leisure time activity compared to 36% of people without disabilities. The disparity between groups is less when examining those who engage in 30 minutes of activity 5 or more days (disabled = 12% v. non-disabled 16%), but becomes more pronounced when a 20 minutes, 3 days per week criteria is used (disabled = 23% v. nondisabled = 33%). Less than 20% of adults with disabilities engage in
vigorous activity that promotes fitness or activities that promote muscular strength [U.S. Department of Health and Human Services, 2000]. These statistics could be more representative of disability due to aging or other disease conditions (e.g., diabetes, respiratory illness) because disability is broadly defined as those with activity limitations, who use assistance, or who perceive themselves as disabled. People with MR may not fall within any of these criteria, thus there exists little information on physical activity as a leading health indicator in this specific population segment.

This lack of data on and promotion for physical activity in people with MR is of significant concern for several reasons. First, the health care costs associated with inactivity among the general population are extreme, with estimates of $75 billion in the U.S. alone [World Health Organization, 2003]. There are no data regarding the costs of inactivity in people with MR, but the lifetime direct medical and non medical (e.g., physician visits, inpatient hospital stays) costs associated with this condition are estimated at over $12 million [Honeycutt et al., 2004]. It is reasonable to assume that this can be partially attributed to chronic disease and disability due to inactivity. Second, indirect costs such as premature death, lost wages, and work limitations are estimated at over $38 million and account for 76% of the total lifetime costs related to the MR diagnosis [Honeycutt et al., 2004], and it is reasonable to predict that a portion of these costs are due to inactivity. These are U.S. statistics but the high costs of dependent care for people with MR have also been observed in other industrialized countries [Polder et al., 2002; Stancliffe and Keane, 2000]. Third, the emotional and social toll of inactivity is difficult to assess; however, people with MR have consistently expressed the desire for control over their own lives [Stancliffe, 2001]. If health is compromised due to inactivity...
then independence will be limited. Essentially, the ability of people with MR to exercise self-determination as integrated and productive members of society is influenced by their health, which is directly related to participation in regular physical activity.

The aim of this paper is twofold: (1) to describe what is known about the engagement of adults with MR in physical activity behavior consistent with standard recommendations; and (2) to describe preliminary findings about the physical and social environments that may foster or hinder participation in health-promoting physical activity among people with MR. The review is limited to studies that used methods that allowed comparison to globally supported physical activity recommendations, such as 30 minutes, accumulated, moderate physical activity on all or most days of the week or 10,000 steps per day [U.S. Department of Health and Human Services, 2000; World Health Organization, 2003]. Studies from countries that use a similar criterion to assess health related activity, specifically 12 bouts of moderate-vigorous physical activity lasting 20 minutes, were also included. It is important to note that only studies that measured physical activity, not exercise or physical fitness, as a direct variable were addressed. To date, there exists only one published study on whether or not children and youth with MR are meeting activity guidelines so this age group was not included in the paper [Frey et al., unpublished data]. Readers are referred to Temple et al. [in press] for a more inclusive review of the literature on physical activity and adults with MR.

UNDERSTANDING PHYSICAL ACTIVITY

Physical activity, exercise, and fitness are three words that are frequently and mistakenly used interchangeably. While these terms are related, each represents a different concept that requires distinct consideration [Caspersen et al., 1985]. Physical
activity is defined as skeletal muscle movement that increases energy expenditure
[Caspersen et al., 1985]. The term is further clarified according to: moderate activity
which includes large muscle group activities equivalent to brisk walking, such as dancing
and yard work; and vigorous activity which includes repetitive large muscle activity at an
intensity equal to 70% of age-predicted maximum heart rate (e.g., jogging and lap
swimming) [Caspersen et al., 1985; U.S. Department of Health and Human Services,
2000]. Exercise is a subcategory of physical activity that is planned, structured, and
undertaken for the purpose of improving or maintaining fitness [Caspersen et al., 1985].
Fitness is a set of physical attributes related to the ability to perform physical activity
[U.S. Department of Health and Human Services, 2000]. Fitness is further categorized
according to health-related (i.e., cardiorespiratory endurance, muscular endurance,
muscular strength, body composition, flexibility) or skill-related (i.e., agility, balance,
coordination, power, speed) with the former being of greatest importance to public health
[Caspersen et al., 1985].

PHYSICAL ACTIVITY ASSESSMENT

To better understand research on physical activity and adults with MR, it is
important briefly review the definition of physical activity and currently accepted
methods of assessing this behavior. For a more comprehensive review of physical
activity assessment the reader is referred to Welk [2002]. There is an ongoing quest to
determine the most accurate approach to measuring physical activity in free-living
populations. A true “gold-standard” measure has thus far eluded researchers, but several
methods demonstrate acceptable validity and reliability: doubly-labeled water, self-
reports, activity monitors, heart rate monitors, pedometers, and direct observation [Dale
There are advantages and disadvantages associated with each method and those most commonly used to examine naturally occurring physical activity behavior are self-reports, activity monitors and pedometers. This review includes the published work that employed one or more of these assessment methods.

**Self-reports.** There are four categories of self-report instruments: diary/log, recall questionnaire, quantitative history and global self-report [Matthews, 2002]. These instruments are inexpensive, provide specific information on activity, and are considered socially acceptable. The type of self-report dictates other aspects of usability; for example, maintaining an activity diary/log imposes greater participant burden and may influence activity behavior, compared to recall questionnaires which do not present these concerns [Matthews, 2002]. Data output varies with each instrument, but bouts of activity, perceived effort (i.e., intensity) associated with a task, time spent in certain activities, and the type of activities performed can be obtained. Energy expenditure is typically calculated using METs conversion tables [Ainsworth et al., 2000]. The validity and reliability of some physical activity surveys have been established [Jacobs et al., 1993] while others remain questionable, and the validity of this approach is modest when compared to objective measures such as motion sensors and pedometers [Matthews, 2002].

The accuracy of self-reports is highly dependent on memory, an understanding of physical activity, motivation to report truthfully, and the complexity of the physical activity addressed in the questionnaire [Dishman et al., 2001]. People tend to overestimate physical activity and underestimate sedentary activity [Klesges et al., 1990]. These issues are particularly troublesome when attempting to apply self-report techniques...
to examine physical activity in people with MR. Problems with acquiescence and 
comprehension in self-report research with this population have been well-documented 
[Bogdan and Taylor, 1994; Finlay and Lyons, 2001]. Proxy respondents (e.g., 
caregivers) are typically used as self-report resources to assess physical activity in this 
group [Draheim et al., 2002a; Draheim et al., 2002b; Messent et al., 1998b; Messent et 
al., 1999; Robertson et al., 2000], but there are some concerns regarding the reliability of 
this approach because secondary sources may not accurately report primary source 
behavior [Finlay and Lyons, 2001]. This is particularly true for individuals with MR who 
reside in less controlled settings (e.g., supported living v. institution). Though self- 
reports are cost effective, allow large population sampling, and impose little participant 
burden [Matthews, 2002], use of this method to assess physical activity in people with 
MR is questionable.

**Motion sensors.** Motion sensors measure limb or segment acceleration as an index 
of human movement and provide a direct, objective measure of physical activity in field- 
based settings [Welk, 2002]. These instruments have internal accelerometers designed to 
detect movement in single (uniaxial) or multiple (triaxial) planes, yet all are most 
sensitive to acceleration in the vertical plane. Data output is an activity count 
representing the magnitude of limb displacement or acceleration measured. Most new 
models have the capacity to collect data continuously according to programmed epochs 
for up to several weeks which allows calculation of activity frequency, intensity, and 
duration. Commercially available devices differ in factors such as size, memory 
capabilities, software and sensor sensitivity, but research indicates that all provide similar 
information [Welk, 2002].
Over the past 10 years there has been a large increase in the number of studies addressing the validity and reliability of motion sensors according to the model and activity type. There have also been efforts to develop equations that predict energy expenditure from activity counts [Hendelman et al., 2000; Tudor-Locke et al., 2002]. Motion sensors provide strong, objective estimates of physical activity frequency, duration and intensity in free-living populations. These attributes also make motion sensors advantageous for assessing physical activity in people with MR because there is no recall demand, and several studies have effectively used motion sensors in this population [Frey, 2004; Temple et al., 2000; Temple and Walkley, 2003b]. However, the devices are costly and provide less accurate estimates of energy expenditure which can limit their utility [Welk et al., 2000].

Pedometers. Pedometers measure steps and distance in response to vertical acceleration, but it is important to note that the devices are not as sophisticated as accelerometers [Montoye et al., 1996]. Since walking is the one of the most popular forms of physical activity, has many health benefits, and is highly promoted in public health campaigns (e.g., 10,000 steps per day recommendation), it is often used as a representative measure of physical activity [Bassett and Strath, 2002]. Research indicates that pedometers are a low cost and low participant burden approach to obtaining reasonably valid and reliable estimates of walking behavior. However, the devices are unable to detect general physical movement, do not measure activity frequency or intensity, and only high-end models can store data which limits their utility in assessing activity patterns. Despite these disadvantages, pedometers have been used effectively to
assess walking behavior in those with MR [Stanish, 2004; Stanish and Draheim, 2004,
2005, , in press-b].

Self-reports, motion sensors and pedometry have all been employed to assess
physical activity in adults with MR, but only pedometry has been examined for validity
in this group. Stanish [2004] investigated the accuracy of pedometers (Yamax
Digiwalkers) as a measure of walking activity in 20 adults with mild MR (12 females, 8
males) aged 19 – 65 years. Step counts and distance walked around a measured track
were compared with direct observations of steps using a hand-held counter as a criterion
measure. Pedometers were highly accurate in measuring steps taken with correlation
coefficients ranging from .95 to .99, regardless of walking speed (fast pace, normal pace)
and terrain (indoor gymnasium, outdoor gravel track). Since both pedometers and motion
sensors are meant to detect normal human movement, the high validity estimates reported
by Stanish [2004] are not surprising. It is logical that validity and reliability estimates for
these devices based on other populations would also apply to those with MR unless there
are significant gait abnormalities that may affect measurement accuracy.

Of greater concern is the lack of valid and reliable self-report instruments.
Temple and Walkley [2003b] reported a 0.78 intraclass correlation coefficient between 3
day diary and accelerometry measures. Stanish and Draheim [2005] found that the
National Health and Nutrition Examination Survey (NHANES III) was a more reliable
measure of physical activity ($r = 0.87-0.88$) than walking behavior ($r = 0.60-0.61$). There
was a moderate percent agreement of 68.9% between 5 bouts of 30 minute moderate to
vigorous physical activity per week obtained from the NHANES III the 10,000 steps per
day criterion obtained from pedometry. Although promising, these findings are
collectively based on 18 subjects and generalizability is limited. Considering the
subjective nature of this method, issues related to recall and understanding, and
questionable reliability of proxy respondents, additional research is needed to support
self-report as an acceptable method for assessing physical activity in people with MR.

As previously mentioned, there is no “gold standard” for assessing physical
activity behavior; therefore, the use of multiple methods is recommended to enhance
measurement accuracy [Treuth, 2002]. Multiple measures potentially allow a more
comprehensive understanding of physical activity behavior since single methods are
limited in scope. Combined use of objective (motion sensors or pedometry) and
subjective (self-reports) instruments will likely provide the best assessment of both the
quantity and quality of movement in people with MR.

PHYSICAL ACTIVITY AND WALKING BEHAVIOR IN ADULTS WITH MENTAL RETARDATION

To date, only eight studies have specifically examined physical activity, not
exercise or fitness, in adults with MR according to current published recommendations
(30 minutes of moderate to vigorous activity all or most days of the week or 10,000 steps
per day) [Draheim et al., 2002a; Draheim et al., 2002b; Draheim et al., 2003; Frey, 2004;
There is large variability in reports, but based on these limited findings, less than one-
third of this population segment engage in sufficient physical activity to accrue health
benefits [Centers for Disease Control and Prevention, 2005], see Table 1. The following
section includes a comprehensive review and critical analysis of the published research
addressing the physical activity behavior of adults with MR in relation to the
recommended guidelines.
Physical Activity Behavior. Temple et al. [2000] used direct observation and uniaxial accelerometers (Caltrac) to record the physical activity behavior of 6 (3 men and 3 women) individuals with MR over 7 consecutive days. All lived in the same group home, had mild to moderate limitations, ranged in age from 19 – 45 years ($M = 37 \pm 1.7$), and could travel independently to and from work or day program. Caltrac accelerometers do not store minute by minute data for later access and therefore direct observation data were used to estimate moderate-intensity physical activity ($\geq 3.3$ METs) and in conjunction with Bouchard’s formulae to estimate energy expenditure [Bouchard et al., 1983]. Direct observation data revealed that one participant achieved 30 minutes of moderate-intensity physical activity on 5 or more days per week, and another participant met the recommendation on each day he was not ill at home (3 out of 7 days). Of note was the variability of participation in moderate or higher intensity physical activity despite the consistent living environment; average minutes per day ranged from $1.3 \pm 3.4$ to $119.4 \pm 88.0$. Although sex differences were not significant, the effect size was moderate ($d = .7$) suggesting that gender requires additional study as a physical activity determinant in this population. Moderate intensity physical activity was accrued mainly via walking for transport and gardening as part of supported employment.

A follow-up study by Temple and Walkley [2003b] examined the concurrence between estimates of energy expenditure generated from 3 day diary recordings (proxy caregiver) [Bouchard et al., 1983] and uniaxial accelerometers. Participants were 37 adults with mild to moderate MR, age range 19 – 60 years ($M = 36 \pm 1.5$), living in supported group homes. Data were collected for 3 days, 2 weekdays and 1 weekend day. The intraclass correlation coefficient between diary and accelerometer measures was .78.
On average, participants accrued more than 1 hour per day of at least moderate intensity physical activity. As previously observed [Temple et al., 2000], there were considerable variability in these data with only 32% of participants meeting the recommended 30 minutes of moderate intensity physical activity per day.

Frey [2004] reported similar findings based on a comparison of physical activity levels between adults with and without MR using uniaxial accelerometers with the capacity of storing movement data continuously for 22 days (Manufacturing Technology, Inc., Fort Walton Beach, FL). Participants were 22 adults with mild MR (MR; 11 men, 11 women; age = 34.9 ± 9.0 years), 17 sedentary controls without MR (SC; 8 men, 9 women; age = 35.8 ± 7.6 years), and 9 active controls without MR (AC; 5 men, 4 women; age = 34.1 ± 5.8 years). The SC group was sex and age matched to the adults with MR and were classified as sedentary based on self-reports (i.e., did not engage in regular moderate to vigorous exercise of at least 30 minutes duration at least 3 days per week). The AC sample was selected on the basis of being regularly physically active (a minimum of 30 minutes of moderate to vigorous exercise per day and 3 days per week).

Average minutes per day of moderate to vigorous physical activity were MR, 19.7 ± 17.6; SC 31.6 ± 21.8; and AC, 55.9 ± 18.2. There were no significant differences in activity levels between MR and SC groups, but active controls were significantly more active than all other subjects. Primary avenues of activity for MR and SC groups were household chores, yard work, walking and, for the former, Special Olympics, while AC subjects engaged in a variety of sports/activities such as jogging and tennis. The proportion of each group achieving 30 minutes of moderate intensity physical activity per day was: MR, 28%; SC, 47%; and AC, 89%. The MR group did not regularly engage in
continuous moderate activity greater than 10 minutes. It was concluded that adults with MR are similar to over 50% of the general population that is classified as sedentary yet the proportion of individuals with MR accumulating 30 minutes of continuous moderate activity is less than those without this diagnosis.

Using a larger sample with a broader age range, Stanish and Draheim [2005] found fewer adults with MR that met the minimum activity guidelines. Physical activity was assessed using the National Health and Nutrition Examination Survey (NHANES III) and steps per day via pedometry (Yamax digiwalkers). Participants were 103 adults (65 men and 38 women) with mild and moderate MR aged 19 – 65 years ($M$: males 35.9 ± 11.2, females 39.7 ± 9.5); 19 participants had Down syndrome (10 men and 9 women). Pedometers were worn for 7 consecutive days and survey interviews were conducted with both participants with MR and direct care providers. Survey data revealed that 64.1% participated in five or more bouts of moderate to vigorous physical activity per week; however, only 17.5% of participants accrued the recommended duration of 30 minutes per day. This is an important distinction to make because estimates of physical activity levels can vary widely depending on the survey instrument and criterion used [U.S. Department of Health and Human Services, 1996].

Draheim et al. [2002a; 2002b; 2003] examined physical activity and other cardiovascular risk factors in a large sample of approximately 150 adults with mild to moderate MR ages 18-65 years. Physical activity was assessed via interviews with study participants and caregivers using the NHANES III. Subjects in this study reported a much higher prevalence of recommended physical activity (45%) compared to the aforementioned studies but data on duration were not reported. There were no gender
differences and prevalence of no leisure time or little to no leisure time was similar to the
general population [Draheim et al., 2002b]. There was a strong association between
physical activity and certain cardiovascular disease risk factors such as abdominal obesity
[Draheim et al., 2002a; Draheim et al., 2003]. The authors noted that the seemingly
inflated activity estimates may be attributed to overestimation by proxy or secondary
sources [Finlay and Lyons, 2001; Lunsky and Benson, 1999].

The consensus is that intermittent bouts of physical activity, as short as 8 to 10
minutes, can be used to accumulate 30 minutes of moderate intensity physical activity
and still provide beneficial health effects but the research does not support the use of
shorter bouts such as 5 minutes [Le Masurier, 2004]. Frey [2004] conducted the only
study with instrumentation that allowed minute by minute data analysis and thus the
ability to assess continuous activity. Few subjects with MR engaged in continuous
activity longer than 5 minutes. Based on these findings, individuals with MR do not
accumulate sufficiently long bouts of moderate to vigorous physical activity per day to
satisfy current guidelines.

There is clearly a paucity of research on the participation of adults with MR in
physical activity consistent with current recommendations, particularly from countries
outside the U.S. Similar findings have been reported in a few studies from England using
the criteria of at least 12 bouts of 20 minutes moderate (>5 and <7.5 kcal/min) to
vigorous (≥7.5 kcal/min) activity occurring over 4 weeks [Emerson, 2005; Messent et al.,
1998b; Robertson et al., 2000]. This threshold had been identified as offering some
protection against coronary heart disease [Department of Health, 1995] and the
proportion of participants meeting this criterion ranged from 4% to 20%. Despite
evidence consistent with the aforementioned studies based on a 30 minute moderate activity criteria, several issues should be considered when interpreting these studies. First, in the mid 1990’s, Britain revised their activity recommendations to coincide with other health agencies [Prior, 1999]. All of the studies were published well after these revisions were implemented yet the outdated guidelines were used for data interpretation leading to potentially unreliable findings. For example, Messent et al. [1998a; 1998b] actually discussed both the 30 minute (current) and 20 minute (former) moderate activity guidelines and it was not clear which was used as a criterion. In addition, the Emerson [2005] study was published well after the policy was revised [Prior, 1999] but a physical activity scale based on the old guidelines was used for data collection. The use of proxy respondents as data sources and a 4 week activity recall, also calls into question the validity of these findings for reasons previously discussed. Additional research that uses updated assessment tools and universal guidelines is needed to better understand physical activity in people with MR from different countries.

Walking behavior. A growing body of evidence suggests that individuals who accumulate 10,000 steps per day have less body fat and lower blood pressure than less active individuals [Moreau et al., 2001; Tudor-Locke et al., 2001] and fewer steps per day are associated with increased body mass index, waist circumference, and diastolic blood pressure [Chan et al., 2003]. Walking is a primary mode of activity in people without disabilities and also appears to be one of the most common physical activities carried out by persons with MR from various countries [Draheim et al., 2002b; Temple et al., 2000; Temple and Walkley, 2003b], yet there exists little research that has directly assessed this behavior.
Despite the prevalence of walking as a primary activity mode, only a handful of studies have actually assessed this health behavior in adults with MR. Stanish [2004] studied walking behavior in a small sample of 20 individuals with mild MR (12 females, 8 males aged 19 – 65 years). Average steps per day for males and females without Down syndrome were 11885 ± 5646 and 11809 ± 4652, respectively. When analyzed according to diagnosis, males and females with Down syndrome (n = 9) 5450 ± 2316 and 8816 ± 4094 acquired fewer steps than those without Down syndrome. Subjects walked less on weekends, with nine participants (45%) achieving 10,000 steps or more on weekdays and only four (20%) achieving this criterion on weekend days. This is contrary to previous research that found no differences in weekend v. weekday physical activity in this population [Frey, 2004]. In a larger sample of 103 adults, Stanish and Draheim [2005] found that subjects with MR walked an average fewer steps per day (7832) and only 21% met the 10,000 steps per day guideline.

Although walking is a prevalent form of physical activity in adults with MR, the intensity is low or low-moderate and may not be sufficient to promote health [Draheim et al., 2002b; Temple et al., 2000; Temple and Walkley, 2003b]. Some evidence to support this premise was recently established by Stanish and Draheim [in press-a] who found no differences in body composition or blood pressure among adults with MR who were classified as ‘sedentary’ (<5,000 steps/day), ‘low active’ (5,000 – 7,499 steps/day), ‘somewhat active’ (7,500 – 9,999 steps/day), and ‘active’ (≥10,000 steps/day). As Le Masurier [2004] points out, if walking is going to be an effective physical activity intervention it should be consistent with the current recommendations, particularly with regard to intensity of effort as well as duration or step counts.
Despite a paucity of studies and methodological limitations, research indicates that the majority of adults with MR do not meet minimum guidelines concerning frequency, intensity and duration of physical activity necessary to achieve health benefits. This observation is consistent regardless of assessment methods, specific guidelines (e.g., 30 minutes moderate activity, 20 minutes moderate activity, 10,000 steps) and country of origin. However, it appears that adults with MR are not necessarily more sedentary than those without the diagnosis.

BARRIERS AND FACILITATING FACTORS FOR PHYSICAL ACTIVITY

Understanding physical activity behavior in the general population has been a topic of significant inquiry but there have been few attempts to explain physical activity in adults with MR. Correlates of activity typically fall into five categories: demographic and biological factors; psychological, cognitive, and emotional factors; behavioral attributes and skills; social and cultural factors; and physical environment factors [Trost et al., 2002]. The following discussion will be organized according to these categories but due to limited information on this topic some may be combined to facilitate discussion.

Demographic and biological factors and behavioral attributes and skills. These categories are combined because it is difficult to separate the biology of mental retardation and resulting behavior or skills. Age, education, gender, heredity, socioeconomic status, ethnicity, the presence of children, activity history, dietary habits, and processes of change impact activity in people without disabilities [Trost et al., 2002] but most of these have not been explored in people with MR. Age appears to be negatively associated with activity in adults with MR [Emerson, 2005; Robertson et al.,
2000]. Interestingly, the gender disparities in physical activity frequently observed in the general population are not apparent in those with MR [Draheim et al., 2002a; Frey, 2004; Robertson et al., 2000] and this may be because both men and women are largely sedentary.

Other demographic or biological factors have not been expressly studied in this group but there exists some data on severity of MR and diagnosis. Emerson [2005] and Robinson et al. [2000] found that, after controlling for physical disabilities, those with fewer behavior and health problems were more active than peers with less desirable scores on these measures. Few studies have analyzed activity participation according to diagnosis, but Stanish [2004] reported that individuals with Down syndrome walk fewer steps per day than counterparts with MR not due to Down syndrome. Since there is sufficient evidence that some impairments associated with Down syndrome (e.g. joint hypermobility, obesity, low bone mass) negatively impact health factors such as physical fitness [Fernhall et al., 1996], specific diagnosis must be considered when studying physical activity in people with MR.

**Psychological, cognitive, and emotional factors.** A large number of personal factors such as activity barriers, expected benefits, health and exercise knowledge, perceived health and fitness, stage of change, and self-efficacy, self-motivation, and self-schemata are all correlated with participation in regular activity by the general population [Trost et al., 2002]. Studying these determinants in people with MR presents serious challenges due to inherent cognitive delays that may interfere with the ability to understand certain constructs, engage in reflective thought, and/or engage in constructive self-expression. Traditional methods for exploring these variables are self-report
instruments which are of limited use with this population. Qualitative methods have been
successfully used to examine other social constructs in this population [Bogdan and
Taylor, 1994; Mactavish et al., 2000] and to date there have been two studies that
employed these methods to assess psychosocial determinants of physical activity from
the participant’s, not a proxy respondent’s, perspective.

Frey et al. [2005] used interpretive ethnography to examine determinants of
activity in 12 adults with MR purposively sampled from a previous study [Frey, 2004].
Individuals were selected for in-depth interviews based on expressive and receptive
language abilities. The authors were well acquainted with the subjects having known
most of them for over 3 years, which allowed for a good level of rapport, trust, and
natural communication during the interviews. In addition, the authors were better
equipped to identify issues of comprehension and acquiescence that could alter findings.
Four parents and two job supervisors were also interviewed separately as to provide a
source for data triangulation. Subjects reported barriers to physical activity similar to the
general population such as time and money and also perceived benefits similar to the
general population such as looking and feeling good [Trost et al., 2002]. A perceived
benefit of physical activity unique to this group was awards. Several participants were
highly motivated by ribbons and medals received through Special Olympics and this
often dictated activity preferences. This is a concern because reliance on this type of
external reinforcement may not be conducive to activity maintenance.

Messent et al. [1999] conducted structured in-depth interviews with 24
individuals with MR and 12 caregivers. Questions focused on daily activities that
occurred in the 7 days previous to data collection, activities they enjoyed, beliefs and
attitudes, and experiences during a 10 week exercise program. Participants had difficulty
conveying rationales for certain responses related to activity likes or dislikes, but
expressed clear frustration with the lack activity choices during weekends and after work.
Adults with MR had little control over their environment, had few opportunities to be
active, and were not empowered to engage in activity choice making.

Rimmer [1996] suggests that adults with MR lack motivation to be physically
active and Prasher and Janicki [2002] reinforce that the motivation of adults with MR is
of concern for those who wish to promote physical activity for wellness. Adults with MR
often expressed a preference for inactivity, particularly watching television, but it is
unclear if this choice was based on a true preference or due to limited alternatives for
other activities [Frey et al., 2005]. Considering that 60% of the global population does
not meet the minimum physical activity guidelines [World Heath Organization, 2003], it
is difficult to conclude if adults with MR are any less motivated to be active than those
without MR.

Social and cultural factors and physical environment. The categories will be
discussed together since there is significant overlap between the social supports an
individual with MR receives (e.g., parents, caregivers) and living environment (e.g.,
family home, group home). Robertson et al. [2000] found that those residing in less
restrictive settings were more active than counterparts who lived under greater
supervision. Conversely, Rimmer et al. [1995] reported that individuals with MR
residing in less structured settings exercised less than those in more supervised
placements. Emerson [2005] also found that participation in segregated day centers was
negatively associated with activity. The discrepancies in physical activity according to living environment may be due to caregivers or staff, a factor that is difficult to control. Lack of staff motivation to promote physical activity [Temple and Walkley, 2003a], a lack of physical activity counseling [Frey et al., 2005], and high client to staff ratios (Messent et al., 1999) have all been reported as constraints to participation. This is supported by Lennox [2002] who asserts that, people with MR “are often living in environments where healthy choices, by them or their carers, are difficult (if not impossible). Too often staff numbers and/or resources may be inadequate to allow regular exercise” (p. 237). Care-providers and supervisors report that inadequate physical activity policies and guidelines for residential and day service providers contribute to these difficulties [Messent et al., 1999].

A salient activity determinant unique to this group is negative messages regarding physical activity participation from support systems [Frey et al., 2005]. Individuals with MR articulated that caregivers, teachers, coaches, and medical personnel rationalized, enabled, and oftentimes encouraged sedentary behaviors. Independent participation in activity was largely discouraged by reinforcing fears and the need for constant supervision. Persistent messages were that participants should not over exert themselves or “overdo it”. These negative messages were well-intentioned efforts to protect seemingly vulnerable individuals but the outcome was that participants with MR developed perceptions of disempowerment, physical fragility, over reliance on supports, and incompetence with regard to being physically active. Despite lack of support for physical activity from certain support systems, people with MR are highly motivated to engage in activity as a social outlet, similar to the nondisabled [Frey et al., 2005].
Within the physical environment, transportation and the location of day program centers in relation to open space and community facilities, may hinder participation in physical activity [Messent et al., 1999; Neumayer and Bleasdale, 1996]. Participants with MR and job supervisors in the Frey et al. [2005] study concurred that transportation was a primary factor in the ability to access activity opportunities. Beyond these general descriptive and environmental determinants there have been few attempts to study social and environmental factors that influence physical activity from the perspective of the individual with MR.

**Summary**

Table 1 summarizes the studies to date that have examined moderate to vigorous intensity physical activity consistent with the recommendation of accumulating 30 minutes of moderate intensity physical activity on 5 or more days per week. The proportion of individuals with MR achieving this criterion ranged from 17.5% to 33%, but if continuous activity is considered these percentages will likely decrease since individuals with MR do not engage in long bouts of continuous moderate activity [Frey, 2004]. These findings are somewhat supported by three British studies that reported physical activity rates of between 4% and 20% based on a more stringent activity criterion (20 minutes of continuous moderate activity). Major sources of physical activity for adults with MR are walking and cycling for transport, chores and work, dancing, and Special Olympics. Walking for transport is by far the most prevalent form of physical activity but studies suggest the intensity may not be sufficient to meet the minimum recommendations to achieve health benefits.
Caution is warranted when generalizing these findings to the broader population of adults with MR since most samples included relatively young volunteers with mild to moderate cognitive delays. Persons with severe or profound MR frequently experience co-occurring conditions such as medical complications and mobility limitations [O'Brien et al., 2002] which make physical activity more difficult. Including more persons with severe or profound MR will, in all probability, further reduce overall rates of physical activity among persons with MR [Emerson, 2005; Robertson et al., 2000]. It should also be noted that the research has been conducted primarily in the United States, Canada, Australia and Britain hence the results are geographically limited and may not be generalizable beyond those areas.

A variety of environmental, physical, and psychosocial factors influence physical activity behavior in these individuals. Similar to the general population, physical activity is lower in older individuals with MR and common perceived barriers to regular activity participation include time, money, and weather. Individuals with MR also experience unique external barriers to physical activity dictated by support systems, such as overprotection by caregivers, agency structures (e.g., policies, staffing ratios, resources), and lack of opportunities. Until these factors are addressed it will be difficult to determine if perceptions toward activity held by individuals with MR are self-determined or overly influenced by support systems.

RESEARCH AND HEALTH PROMOTION NEEDS

The global goal is to increase participation in moderate physical activity that meets the minimum guidelines 30 minutes on all or most days of the week [World Heath Organization, 2003]. The U.S. Surgeon’s General report presents a more specific goal to
increase the number of people who meet the aforementioned recommendation from 15% to 30%. It may appear from the few studies published on physical activity and adults with MR that this goal has been achieved. Indeed the proportion of adults with MR walking or cycling for transport may be higher than the general population, but our knowledge regarding the participation of adults with MR in physical activity is too superficial to draw conclusions.

This review clearly illustrates that few studies have been conducted in this area despite the extensive body of research documenting the relationship between physical activity and health. In addition, only a handful of studies have examined the determinants of physical activity participation in people with MR. The development of activity interventions or promotion programs is difficult because no clear barriers/facilitators have been identified through research. Inconsistency in activity assessment methods, sample populations, as well as large differences in disability policies and services across countries render it impossible to develop a consensus regarding physical activity and people with MR. Although it is generally accepted these individuals are one of the most sedentary segments of society [Messent et al., 1999], this assumption is inferred rather than factual. Since there has been only one study that actually employed a comparison group to assess the magnitude of difference in physical activity between those with and without MR [Frey, 2004], it is premature to assert that these individuals are less active than the general population.

There is a pressing need to conduct studies using appropriately powered representative samples and acceptable assessment methods that also compare participation to that of the general community. In addition, future research must
incorporate elements of both behavior and disability theories to provide a framework from which to examine the many complicated factors that influence physical activity in this population. Essentially there is an urgent need for an increase in the quality and quantity of research on physical activity and people with MR.

The importance of physical activity for people with disabilities, including those with MR, has been recently acknowledged by leading health promotion agencies [U.S. Department of Health and Human Services, 2000; U.S. Public Health Service, 2002]. Unfortunately, without sound baseline data it is difficult to assess the level of health risk associated with inactivity or the efficacy and effectiveness of longitudinal interventions in this population segment. By determining the nature and scope of physical activities performed by individuals with MR we will increase our ability to develop high quality health-promotion interventions that appropriately address the unique needs of this group of individuals.
REFERENCES


Table 1

Proportion of study participants accruing 30 minutes of moderate or higher intensity physical activity

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>N</th>
<th>% male</th>
<th>METs</th>
<th>30min/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temple et al. (2000)</td>
<td>Australia</td>
<td>6</td>
<td>50</td>
<td>≥3.3</td>
<td>33%</td>
</tr>
<tr>
<td>Temple &amp; Walkley (2003)</td>
<td>Australia</td>
<td>37</td>
<td>51</td>
<td>≥3.3</td>
<td>32%</td>
</tr>
<tr>
<td>Frey (2004)</td>
<td>USA</td>
<td>22</td>
<td>50</td>
<td>≥3.0</td>
<td>28%</td>
</tr>
<tr>
<td>Stanish &amp; Draheim (2005)</td>
<td>Canada</td>
<td>103</td>
<td>63</td>
<td>&gt; 3.5</td>
<td>17.5%</td>
</tr>
</tbody>
</table>

Note. METs, metabolic equivalents