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Analysis of physical activity and health profiles and the utilization of the Biokinetic Humanitarian Project among senior university students

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Abstract

Minimal research has investigated physical activity and health profiles among university students in Africa. Research has however shown the need for health intervention programmes across all domains to advocate both physical activity participation and exercise education. The purpose of this study was to objectively analyse physical activity and health profiles among senior university students in Cape Town, South Africa. A secondary aim was to investigate the use of the non-profit organisation, the Biokinetic Humanitarian Project (BHP) (which provides complimentary exercise testing, exercise prescription and health education) to improve selected health measures in this population. A cross-sectional research study was employed whereby male and female university residence students (n=19) were screened for health and fitness measures at baseline and after a 6-month intervention period. Physical activity and health education was assessed using the International Physical Activity Questionnaire guidelines. The 6-month intervention comprised of both gym and home-based exercise programmes. Descriptive and comparative/interferential statistics were used to analyse the results. The level of significance was set at $p \leq 0.05$ for both genders. Significant improvements ($p \leq 0.05$) were observed for waist and hip measurements and for resting heart rate. Males demonstrated significant differences ($p \leq 0.05$) in hip circumference, heart rate and blood glucose. These findings suggest that the 6-month BHP intervention resulted in significant improvements in selected health and fitness parameters among university students. Future investigations should include bigger samples and be conducted among other public and private university settings.

Keywords: Students, The Biokinetic Humanitarian Project, physical activity, exercise, health, fitness.

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Introduction

Physical inactivity and sedentary behaviour are responsible for adverse health consequences such as cardiovascular diseases, hypertension and type two diabetes (WHO, 2012). According to the World Health Organisation (WHO), physical inactivity can be attributed for 3.2 million deaths related to health issues annually, making it the fourth leading risk factor for global mortality (WHO, 2012). In South Africa (SA), these figures are much more astounding in that one out of four males (27.9%) and one out of two females (45.2%) have been self-reported as physically inactive from a survey of 25 532 individuals (SANHANES-1, 2013). Furthermore, it was estimated that 37% of South African deaths in 2000, were attributable to non-communicable diseases, many of which were associated with nutrition and poor habits of lifestyle (Bradshaw et al., 2003). Therefore, the need to promote healthy lifestyle choices at educational institutions as well as through public awareness is recommended to effectively reduce these figures (SANHANES-1, 2013; WHO, 2012; Bradshaw et al., 2003).

Studies have shown the need to target the youth as they transition from adolescents to adulthood to prevent future health implications and for living healthy adult lives (Dinger et al., 2014; Joseph et al., 2013; Gharaibeh et al., 2012). In university students, behaviour adaptation could potentially prevent future health problems (Dinger et al., 2014; Hacıhasanoğlu et al., 2011). During their university years, students have described difficulty in adapting to healthy eating lifestyles and exercise behaviours as recorded in recent studies (Deliens et al., 2014; Linde et al., 2014). Additionally, campus food was not considered healthy by the students and with the high cost and limited time to prepare meals, intrinsic motivation is required to follow a healthy diet and to exercise regularly (Deliens et al., 2014; Linde et al., 2014). Living in a student residence also poses challenges with regards to environmental lifestyle changes from living with parents to living independently (Deliens et al., 2014). In conjunction with motivation, intervention programmes could be an effective strategy to advocate for both physical activity participation and exercise education (Gharaibeh et al., 2012; Noorbhai et al., 2013; SANHANES-1, 2013).

The Biokinetic Humanitarian Project (BHP) (SA NPO 135-447) *(http://www.thebhp.org*) is a non-profit volunteer-based organisation in South Africa which provides complimentary exercise testing, exercise prescription and health education to different communities, especially to those not previously/traditionally exposed to Biokinetic services (Noorbhai, 2013). The initiative is open to all interested students, communities and health professionals who would like to volunteer their assistance on any capacity. The BHP is mainly targeted towards underprivileged communities, students residing at schools and universities, public health settings and other settings, which may be in need of assistance. The aims of the BHP interventions include an enhancement of well-being, lifestyle, quality of

life and health among individuals (Noorbhai, 2013).

Numerous studies have investigated the physical activity profiles of university students emphasizing the importance of targeting this population (Dinger et al., 2014; Cruz et al., 2013; Joseph et al., 2013; Hacıhasanog˘lu et al., 2011). At present, the work performed through the African Physical Activity Network (AFPAN) *(www.afpan.weebly.com*) has focused on promoting physical activity amongst children and teenagers (Wachira et al., 2014) as well as the adult population in Africa (Guthold et al., 2011). However, little research has investigated physical activity and health profiles among university students in Africa. Therefore, the purpose of this study was to objectively analyse physical activity profiles among senior university students in Cape Town, South Africa. A secondary aim was to investigate the effectiveness of a Biokinetic Humanitarian Project (BHP) intervention on the health profiles among these senior university students.

Methodology

Research design

A cross-sectional quantitative experimental research design was employed. Nineteen senior university students volunteered to take part in the study. A questionnaire containing close-ended questions was administered to determine physical activity levels, health education and dietary behaviour. This research study was derived from a BHP intervention which took place at the Obz Square Residence of the University of Cape Town (UCT).

Participants

The participants (n=19) were screened for health and fitness measures at baseline and again after six months. Senior students were described as those who have been at university for more than three years.

Ethical considerations

Ethics approval was granted by the Human Research Ethics Committee of the University of Cape Town (HREC: 177/2013). Informed written consent was received from the students and confidentiality was observed at all times. Participants' data were also coded by the researcher(s) to enhance confidentiality. This study also conforms to the ethical principles for medical research involving human subjects as stated by the World Health Association Declaration of Helsinki.

Baseline testing

Participants were given forms which were filled out by the Biokineticist and were colour-coded to aid in the progression of the intervention. Questionnaire forms were completed and handed in by the participants at the beginning of the programme at the first 'check in' station. Thereafter they progressed from station two to station four whereby risk stratification and testing would allow the Biokineticist to prescribe the appropriate gym or home-based exercise programme. Risk stratification was determined by asking the participant a series of questions relating to exercise and family history of cardiovascular disease (CVD) risk factors (Thompson, 2010). This was followed by clinical measures testing which included blood pressure and glucose measurements and exercise measures consisting of weight, height and fitness testing.

Measures

Clinical measurements

A manual blood pressure cuff, sphygmonometer and stethoscope were used to take blood pressure which was not at a scheduled time and was during the participant's time of arrival at the intervention (®Medline MDS2001, USA). Blood pressure was measured once, following five minutes of sitting. Heart rate was measured on the participants' radial artery for 15 seconds after which the number of beats were multiplied by four to provide the number of beats per minute. Total blood glucose (1.5ml of blood) was tested on a members' index finger using a lancet and recorded after three minutes using the AccuChek machine (®Roche Diagnostics, USA).

Anthropometric measurements

Height was measured in meters (m) using an upright Seca stadiometer (Seca, USA). Participants stood barefoot with their heels and head in contact with the wall and arms at their side. Weight was measured in kilograms (kg) using a Clover Scale (Model TCS-A300; Clover Scale, SA), with the value rounded to the nearest 100^{th} gram (g). Body Mass Index (BMI) was calculated using the equation: BMI = weight (kg) / height (m^2).

Four different skinfold sites were used to measure body fat percentage (%), this included: the biceps, triceps, subscapular and suprailiac regions using Harpenden skinfold callipers (Baty International, UK). The rationale for using the four-site skinfolds provides an increase in accuracy compared to equations using seven, nine or 11 anthropometrical sites to calculate body fat percentage.

Health risk and dietary behaviour variables

Physical activity and dietary behaviour were assessed based on the self-administered International Physical Activity Questionnaire (IPAQ) (IPAQ, 2002). Health education was assessed by the question 'How good is your knowledge on the importance of health and exercise?' and the frequency of health fitness testing was assessed by the question 'How often do you have health and fitness testing?'

Cardiovascular disease risk factors

The average number of CVD risk factors was calculated by the presence of the following five risk factors: Age to gender (Male>45; Female>55), co-morbidities such as hypertension (systolic blood pressure: >140mmHg; diastolic blood pressure: >90mmHg); BMI (>25kg.m^2); fasting glucose (>5.6 mmol/L) and lifestyle behaviours such as cigarette smoking and physical inactivity (Thompson, 2010). Members were categorized "at risk" by having more than two of the above five CVD risk factors (Thompson, 2010). These five CVD risk factors were used in the calculation to determine and address the common risk factors for CVD among students.

Fitness measurements

Fitness levels were determined by the most number of push-ups and sit-ups performed by the participant in one minute.

All measurements were recorded and measured by the Biokineticist.

Statistical analysis

Statistica 11 analysis software was used for all analyses. Descriptive (means, medians, standard deviations) and independent t-tests were used to determine if there were any significant differences between groups at baseline and follow-up for continuous variables. Additionally, independent t-tests were performed whilst co-varying for gender to determine any significant differences. Level of significance for all analyses was set at $p \leq 0.05$.

Results

Participants' characteristics

The mean age of the participants involved in this study was 23.6 years $\pm$ 3.6 and 52.6% were males and 47.3% were females. In addition, the average height of the participants was 1.7cm$\pm$0.1 with the average height amongst males and females, 1.7cm$\pm$0.1 and 1.6cm$\pm$0.1, respectively ($p \leq 0.01$) (Table 1).

Physical health and fitness variables

Table 1 displays the results for physical health and fitness variables conducted at baseline and at follow-up for all participants. For all participants, significant differences were observed for waist (67.3cm±39.6) and hip measurements (89.4cm±50.4) ($p \leq 0.00$) and for heart rate (66.5b.min^{-1}±10.2) ($p \leq 0.04$). Similarly, significant differences were observed for males regarding their hip circumference (72.6cm±44.0) ($p \leq 0.04$), heart rate (64.0b.min^{-1}±8.6) ($p \leq 0.02$) and blood glucose (5.1mmol/L±0.9) ($p \leq 0.05$) between baseline and follow-up assessment.

Health risk and dietary behaviour variables

Table 3 displays the health risk and dietary behaviour variables extracted from the questionnaires for all participants, as well as co-varying for gender.

Table 1: Demographical, physical health and fitness variables among university students (n=19) at baseline and [(mean ± SD)]

	Total (mean ±SD)		**Gender**	
Variables	**Baseline**	**Male (n=80)**	**Female (n=12)**	**p-value**
Age (years)	23.1 ± 3.9	23.7 ± 4.8	22.6 ± 3.0	0.07
Height (cm)	1.7 ± 0.1	1.7 ± 0.1	1.6 ± 0.1	0.00*
Body weight (kg)	70.1 ± 15.7	77.1 ± 14.7	69.9 ± 18.7	0.00*
BMI (kg.m^{-2})	24.9 ± 5.0	24.65 ±4.0	25.0 ± 5.7	0.61
Waist (cm)	75.1 ± 16.2	76.6 ± 12.1	73.8 ± 19.0	0.33
Hip (cm)	97.8 ± 18.0	97.1 ± 14.0	98.4 ± 20.8	0.69
Waist/hip ratio	0.8 ± 0.1	0.8 ± 0.1	0.8 ± 0.1	0.00*
Tricep circumference (cm)	15.8 ± 7.8	13.2 ± 7.4	17.7 ± 7.6	0.02*
Bicep circumference (cm)	9.1 ± 5.0	7.6 ± 5.3	10.3 ± 4.4	0.03*
Subscapular (cm)	14.8 ± 6.8	14.7 ± 8.1	17.4 ± 15.8	0.42
Suprailliac (cm)	13.1 ± 5.8	12.5 ± 6.8	13.6 ± 4.8	0.44
Body fat (%)	22.4 ± 7.0	17.4 ± 5.0	24.4 ± 5.7	0.00*
Systolic blood pressure (mmHg)	113.9 ± 10.9	117.7 ± 9.1	111.2 ± 11.2	0.00*
Diastolic blood pressure (mmHg)	118.2 ± 8.5	74.7 ± 8.5	70.5 ± 8.1	0.00*
Heart rate (b.min^{-1})	71.5 ± 10.4	69.3 ± 10.7	73.4 ± 10.2	0.00*
Blood glucose (mmol/L)	5.6 ± 1.1	5.4 ± 0.8	6.8 ± 9.7	0.20
ABS (N)	25.5 ± 8.0	27.5 ± 8.8	23.6 ± 6.9	0.00*
UBS (N)	26.8 ±9.0	31.3 ± 14.0	30.1 ± 24.5	0.69

ABS – abdominal body strength; BMI – body mass index; N – number; SD – standard deviation; UBS – upper body strength
*$p \leq 0.05$

Table 2: Demographical, physical health and fitness variables among university students (n=19) at baseline and 6-months (follow-up) [(mean ± SD)]

Variables	Total (mean ±SD)			Female (n=9)			Female (n=9)		
	Baseline	Follow-up	p-value	Baseline	Follow-up	p-value	Baseline	Follow-up	p-value
Age (years)	23.6 ± 3.6	-	-	24.1 ± 4.1	-	-	23.0 ± 3.0	-	-
Height (cm)	1.7 ± 0.1	-	-	1.7±0.1	-	-	1.6±0.1	-	-
Body weight (kg)	72.9±33.0	71.7±33.1	0.22	76.9 ±38.4	76.7 ± 38.3	0.50	50.0 ± 25.5	50.0 ±28.0	0.40
BMI ($kg.m^{-2}$)	26.5 ± 8.4	27.0 ± 6.2	0.86	26.5 ± 11.2	24.7 ± 2.7	0.49	26.1±6.6	25.4±4.3	0.37
Waist (cm)	82.2±14.6	67.3±39. 6	0.00*	78.4±4.3	58.5±26.9	0.07	63.0 ±23.3	66.7 ±45.8	0.27
Hip (cm)	103.7±12.9	89.4±50.4	0.00*	99.3 ± 6.2	72.6 ± 44.0	0.04*	93.0±18.5	92.0±59. 4	0.29
Waist/hip ratio	0.8	0.8	0.77	0.8±0.1	0.8±0.1	0.09	0.8±0.1	0.7 ± 0.1	0.19
Tricep circumference (cm)	15.2 ±7.6	-	-	11.4±4.6	-	-	10.0 ±8.2	-	-
Bicep circumference (cm)	9.3 ± 5.9	-	-	5.9 ± 1.9	-	-	8.0±6.6	-	-
Subscapular (cm)	16.2±9.4	-	-	13.4 ±4.4	-	-	10.0 ±12.6	-	-
Suprailliac (cm)	13.9±6.8	-	-	12.8±8.4	-	-	8.0±4.7	-	-
Body fat (%)	21.0 ±6.8	-	-	16.0±5.1	-	-	28.9±8.7	-	-
Systolic blood pressure (mmHg)	114.8 ±12.1	118.1±12.5	0.13	121.5 ±7.7	119.4±10.9	0.36	121.0 ± 12.1	118.0±12.5	0.06
Diastolic blood pressure (mmHg)	70.1 ± 8.1	73.7±8.8	0.49	70.2 ±7.7	72.6 ±9.9	0.31	70.0 ±8.9	78.0 ±7.8	0.18
Heart rate ($b.min^{-1}$)	72.7±8.4	66.5 ± 10.2	0.04*	70.0±6.8	64.0±8.6	0.02*	66.0±9.4	52.0±11.7	0.07
Blood glucose (mmol/L)	6.0±1.5	4.00 ±0.92	0.08	5.6±0.6	5.1±0.9	0.05*	6.0±2.3	5.6±1.3	0.40
ABS (N)	28.3±6.0	28.8±8.9	0.08	31.2±6.2	33.7±9.0	0.25	25.0 ±3.3	23.0±5.1	0.13
UBS (N)	30.5±17.1	33.5 ±18.0	0.57	35.2 ±16.9	45.2 ±18.1	0.18	21.0 ±12.2	26.0 ±7.2	0.48

ABS – abdominal body strength; BMI – body mass index; N – number; SD – standard deviation; UBS – upper body strength

*$p \leq 0.05$. no data obtained (-)

Less than a third of all participants were physically inactive (15.8%) whilst more than half (52.6%) followed a healthy eating plan. More than half (52.6%) of all participants exhibited moderate stress levels. In addition, the prevalence of pain amongst participants was found to be 52.6%, with dominance towards musculoskeletal pain (73.7%).

Table 3: Health risk and dietary behaviour variables among university students (n=19)

Variables	Total (n=19)	Gender - N (%)	
	N (%)	Males (n=10)	Females (n=9)
Physical Activity			
Once	1 (5.3)	0	1 (11.1)
2-3 days	11 (57.9)	6 (60.0)	5 (55.6)
>4 days	4 (21.1)	3 (30.0)	1 (11.1)
Never	3 (15.8)	1 (10.0)	2 (22.2)
Duration of exercise			
0	1 (5.3)	1 (10.0)	0
<15 minutes	2 (10.5)	0	2 (22.2)
<30 minutes	4 (21.1)	2 (20.0)	2 (22.2)
>30 minutes	12 (63.2)	7 (70.0)	5 (55.6)
Healthy Eating Plan			
Sometimes	10 (52.6)	7 (70.0)	3 (33.3)
Most of the time	7 (36.8)	2 (20.0)	5 (55.6)
Never	2 (10.5)	1 (10.0)	1 (11.1)
Number of Take-outs/Fast Food in a week			
1	11 (57.9)	4 (40.0)	7 (77.8)
2	4 (21.1)	3 (30.0)	1 (11.1)
3	1 (5.3)	1 (10.0)	0
4	2 (10.5)	2 (20.0)	0
5	1 (5.3)	0	1 (11.1)
Stress Levels			
Low	5 (26.3)	4 (40.0)	1 (11.1)
Moderate	10 (52.6)	5 (50.0)	5 (55.6)
High	4 (21.1)	1 (10.0)	3 (33.3)
Posture-related Pain			
Yes	6 (31.6)	3 (30.0)	3 (33.3)
No	8 (42.1)	6 (60.0)	2 (22.2)
Sometimes	5 (26.3)	1 (10.0)	4 (44.5)
Health Knowledge			
Poor	1 (5.3)	0	1 (11.1)
Below Average	1 (5.3)	0	1 (11.1)
Good	9 (47.4)	4 (40.0)	5 (55.6)
Average	7 (36.8)	5 (50.0)	2 (22.2)
Excellent	1 (5.3)	1 (10.0)	0
Health & fitness testing			
Every 6 months	1 (5.3)	1 (10.0)	0
Every 12 months	2 (10.5)	1 (10.0)	1 (11.1)
Never	16 (84.2)	8 (80.0)	8 (88.9)
Weight Perception			
Normal	13 (68.4)	8 (80.0)	5 (55.6)
Underweight	1 (5.3)	0	1 (11.1)
Overweight	5 (26.3)	2 (20.0)	3 (33.3)
History of Heart attack/disease			
Yes	1 (5.3)	1 (10.0)	0
No	18 (94.7)	9 (90.0)	9 (100.0)
Family History of Heart Disease			
Yes	8 (42.1)	3 (30.0)	5 (55.6)
No	11 (57.9)	7 (70.0)	4 (44.4)
Smoking Status			
Yes	1 (5.3)	1 (10.0)	0
No	18 (94.7)	9 (90.0)	9 (100.0)
Musculoskeletal Pain (n = 18)			
Yes	13 (73.7)	5 (50.0)	8 (88.9)
No	5 (37.3)	5 (50.0)	1 (11.1)
Type of Pain (n = 13)			
Acute	10 (84.6)	4 (80.0)	6 (75.0)
Chronic	3 (15.4)	1 (20.0)	2 (25.0)
Aetiology of Pain (n = 13)			
Work	5 (38.5)	3 (60.0)	2 (25.0)
Exercise	3 (30.8)	1 (20.0)	2 (25.0)
Sport	2 (15.4)	1 (20.0)	1 (12.5)
Other	3 (30.8)	0	3 (37.5)

The main aetiology of musculoskeletal pain was work-related pain (38.5%) whilst sport-related pain was the least (15.4%) prevalent. Health education

amongst senior university students was adequate (47.4%), but more than three quarters (84.2%) had never had health and fitness testing prior to this intervention.

Cardiovascular risk profile

The prevalence of CVD risk factors for all participants is represented in Figure 1. More than half (63.2%) of all participants were overweight with the majority of overweight participants being female (58.3%). About a third (26.3%) of all participants had elevated glucose levels (>5.6 mmol/L), whilst 15.8% were physically inactive.

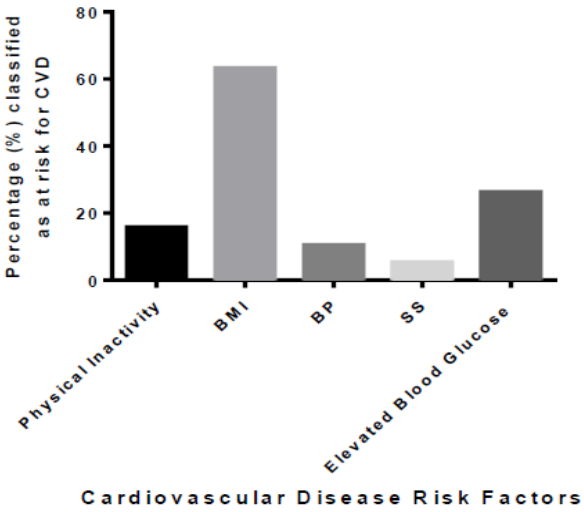

Figure 1: Cardiovascular disease risk factors for university students (n=19) (BP – blood pressure, BMI – body mass index, SS – smoking status)

Discussion

Physical inactivity is a critical health issue that South Africa faces as it is one of the major risk factors for CVDs, and it is modifiable. Targeting the young adult group is ideal in preventing CVDs (Dinger et al., 2014; Joseph et al., 2013; Gharaibeh et al., 2012). The main findings in this study were that significant improvements were observed as a result of the intervention for waist and hip measurements ($p \leq 0.00$) and heart rate ($p \leq 0.04$) of all students. These findings are similar to previous studies conducted amongst university students (Green et al., 2011; Gharaibeh et al., 2012; Fernandes et al., 2013; Kutlu & Memetoglu, 2013; Chen et al., 2014).

The significant improvement observed in males (hip circumference and heart rate) support previous findings that they are more motivated to exercise and maintain healthy eating plans (Romaguera et al., 2011), whilst the decrease in blood glucose may have resulted in them reducing their carbohydrate intake or becoming more

physically active (Chen et al., 2014). Interestingly, though not significant, systolic blood pressure and diastolic blood pressure were elevated in all participants upon follow-up. Follow-ups had taken place during the stressful exam period which could account for these elevated measurements (Zhang et al., 2011).

The second finding of this study was that more than three quarters (84.2%) of students never had health or fitness testing prior to this intervention. This is consistent with a previous report by Yahia et al. (2010). In a South African context, this is further supported by the SANHANES-1 survey in that participants had self-reported that they attended their last testing session 1.8 years before the survey (SANHANES-1, 2013). Several reasons are given for this in that they attended only when the medical need arose and others could not afford it and were not receiving medical aid. In this study, despite the tertiary level of education, students were prone to not attending sessions due to finances, time and transport limitations (Kutlu & Memetoglu, 2013; Deliens et al., 2014). When comparing health risk measures to the SANHANES-1 survey, our results for family history of heart disease (7.6% vs 42.1%) and personal history (1.5% vs 5.3%) are higher than the data collected from the survey. This could be due to a strength of objectively obtaining measures in our study as opposed to being self-reported.

Our findings also support the fact that those who exercised for more than 150 minutes per week (>4 days) had lower levels of stress (Cruz et al., 2013). Our results however, do not support the finding that high levels of stress are associated with low levels of physical activity. We report a contrast in that the students are active during stressful periods in order to cope at university, particularly at the post-graduate level (Cruz et al., 2013).

The Obz Square residence at UCT is a self-catering student housing facility surrounded by fast food restaurants which pose an increased influence and accessibility to unhealthy eating behaviours. Despite this, 52.6% of students reported having the occasional take-out in a week with only one student reporting having had take-out food five times a week. In addition, most students (89.5%) reported either always or sometimes having a healthy eating plan. Even though the residence environment poses an influence on a student's lifestyle, senior students seem to practice more self-control (Deliens et al., 2014).

Another finding of this research study was that 63.2% of all participants were overweight or at risk for obesity with females exceeding the number of males. This finding is supported by previous studies focusing on physical activity attributes amongst university students (Cruz et al., 2013; Peltzer et al., 2014; Racette et al., 2014). In a study conducted on 800 university students from 22 countries, female obesity was reported as most prevalent in Sub-Saharan Africa as opposed to Asia and North Africa where male obesity was dominated (Gharaibeh et al., 2012). Due to the lifestyle of a student living in residence, obesity could be due to fast food take-outs, physical inactivity, high stress levels and inconsistent eating (Kutlu &

Memetoglu, 2013). Furthermore, the perception of being overweight with the association of low levels of physical activity and being overweight correlating with smoking was not seen in this study though previously reported (Yahia et al., 2010). Findings however suggest the opposite in that weight does not influence smoking status and students that are overweight have very high activity levels.

Lastly, the current study supports previous findings regarding the monitoring of CVD risk factors in university student populations (Gharaibeh et al., 2012). CVD risk factors such as obesity and physical inactivity may be modified by increasing the students' access to physical activity opportunities and health education (Fernandes et al., 2013). The BHP initiative was effective at reducing modifiable CVD risk factors through a unique intervention offering complementary screening, exercise prescription and educational information. Although the use of social media (self-reported measures) have shown to be useful for students at university, objectively obtaining data (as offered through the BHP intervention) reduces bias and increases validity (Napolitano et al., 2013).

Recommendations and implications for future interventions

Monitoring participants biweekly or weekly may enhance exercise adherence. Collaborating with other small and mega-scale organisations will assist in providing a more comprehensive and holistic intervention to other communities in need.

Strengths and limitations

The strength of this study was that fitness and health measurements were obtained objectively rather than using self-reporting measures. In addition, these measures were performed by qualified Biokineticists. It is worthy to note that a sample size of 192 students was recruited at baseline; however, the limitation was that follow-up assessments were only performed for 19 of these students. Another limitation was that the questionnaires contained close-ended questions which could not provide further insight into health risk and behaviour. Finally, the lower body strength test was not performed which could have increased the strength of the physical and fitness measures.

Conclusion

University students have reported high workloads, lack of time and logistical challenges to exercise and to assess their health regularly. Cost-effective and accessible exercise and health testing is thus required to reduce the risk for CVD in the student population. The BHP initiative was an effective, yet complementary intervention and can thus assist in filling the gap and alleviate the epidemic of physical inactivity in Africa. It is imperative that similar investigations are conducted among other university settings in Africa. While this study has proven to be a success, it would also be beneficial to replicate it in other public and private settings.

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