Fitness of Black African Early Adolescents With and Without Mild Mental Retardation

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This study compared the fitness of Black African early adolescents with and without mild mental retardation. Participants included 30 purposively selected early adolescent Black Africans with mild mental retardation aged 11-14 from three schools for children with mild mental retardation in Southern Botswana and 30 randomly selected early adolescents of similar ages without mental retardation. Participants were assessed on a number of standard fitness variables including the Rockport Walk Test. In general, when compared to participants without mental retardation, participants with mild mental retardation exhibited low levels of fitness. Based on study results, the Ministry of Education is called upon to urgently put in place policies and programs that would reverse the low level of fitness among adolescents with mild mental retardation.

Generally, individuals with disabilities are found in all societies (Hallahan & Kauffman, 1997). In Africa, about 8% of the population has one form of disability or another; and these disabilities negatively affect their lives, making them look frail and physically incapable of taking part in most activities indulged in by able-bodied members of the society (Suarau, 1999). According to Suarau, the disabilities are a result of wars, extreme poverty, drought, famine, diseases, etc.

Adolescents with disabilities, particularly those with mental retardation, tend to be more sedentary and lack motivation in regard to exercise when compared to adolescents without disabilities (Faison-Hodge & Porretta, 2004; Kavale & Forness, 2000; Lotan, Isakov, Kessel, & Merrick, 2004; Obrusnikova, Valkova, & Block, 2003). These adolescents seldom take part in leisure time pursuits and physical activities (Rizzo, Faison-Hodge, Woodard, & Sayers, 2003).

In Botswana, like in most African countries, people with mental retardation failed to get the attention of the government due to negative attitudinal disposition (Onyewadume, 2003). However, with the establishment of the National Chapter of Special Olympics in 1990 and the investiture of the then First Lady as the Matron of Special Olympics Botswana, there was a great national awareness campaign on the

plight of people with mental retardation. The government and some philanthropic organizations then saw the need to support and help them; however, this support was in other areas except in the area of the provision of policies and programs that could get them off their sedentary lifestyles.

In the United States of America, this inactive nature of people with disabilities was so much a concern that the Surgeon General's report categorically confirmed, after reviewing series of studies in the discipline, that people with disabilities are naturally less likely to engage in regular moderate physical activity than those without disabilities (U.S. Department of Health & Human Services, 1996). The cumulative effects of this life style of inactivity, the report says, translate into very detrimental health and social consequences for this group of individuals. Such negative consequences include various types and degrees of debilitating ailments like osteoporosis, diabetes, and some forms of cancer (Cooper et al., 1999) and cardiovascular risks like high blood pressure, high blood lipid levels, increased insulin resistance, obesity, and negative psychological manifestations of stress, anxiety, and depression (Fletcher et al., 1996).

Studies have also shown that adolescents with mental retardation have lower physical work capacity (Fernhall & Pitetti, 2001; Pitetti & Fernhall, 2004), higher body mass index (BMI; Fernhall, 2003; Pitetti, Yarmer & Fernhall, 2001), lower exercise capacity and lower aerobic fitness (Faison-Hodge & Porretta, 2004; Fernhall & Pitetti, 2000; Gillespie, 2003; Pitetti et al., 2001) than their counterparts without a disability. They have also been found to possess lower levels of muscular strength (Fernhall & Pitetti, 2000) than their peers without a disability.

These debilitating conditions have led to a reduced ability to manage basic activities of daily living, hence a reduced quality of life and functional capacity. Supporting these views, Cooper et al. (1999) noted that disabilities commonly cause a cycle of deconditioning in which physical functioning deteriorates, leading to further reduction in physical activity levels. They emphasized that even small reductions in stamina or physical work capacity can negatively impact on the ability of people with disabilities to dress, bathe, eat, or walk without assistance, leading to loss of independence. This loss of independence also impacts strongly on the costs of and need for long-term care services that weigh heavily on the purses of both governments and philanthropic organizations.

Many adolescents with mental retardation can, however, reverse the negative trends above with increased participation in physical activities. Studies have shown that regular physical activity increases longevity by protecting against the development of cardiovascular diseases and also favorably modifying other cardiovascular risk factors including high blood pressure, high blood lipid levels, increased insulin resistance, non-insulin-dependent diabetes, and obesity (Clarke & Stansbie, 2001; Cooper et al., 1999; deBree, Verschuren, Blom, & Kromhout, 2001; Fattirolli, Cellai, & Burgisser, 2003; Lotan et al., 2004; Rimmer, Heller, Wang, & Valerio 2004; Ryan, 2000; Steenge, Verhoef, & Greenhaff, 2001). Participation in regular physical exercises has also been associated with independence and improved quality of life through its potential in controlling body weight, improving healthy bones, joint flexibility, muscular strength, and postural stability (Pollock et al., 2000; Warburton, Gledhill, & Quinney, 2001).

It is for the above reasons that many governments (China Government White Paper, 2005; Government Country Reports, 1997; Office of the Deputy President,

1997) have supported rehabilitation efforts and commissioned numerous research projects (Cooper et al., 1999; Pollock et al., 2000) on how best participation in physical activities can benefit their citizens with disabilities. However, the present situation in Botswana is different. According to the Revised National Policy on Education (1994), provision of education for children with disabilities still remains limited. This policy further states that government is committed to the education of all children, including those with disabilities and therefore will intensify efforts to increase access to education for children with disabilities.

No phrase or sentence in the whole document, including the recommendations that followed, specifically mentioned the need for the development of a robust program of physical activity for people with disabilities. In fact, as recent as 2003, the National Director of Health Services in the Ministry of Health called on government to formulate laws that would facilitate the provision of services such as rehabilitation and other forms of support and assistance that would ensure that they enjoy life as much as able-bodied people (Republic of Botswana, 2003). It should be noted that even this call on government was not specific on the need for the provision of a sport and recreation policy for all persons with disability; however, this was as near as it could get even in the 21st century.

Since most government policy statements are informed by empirical experiences or evidence, this study was designed to identify, through a comparison, the present fitness status of early adolescents with disabilities and their peers without disabilities. It is hoped that the results of this study would modify the focus of the relevant Ministry officials toward giving priority attention to the development of a national sports and recreation policy for people with disabilities in Botswana. Gillespie (2003) supports this need for a critical examination of the benefits of physical activity programs for children with mental retardation. Such a shift in focus by the relevant Ministry officials could bring about the desired positive change in the fitness, and hence the quality of life, of early adolescents with mild mental retardation and, by extension, the rest of the community living with various forms of disabilities.

Also, there is a dire need for cross-cultural studies in the area of the fitness of adolescents with MMR. To this moment, literature in this area is reviewed on American, Asian, European, and Semitic studies. From accessible published international journals, no study was found comparing the fitness of Black African early adolescents with mild mental retardation and their nondisabled counterparts. Apart from some countries in the northern and southern parts of Africa with large populations of colored persons, Blacks dominate the rest of Africa. There are clearly some differences in the genetic make-ups of these groups of people, and these could have some effects on the types of disabilities they have or their responses to exercises and medical care.

Furthermore, according to Malik (2003), many doctors and geneticists have suggested that medicine shows up the reality of race. The doctors noted that in practicing medicine, they are not colorblind. They always took note of patients' races. This they did because they realized that certain diseases and treatment responses cluster by ethnicity etc. and that when it comes to practicing medicine, stereotyping often works. With this realization, this study was therefore designed to bridge this cross-geneto-cultural gap and provide some internationally accessible data on the Black race. It is therefore hoped that international scholars would find

the results useful for cross-geneto-cultural comparative studies, not leaving out Africa, particularly the Black race, in the scheme of events with regard to early adolescents with mild mental retardation.

Furthermore, despite the copious literature in favor of superior cardiovascular fitness in adolescents without mental retardation over those with mental retardation, Pitetti, Millar, and Fernhall (2000) reported no significant difference in cardiovascular fitness between children and adolescents with and without mild mental retardation. This finding motivated the desire to find out what the situation would be in the case of the participants of this study.

The purpose of this study, therefore, was to compare selected fitness components of Black African early adolescents with and without mild mental retardation. The intention is to also bring Africa to the fore whenever cross-geneto-cultural, comparative researches on early adolescents with mild mental retardation are discussed around the world.

Based on existing research results on the comparisons done between children with and without mental retardation, it was hypothesized that significant relationships in selected fitness attributes would exist between participants with and without mild mental retardation. It was also hypothesized that there would be significant relationships between gender and fitness attributes. Finally, it was hypothesized that there would be a significant interaction effect of disability and gender on the selected fitness variables of the participants of this study.

Method

Participants

Participants were 30 early adolescent Black Africans with mild mental retardation (13 males, 12.8 ± 1.7 years and 17 females, 12.5 ± 1.4 years) and 30 early adolescent Black Africans with without mental retardation (15 males, 12.3 ± 1.6 years and 15 females, 12.3 ± 1.1 years). To control for age and physical development, only early adolescents, 11-14 years were included in the study (Pitetti et al., 2001). The sampling design was purposive (Henry, 1990; Sherrill & O'Connor, 1999) in that participants had to meet the criterion for mild mental retardation and must have been residents of the same district. Classification for mental retardation was determined according to the model for diagnosis by Luckasson et al. (2002) and was carried out by qualified school district personnel. Participants were prescreened for medical contraindications to exercise and also for congenital heart defects, current use of medications affecting the functioning of the heart, and mobility problems that could prevent them from taking part in very fast walks and performing other activities.

Adolescents with Down syndrome did not participate in the study. Adolescents with mild mental retardation lived in boarding accommodations where they were cared for by both government and philanthropic organizations and were taught to read and write. Since schools for children with disabilities had no specific physical education programs, special education teachers instructed students in elementary physical activities such as clapping and singing, walking, and stretching exercises, etc. These schools lack appropriately trained physical education professionals; however, they are now being trained in the country and will hopefully replace the current special education teachers.

On the other hand, the participants without mental retardation were developing normally and lived with their parents or guardians and attended public primary schools. They took part in school organized physical activity classes. The Ministry of Education only introduced organized physical education in public schools in 2004 as one of three subjects grouped as creative and performance arts, fine arts, and music being the two other subjects in this group in the new syllabus. Physical education in these schools, prior to this time, consisted mainly of physical drills and was based on the imagination and ingenuity of the newly trained physical education professionals. Students took part in ball games, mainly soccer and netball, gymnastics, and track events in athletics. The classes were for 30 minutes, twice a week.

Parental consent was not feasible as some of the parents of the participants lived in the rural areas. School heads and teachers therefore acted in loco parentis. School heads gave the consent for the study and informed consents were obtained from the participants and their teachers prior to testing.

Instrumentation

The cardio-respiratory endurance test for the estimation of the $VO_{2\ max}$ of the participants was the Rockport fitness walking test as described by Mackenzie (2004b). This 1.6 km fitness walking test was recommended by Fernhall (1997) as beneficial for estimating the $VO_{2\ max}$ of the children with MR; it has been validated and cross-validated as a reliable field test for determining the $VO_{2\ max}$ of persons with mental retardation. The walking-track was marked in line with the prescription of Mackenzie. Post-testing heart rate was monitored with a dual-head stethoscope while time was monitored using the Trisport brand stopwatch. Body weight was measured with the use of the Life-Source MD scale while height (cm) was measured using the Quick Medical portable height measuring scale. Both measurements were used to compute the participants' BMI. Age- and sex-specific prediction formulae by Deurenberg, Weststrate, and Seidell (1991) were used to compute the participants' percent BF. Isometric strength of the dominant hand was measured using the Takei handgrip dynamometer, while combined back and leg strength was measured using the pull dynamometer, model 32526A, from Lafayette Instrument Co. Trunk flexion was measured using the Lafayette flexometer, model 01285. Vertical jump heights were marked off the wall, while the number of sit-ups and push-ups were each counted for a 1-min duration.

Procedure

Motivation and task understanding have been reported as major obstacles when evaluating the physical fitness of persons with mental retardation (Fernhall et al., 1996; Pitetti, et al., 2000; Pitetti, Rimmer, & Fernhall, 1993). Fernhall et al. (1996), Fernhall et al. (1998), and Teo-Koh and McCubbin (1999) report that poor motivation or task understanding could negatively affect measures of peak performance for persons with MR. If not taken care of, these factors could adversely affect the quality (reliability) of the data collected and the certainty of the conclusions made (Raven, 1999). With these in mind, adequate steps were taken prior to data collection. Throughout this study, participants were familiarized with the tasks and

practiced them before data collection. To compensate for lack of experience in the performance of the skills, the participants with MMR performed the activities a number of times until they understood the activities and displayed proper forms. Teachers were trained as pacers. They accompanied all the participants and verbally encouraged them throughout the course of the Rockport fitness walking test. Participants were also tested in pairs or in groups of three to provide competitiveness. The above procedures are similar to those used by Guerra, Pitetti, and Fernhall (2003) and Pitetti et al. (2001).

Data collection started with height and weight measurements before progressing to grip strength (dominant hand), combined back and leg strength, trunk flexion and extension, vertical jump, sit up, and push up tests. These tests were completed over a one-week period. In the second week, the Rockport fitness walking test was administered and scored according to the procedure described by Mackenzie (2004a). For the Rockport fitness walking test, some of the schools did not have enough space for marking 400m tracks. In such schools, available space that permitted the construction of 200m tracks was utilized. Participants were made to walk as fast as possible on the tracks for 1.6 km (1mile). On completion of the distance, heart rates were monitored within the first 10 seconds with a dual-head stethoscope and then later multiplied by 6. These 1-min heart rate readings, together with the task completion time (monitored using a Trisport brand stopwatch), as well as the remaining fitness variables, were in-put into the equation provided by Mackenzie for the determination of the estimated $VO_{2\,max}$ of the participants. For the isometric strength of the dominant hand and the back and leg, the procedure described by Balic, Mateos, Blasco, and Fernhall (2000) was adopted.

Statistical Analyses

Descriptive data are presented and a series of two-factor ANOVAs were computed utilizing SPSS version 12.0.1. Statistical significance was set at $p < .05$. A pooled standard deviation technique as recommended by Thomas and Nelson (2001) was used to determine effect size.

Results

The means and standard deviations for all the variables by gender and disability are presented in Table 1. Table 2 depicts the results of a series of 2-factor ANOVAs (gender and disability) computed on the selected fitness components. Apart from the main effects of disability, $F(1, 56) = 2.10$, MSE = 308.763, $p = .153$, on the Rockport post-test HR, all other variables showed significant relationships at $p < .05$. These results revealed that the participants without mental retardation had significantly better values in percent BF, grip strength, trunk flexion, combined back and leg strength, vertical jump, push ups, and Rockport fitness walking test duration than the participants with mild mental retardation. The higher Rockport post-test HR values among the participants with mild mental retardation were an indication of poor fitness. From this result, all but one of the hypotheses on the significant relationship between disability and the selected variables were accepted.

Table 1 Descriptive Statistics of Demographic Data and Selected Fitness Components Black African Early Adolescents With and Without Mild Mental Retardation (MMR/NMR)

Variables	Male MMR (n = 13)	Female MMR (n = 17)	Male NMR (n = 15)	Female NMR (n = 15)
Age (yrs)	12.8 ± 1.2	12.5 ± 1.4	12.3 ± 1.2	12.3 ± 1.1.
Weight (kg)	33.8 ± 6.3	38.5 ± 7.2	37.7 ± 5.1	37.1 ± 6.4
Height (m)	1.4 ± 0.13	1.4 ± 0.11	1.5 ± 0.08	1.5 ± 0.11
B.M.I. (kg/m^2)	17.4 ± 1.9	19.2 ± 1.7	16.6 ± 1.5	16.7 ± 1.2
%BF	15.2 ± 3.3	21.3 ± 2.9	14.4 ± 2.7	17.9 ± 1.8
Grip Strength (D)(kg)	18.3 ± 4.3	12.2 ± 1.9	34.6 ± 7.3	24.1 ± 5.1
Trunk Flexion (cm)	19.3 ± 6.1	20.8 ± 3.9	16.4 ± 4.6	18.4 ± 3.9
Combined Back & Leg Strength (kg)	162.1 ± 26.4	129.2 ± 29.1	221.2 ± 39.7	185.9 ± 28.4
Trunk Extension (cm)	20.0 ± 3.4	18.6 ± 3.5	37.2 ± 4.3	40.8 ± 4.3
Vertical Jump (cm)	11.9 ± 3.8	9.1 ± 4.1	34.6 ± 3.2	31.2 ± 4.9
Sit Ups (no./min)	13.1 ± 2.9	10.1 ± 4.1	37.8 ± 5.1	28.0 ± 8.7
Push Ups (no./min)	7.5 ± 2.3	5.8 ± 2.2	22.0 ± 7.2	18.4 ± 7.0
Rockport Fitness Walking Test (Duration) (min. secs)	23.8 ± 2.1	24.2 ± 1.5	13.5 ± 0.8	14.3 ± 0.2
Rockport Post-Test HR. (b./min)	193.8 ±15.2	193.8 ± 15.3	184.8 ± 24.3	189.6 ± 13.4
Estimated VO_{2max} (mls/kg/min)	26.8 ± 6.2	24.9 ± 4.3	61.2 ± 4.6	52.2 ± 2.9

Table 2 F Values and Significance Levels of Fitness Variables of Black African Early Adolescents With and Without Mild Mental Retardation (MMR/NMR)

Dependent Variables	Corrected Model $F(_{3,56})$	F(1, 56)			P - values			
		Disability	Gender	Interaction	Model	Disability	Gender	Interaction
B.M.I. (kg/m^2)	9.22	16.01	4.74	4.45	< .001	< .001	< .034	< .039
Percent BF	22.03	9.09	49.52	3.64	< .001	< .004	< .001	.062
Grip Strength (D)(kg)	57.36	119.61	41.29	2.82	< .001	< .001	< .001	.099
Trunk Flexion (cm)	2.47	4.85	2.09	0.05	.071	< .032	.154	.821
Combined Back & Leg Strength (kg)	24.17	50.59	17.51	0.02	< .001	< .001	< .001	.885
Trunk Extension (cm)	131.77	380.80	1.17	6.16	< .001	< .001	.283	< .016
Vertical Jump (cm)	156.11	447.99	8.61	0.08	< .001	< .001	< .005	.780
Sit Ups (no./min)	80.73	211.60	19.10	5.35	< .001	< .001	< .001	< .024
Push Ups (no./min)	35.07	98.51	3.68	0.52	< .001	< .001	.060	.476
Rockport Fitness Walking Test (Duration) (min. secs)	291.16	858.50	2.79	0.44	< .001	< .001	.101	.511
Rockport Post-Test HR. (b./min)	0.89	2.10	0.27	0.29	.451	.153	.607	.594
Estimated VO_{2max} (mls/kg/min)	243.44	686.97	21.71	9.71	< .001	< .001	< .001	< .003

Also, apart from the main effects of gender, $F(1, 56) = 2.09$, MSE = 21.304, $p = .154$ on the trunk flexion test; $F(1, 56) = 3.68$, MSE = 27.738, $p = .060$ on the push up test; $F(1, 56) = 2.79$, MSE = 1.760, $p = .101$ on the Rockport fitness walking test duration; and $F(1, 56) = 0.27$, MSE = 308.763, $p = .607$ on the Rockport post-test HR, all other variables showed significant relationships at $p < .05$. These indicate that the participants' gender had significant influence on the test values of the percent BF, grip strength, combined back and leg strength, and vertical jump of the participants. Hence, of all the twelve sub-hypotheses tested on the significant relationships between gender and the selected variables, four were accepted while eight were not. From the data presented in Table 1, on the average, males had higher values than females in grip strength, combined back and leg strength, and the vertical jump test results. The females, on the average, had higher values than the males in the percent BF test result.

The interaction effects of gender and disability were significant in four of the twelve variables tested. Results yielded a significant interaction effect of $F(1, 56) = 4.45$, MSE = 2.459, $p = .039$ on BMI; $F(1, 56) = 6.16$, MSE = 15.159, $p = .016$ on trunk extension; $F(1, 56) = 5.35$, MSE = 31.969, $p = .024$ on the sit up; and $F(1, 56) = 9.71$, MSE = 20.691, $p = .003$ on estimated VO_{2max} measurements. Hence, out of the twelve sub-hypotheses that were tested for significant interaction effects between gender and disability, four were accepted while the remaining eight were not. Results of further analyses of the values of the significant interaction of gender and disability using the interaction comparisons approach as described by Jaccard and Becker (2002) are presented in Table 4. The analyses reveal that the effect of disability on BMI is more pronounced in females (2.49) than in males (0.77), while the effect of gender on BMI is more pronounced in participants with mental retardation (-1.74) than in participants without mental retardation (-0.03). Again, the influence of disability on trunk extension is more pronounced in females (-22.21) than in males (-17.20), while the effect of gender on trunk extension is more pronounced in children without mental retardation (-3.60) than in children with mental retardation (1.41). Also, the influence of disability on sit ups is more profound in males (-24.72) than in females (-17.94), while the effect of gender on sit ups is more profound in participants without mental retardation (9.80) than in participants with mental retardation (3.02). And finally, the effect of disability on estimated VO_{2max} is more pronounced in males (-34.60) than in females (-27.25), while the effect of gender on estimated VO_{2max} is more pronounced in participants without mental retardation (9.17) than in participants with mental retardation (1.82).

In summary, therefore, the disability factor had more pronounced effect on BMI and trunk extension values in females than in males, while it had more profound effect on estimated VO_{2max} and sit up values in males than in females. Also, the gender factor had more pronounced effect on BMI values in participants with mental retardation than those without, while it had more profound effect on estimated $VO_{2max,}$ trunk extension, and sit up values in participants without mental retardation than those with mental retardation.

In Table 3, results are depicted for each variable along with effect size computations. All the pooled standard deviation results, with the exception of the height, can be interpreted as large, confirming that most differences in the means were statistically significant and indicating sufficient sample size (Thomas & Nelson, 2001).

Table 3 Descriptive Statistics of Demographic Data and Selected Fitness Components of Black African Early Adolescents With and Without Mild Mental Retardation (MMR/NMR)

Variables	MMR (n = 30)	NMR (n = 30)	Effect Size (Pooled SD)
Age (yrs)	12.6 ± 1.3	12.3 ± 1.1	1.2
Weight (kg)	36.5 ± 7.1	37.4 ± 5.7	6.5
Height (m)	1.4 ± 0.11	1.5 ± 0.09	0.1
B.M.I. (kg/m^2)	18.4 ± 1.9	16.7 ± 1.3	1.7
Percent BF	18.6 ± 4.3	16.2 ± 2.7	3.6
Grip Strength (D)(kg)	14.8 ± 4.4	29.4 ± 8.1	6.5
Trunk Flexion (cm)	20.1 ± 4.9	17.4 ± 4.3	4.6
Combined Back & Leg Strength	143.4 ± 32.1	203.6 ± 38.4	35.4
Trunk Extension (cm)	19.2 ± 3.4	39.0 ± 4.6	4.1
Vertical Jump (cm)	10.3 ± 4.2	32.9 ± 4.4	4.3
Sit Ups (no./min)	11.4 ± 3.9	32.9 ± 8.6	6.7
Push Ups (no./min)	6.5 ± 2.3	20.2 ± 7.2	5.3
Rockport Fitness Walking Test (Duration) (min. secs)	24.0 ± 1.8	13.9 ± 0.7	1.3
Rockport Post-Test HR. (b./min)	193.8 ± 15.0	187.2 ± 19.5	17.4
Estimated VO_{2max} (mls/kg/min)	25.7 ± 5.2	56.8 ± 6.0	5.6

Note. Effect Size: ≤ 0.2 = small; 0.3 – 0.7 = moderate; ≥ 0.8 = large (Thomas & Nelson, 2001).

Table 4 Mean Differences of Interactions of Gender and Disability on Selected Fitness Components of Black African Early Adolescents With and Without Mild Mental Retardation (MMR/NMR)

Variables	MaMR-MaNMR	FeMR-FeNMR	MaMR-FeMR	MaNMR-FeNMR
BMI	0.77	2.49	–1.74	–0.03
Trunk Extension	–17.20	–22.21	1.41	–3.60
Sit Ups	–24.72	–17.94	3.02	9.80
Estimated VO_{2max}	–34.60	–27.25	1.82	9.17

Note. MaMR = Male participants with mental retardation; MaNMR = Male participants without mental retardation; FeMR = Female participants with mental retardation; FeNMR = Female participants without mental retardation.

Discussion

The purpose of this study was to compare the fitness of early-adolescent Black Africans with and without mild mental retardation. Results show that participants with mild mental retardation had significantly higher BMI and percent body fat than those without mental retardation. These results were not surprising as studies by Fernhall (2003) and Pitetti et al. (2001) have noted that BMI is usually higher in persons with mental retardation. The mean BMI values shown in Table 1 for male and female participants with mild mental retardation fell short of the International cut-off points for BMI for overweight values established by Cole, Bellizzi, Flegal, and Dietz (2000) by a margin of 4.16kg/m^2 and 2.94 kg/m^2, respectively. Probable reasons for the difference of the values obtained in this study from those of the International BMI cut-off points could be related to differences in diet, genetic make up, socio-economic variables, and activity levels of the present participants vis-à-vis participants used in the study by Cole et al. (2000). Further research could be directed in these areas since the present study did not investigate these variables.

Muscular strength, particularly leg strength, has been found to be an important component of physical fitness in adolescents with mental retardation (Fernhall & Pitetti, 2000). Studies have shown that children with mental retardation exhibit much lower muscular strength than their nondisabled peers (Fernhall et al., 1996). In the present study, those with mild mental retardation exhibited significantly lower combined back and leg strength than their nondisabled peers. These values were lower than the 226.6 ± 54.4 kg and the 207.0 ± 52.9 kg, respectively, for male and female participants with mental retardation of similar age used in the study by Pitetti and Yarmer (2002). Differences could be due to the nature of the routine physical activities the Pitetti and Yarmer participants indulged in, their health status, and their genetic make up.

Lower leg strength has been considered a critical limiting factor in achieving good peak VO_2 values among persons with mental retardation. According to Pitetti and Fernhall (1997), children with mild mental retardation demonstrate a strong relationship between peak VO_2 and leg strength. And according to Fernhall

and Pitetti (2000), poor muscle strength and function could be the limiting factor during peak exercise performance as opposed to their cardiovascular function. The stronger the leg muscles, the more the explosive power of an individual during a vertical-jump performance.

In the muscular endurance tests of the sit up and push up, the participants with mild mental retardation also had significantly lower values than their peers without mental retardation. This was also the case with gender. In addition to poor peak VO_2 and muscular strength, participants with mild mental retardation also exhibit very poor endurance run performance (Fernhall et al., 1996). This was true in this study. The significantly higher duration in the performance by participants with mild mental retardation on the Rockport fitness walking test resulted in a significantly lower estimated VO_{2max}. The endurance test values exhibited by the participants with mild mental retardation were therefore probably affected adversely by a combination of cardiovascular and neuromuscular factors. It would therefore be necessary to suggest that activity intervention strategies, aimed at improving the muscular strength and endurance and, in fact, the general functional ability (Lotan et al., 2004) of the present participants with mental retardation, be provided on a daily, structured basis. This, according to Fernhall and Pitetti (2000), Gillespie (2003), and Lotan et al. could provide multiple benefits. Hence, schools for early adolescents with mental retardation, and indeed other types of disabilities, must be encouraged by the Health and Education Ministries to institute a regimented physical activity program.

In addition, since the significantly low values of cardiorespiratory endurance obtained in this study agree with those of earlier findings (that people with mental retardation have lower cardiorespiratory endurance capacity than the general population; Cooper et al., 1999; Fernhall et al., 1996; Gillespie, 2003), governments, district councils, philanthropic organizations, health and education Ministries, and schools for students with disabilities must address the health concerns caused by inactivity among the population of persons with mental retardation.

Males and females performed similarly on trunk flexion and extension, push-ups, Rockport fitness walking test duration, and post-test heart rate. The results on joint flexibility failed to significantly differentiate betweem the trunk flexion and extension performances by females from those of males. These are contrary to popularly held views. Results of earlier studies on trunk flexion and extension reported by Alter (1996) and Norkin and White (1995), respectively, noted that females are generally more flexible than males at all ages, while males have greater range of hip extension than do females. The greater flexibility of females is usually attributed to differences in pelvic structures and to hormones that may affect the laxity of connective tissues. However, habitual movement patterns and physical activity levels may be the core factors in these findings. This view agrees with a long time assertion by Kirby, Simms, Symington, and Garner (1981), who noted that habitual movement patterns and physical activity levels are more important determinants of flexibility than gender, age, and body type.

Summary and Recommendations

The results of this study show that participants without mental retardation were superior to their counterparts with mild mental retardation in all selected fitness

components. The above scenario predisposes participants with mild mental retardation to poor fitness, hence leading to numerous health problems. To prevent these, therefore, Gillespie (2003) suggested that a critical examination of physical activity programs for children with mental retardation be carried out. This is because high levels of cardiovascular fitness are important for improving the overall health of adolescents with mental retardation. Therefore, all efforts should be geared toward improving the fitness of people with mental retardation.

To improve on their fitness/wellness, it is recommended that the following steps are considered. First, The Ministry of Education should formulate a well thought-out sports and recreation policy for children with disabilities. Second, The Ministry should also direct physical activity program formulation, implementation, and supervision. Third, The Ministry must develop a strategic plan with a time-line for implementation. This plan should include the following: (a) an understanding of the children with mental retardation—their specific needs, interests, and capacities (Fletcher et al., 1996; Sherrill, 2003; Winnick & Short, 1985), including their physical fitness needs; (b) cooperation of school heads and other school professionals, staff, co-opt parents and siblings, and consideration for designing disability-specific and age-specific facilities and teaching strategies (Fletcher et al.); (c) evaluation/assessment of urgent individual fitness needs of the children and a design for an individualized, regular/daily, physical activity program (Grant, 2000); and (d) gradual exposition to an intramural, and later on, interscholastic sports program as soon as their fitness levels improve.

Finally, such a strategic plan must consider age, sex, nature of disability, activity, experiences, growth, development, maturity, and coordination (Winnick & Short, 1985) as important factors during the planning and implementation phases of the daily physical activity program. Future research should be directed toward determining the relationships between the physical fitness of children with mild mental retardation and their diets, genetic make-ups, socio-economic status, and activity levels.

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