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Can certified health professionals treat obesity in a community-based programme? A quasi-experimental study

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ABSTRACT

Objective: To test the effectiveness of a non-pharmaceutical programme for obese participants in a rural Eastern Canadian Province using certified health professionals.

Design: A prospective quasi-experimental design with repeated premeasure and postmeasure.

Participants: 146 participants with obesity (body mass index >30 kg/m^2) from rural and urban communities in an Eastern Canadian Province were divided into four groups.

Intervention: A 6-month intensive active community-based lifestyle intervention (InI) delivered by Certified Exercise Physiologists, Certified Personal Trainers and Registered Dietitians, followed by 6 months of self-management. A second intervention (InII) was nested in InI and consisted of group-mediated cognitive–behavioral intervention (GMCBI) delivered by an exercise psychologist to two of the four InI groups.

Outcomes: (1) Improving health outcomes among the participants' preactive and postactive 6-month intervention and self-management period, (2) Documenting the impact of InII (GMCBI) and location of the intervention (urban vs rural).

Results: The 6-month active InI significantly improved cardiovascular health for participants who completed the intervention. InII (GMCBI) significantly lowered the attrition rate among the participants. The self-management period was challenging for the participants and they did not make further gains; however, most were able to maintain the gains achieved during the active intervention. The location of the intervention, urban or rural, had little impact on outcomes.

Conclusions: A community-based programme utilising healthcare professionals other than physicians to treat obese patients was effective based on premeasure and postmeasure. During the self-management phase, the participants were able to maintain the gains. Psychological support is essential to participant retention.

Strengths and limitations of this study

- Using self-referred participants for preintervention and postintervention may introduce sampling biases.
- More women than men participated in the intervention.
- A 6-month community-based active lifestyle intervention led by certified health professionals can be an effective way of treating obesity.
- Gains made during the active intervention were maintained during the 6 months of self-management.

BACKGROUND

When people grow older, they engage less in physical activity.[1] This often results in weight gain to obesity, defined as having a body mass index (BMI) of 30 kg/m^2 or higher.[2] The prevalence of obesity globally has increased steadily over the past few decades.[3 4] A 1985 Canadian Health Promotion study reported that 6.1% of Canadian adults were found to be obese, as compared with 18.1% in 2010.[5 6] Some studies link obesity to higher levels of multiple chronic and mental health conditions and physical challenges.[7–12] Hence, it is important that adults and specifically older adults who are overweight or obese attempt to become fitter to avoid or delay the onset of chronic disease.

Obesity is a multifaceted problem that defies magic bullet solutions often touted by popular media reporting (eg, extreme or fad dieting, intensive exercise). Obesity is influenced by genetics, environment, behaviour and socioeconomic conditions.[13] Recent research also suggests that geography and income impact obesity and physical activity levels.[14–16] In particular, rural citizens tend to have higher levels of obesity than their urban counterparts.[16 17] This same trend is true for income, such that people with lower incomes present with higher obesity levels than those with higher income levels.[14] In Canada, on average, rural citizens have lower incomes[18 19] and high obesity rates related to physical inactivity.[15]

Despite its complex aetiology, obesity can be treated. The most common treatment involves lifestyle changes such as improved nutrition and increased physical activity.[20–23] Studies have demonstrated that, for example, cardiometabolic risk factors were reduced in a group of morbidly obese individuals after a 1 year lifestyle intervention targeting nutrition and physical activity.[24] In another study examining the effectiveness of an 18-month intervention focusing on exercise and goal setting, a group of sedentary, middle-aged women increased their participation in physical activity and improved their self-efficacy related to overcoming barriers and accomplishing goals.[25] An analysis of the literature examining intervention programmes for overweight and obese people concluded that intervention programmes "...have potential in changing energy balance related lifestyle and anthropometric outcomes."[26]

Research indicates that lifestyle intervention programmes can work[27] if the participants remain engaged long enough to complete the programming. It seems that psychological support as part of lifestyle intervention programmes is important to assist in weight management.[28 29] Research examining the effectiveness of lifestyle changing studies that included goal setting sessions, or sometimes also called group-mediated cognitive–behavior interventions (GMCBI),[30] had better outcomes compared with those without GMCBI components.[31–34]

Although primary care providers can prescribe lifestyle changes, such treatments have poor uptake.[35 36] Obese patients need guidance to learn and implement lifestyle changes. Primary care providers are often unable to provide this kind of complex, prolonged and intense treatment,[37 38] whereas other professionals are uniquely trained for it. A Canadian Society for Exercise Physiology (CSEP) Certified Exercise Physiologist (CSEP-CEP) is certified to assess exercise capacity and prescribe appropriate physical activity and rehabilitative exercise programming to individuals with a variety of clinical conditions. Certification is achieved after completing a 4-year Bachelor's degree in exercise sciences from an accredited postsecondary institution specialising in health-related and performance-related fitness applications, clinical experiences with various populations, and successful completion of the Society's written and practical examinations. CSEP Certified Personal Trainers (CSEP-CPT) have a minimum of 2 years of university/college coursework in a specific core competency related to exercise and have successfully completed standard theory and practical examinations. The CSEP certifications are comparable to those provided in the USA by the American College of Sports Medicine. Registered Dietitians (RDs) must successfully complete a Bachelor's degree in food and nutrition from an accredited university, a 12-month supervised internship and a written national accreditation examination with Dietitians of Canada. These non-physician allied health professionals are uniquely trained to treat obesity and are excellent candidates to deliver lifestyle intervention programmes.

The primary objective of the current study was to examine how well a 6-month active intervention (based on physical activity and teaching nutritional knowledge) with content specialists, followed by a 6-month self-management period, would improve the health of obese participants. In addition, we tested the hypothesis that behavioural change strategies guided by principles of GMCBI would further improve health outcomes. Lastly, we examined whether the geographic location of the intervention (urban/rural) was related to the effectiveness of the health outcomes. We deliberately did not include a control group in this long and complex study. The literature indicates that when obese people do not engage in lifestyle modifications, they will not improve their health outcomes.[39–41] Hence, we felt that inclusion of a control group that received no intervention would provide little new information.

METHODS

Setting and study population

The Healthy Eating, Active Living for Tomorrow's Health (HEALTH) study was conducted in the Eastern Canadian Province of New Brunswick. This province has one of the highest obesity rates in the country.[42] The multisite study was conducted in three separate locations, two rural and one urban, using four separate groups, two rural and two urban (the two urban groups were conducted in the same city). Owing to the long, cold and icy winters, the intervention took place indoors. The urban interventions took place in two public arenas equipped with a community room and a walking track. One of the two rural interventions took place in a local arena that did not have a walking track. The participants walked the perimeter of the rink and through the stands. The other rural community did not have an arena, so the programme was delivered in the local Legion Hall. Tables were used to create walking lanes.

Recruitment was achieved through media articles and advertisements in physicians' offices and no incentives to patients or their physicians were provided. Potential participants were screened to assess if they fit the inclusion criteria: having a BMI between 30 and 40 kg/m^2 and being between 19 and 69 years of age. To ensure that participants were physically able to complete the intervention, each participant obtained approval to participate from their physician by having their physician complete a Physical Activity Readiness Medical Examination (PARmed-X). Once deemed suitable by their physician, participants were able to enrol in the study. A total of 146 participants were enrolled in the study, of whom 85% were female. Participants were enrolled into one of two urban or two rural community groups based on their community of residence. All four experimental groups received InI and Urban I and Rural II received InI and InII. The Urban I and Rural I groups began their programmes in January 2012 while the Urban II and Rural II groups started in September

2012. Intervention programme staff travelled to the communities to deliver the programme.

A priori sample size calculations indicated that a minimum of 25 participants were required for each group; we oversampled and allowed 35 participants in each group.[i] After recruitment, participants were required to sign a consent form in order to participate in the study.

Intervention

The active intervention (InI) consisted of 1 h of physical activity three times a week over a 6-month period. The physical activity was supervised and delivered by a CSEP-CEP and CSEP-CPTs, as well as CSEP-CEP and CSEP-CPT students in training. Additionally, all participants took part in biweekly nutritional interventions delivered by an RD. The nutritional component was comprehensive, covering topics including learning how to read nutrition food labels; portion control; fat, sugar and sodium intake; meal planning; and grocery shopping, including a grocery store tour. Nested in the InI was a second intervention, InII, in which two of the four groups (one urban, one rural) received biweekly GMCBI sessions delivered by an exercise psychologist.[30 43] The assignment of the groups for GMCBI was in advance and based on the location of the intervention, and not based on the individual participants' characteristics.

The GMCBI sessions were developed to equip participants with psychological skills to help address the barriers participants often perceive or create when attempting to make lifestyle changes, particularly around physical activity. The sessions provided participants with psychological skills to address these challenges while also leveraging the positive aspects of group dynamics to motivate and support new behaviours around nutrition and physical activity. The GMCBI sessions addressed group identity, teaching self-monitoring skills, individual and group goal-setting, developing strategies to overcoming barriers, sharing and support of group and individual goals, relapse prevention planning, cognitive regulation strategies, and transitory strategies for when the programme terminated.[30 44 45]

Each InI was followed by a 6-month self-management period. Each participant received a lifestyle resource book, but there was no contact between programme staff and participants for the duration of this phase. For the entire intervention, no control groups were used. Past research robustly indicates that when obese people do not engage in lifestyle changes, their health outcomes typically do not improve.[39–41]

Instruments and assessment

Health measures such as blood pressure, resting heart rate, weight and height (BMI), waist circumference and mental health—part of the SF-36v2 Health Survey—were measured. We focused on the SF-36v2 Mental Health Summary Score because 26 participants scored at or below 42, which is the cut-off point for a positive first stage depression screening.

Additional measures related to physiological abilities, nutrition knowledge and behaviour were taken but will not be reported in this paper. We hypothesised that the intervention programme and the GMCBI would improve the health and well-being of the participants but geographic location (rural and urban) would have little impact on outcomes. Participants were measured at three different times: preintervention (T0) for initial measurements, after the 6-month active intervention (T1) and after the 6-month self-management phase (T2) for their final measurements. The measurements were conducted by the CPTs under the leadership of one CEP. The staff was the same throughout the entire programme, for all four sites, including all three measurement periods.

Statistical methods

For the primary objective of this study, the effectiveness of both components of the intervention (InI and the self-management period) was examined by conducting a repeated measures multivariate analysis of variance (MANOVA) with time of measurement (T0, T1, and T2) as the independent variable and five dependent variables (resting heart rate, systolic blood pressure, waist circumference, BMI and the mental health component summary). This analysis was conducted using only the final 59 participants who completed all three measurement points.

Differences in the improvement of the health outcomes between the GMCBI and non-GMCBI groups were examined using a between-subject MANOVA. Difference scores were calculated between T0 and T1, T0 and T2, and T1 and T2 for resting heart rate, systolic blood pressure, waist circumference, BMI and the mental health component summary on the SF-36v2. These difference scores were then included as the dependent variables in the GMCBI MANOVA with GMCBI status as the independent variable. The comparison of the effectiveness of the intervention between geographic locations (urban/rural) was also examined using a between-subject MANOVA, with the health variables difference scores included as the dependent variables and geographic location (urban/rural) as the independent variable.

[i]In order to ensure a sufficient sample to alleviate the possibility of rejecting a false null hypothesis, a power calculation was performed based on exercise data from a previous study. In that study participants improved their walk time for a 1.6 km distance between (T1 mean 15.3 SD 1.8; T2 14.1 SD1.5). Assuming an α level of p=0.05 and a desired power level of β=0.80 and the need to compare two groups, calculations indicate 23 participants were required in each group (4×23=92). Owing to a 32% attrition rate in the 8-week study we felt it would be prudent to over-recruit the number of participants to 35 in each of the four groups.

RESULTS

Participant profile

Over the four sites, a total of 146 participants enrolled in the study (85% women and 15% men). All participants were between the ages of 20 and 69 years, with a mean age of 50.47 (SD=11.03). Most were self-referred, with a few referred by their physician (N=7). See table 1 for additional descriptive data.

Participants' health measures at intake (T0) are listed in table 2. The mean level of obesity among participants was class II (36.5 kg/m^2; SD 3.09), and systolic and diastolic blood pressures were elevated.

Attendance and attrition

On average, participants attended 67% of the InI sessions; however, attrition rates were high. After InI (T0), 57 participants (39%) had terminated the programme and a further 30 (20.5%) participants were lost for the T2 measurements, for a total dropout of 87 participants (59.5%). Attrition rates did not differ between urban and rural sites.

Effectiveness of InI (physical activity)

Results from the repeated measures MANOVA for the aggregate data of all four groups revealed that there was a significant main effect of time, indicating that the difference in the five health outcomes across the three measurement points was significant, $F(2, 116)=19.57$, $p<0.001$ (see table 3). To follow-up the significant main effect, Bonferroni post-hoc tests were conducted for each dependent variable independently. These post-hoc tests revealed that all five health outcomes differed significantly from T0 to T1 and from T0 to T2, but not from T1 to T2 (see table 4). This indicates that the participants improved on all five health outcomes during the InI and maintained their health status during the self-management phase. The interaction effects between the measurement points and the health outcomes were not significant ($p>0.05$), indicating that the improvement in health outcomes did differ significantly across the health outcomes. For the SF-36v2, we focused on the Mental Health Summary Score because 26 participants scored

Table 1 Participant demographic profile (N=146)

Characteristics	Total N (%)	Urban I GMCBI N (%)	Rural I N (%)	Urban II N (%)	Rural II GMCBI N (%)
Male	22 (15)	7 (16)	4 (11)	7 (20)	4 (12)
Female	124 (85)	36 (84)	31 (89)	28 (80)	29 (88)
Urban	78 (53)	100	0	100	0
Rural	68 (47)	0	100	0	100
Overweight (25.0–29.9 kg/m^2)	02 (01)	0	03	03	0
Class I (30.0–34.9 kg/m^2)	43 (30)	26	26	43	24
Class II (35.0–39.9 kg/m^2)	82 (56)	51	68	40	67
Class III (≥40.0 kg/m^2)*	19 (13)	23	03	14	09
Single/separated/divorced/widowed	37 (25)	26	20	37	18
Married/common law/engaged	109 (75)	74	80	63	82
Education					
High school or less	44 (30)	9	43	29	45
Postsecondary	79 (54)	70	49	43	52
Graduate degree	23 (16)	21	8	28	3
Working full-time	84 (58)	61	57	62	52
Working part time	24 (17)	16	11	17	21
Not working (retired/unemployed/on leave)	37 (26)	23	32	21	27
Family income: <$40 000†	50 (36)	20	40	40	52
Family income: between $40 001 and $80 000	49 (36)	44	40	24	33
Family income: >$80 001	38 (28)	36	20	36	15
Diagnosed with:					
Type II diabetes	17 (12)	12	9	14	12
Hypertension	58 (40)	35	51	37	36
High cholesterol	41 (28)	23	34	29	27
Vascular diseases	15 (10)	07	09	11	15
Lung diseases	24 (16)	05	17	26	21
Musculoskeletal diseases	43 (30)	26	31	34	27
Current smoker	12 (08)	02	09	09	15
Positive for depression	40 (27)	40	20	31	15

*A number of participants had a BMI over 40 kg/m^2 (maximum 41.1) and were allowed to participate.
†Nine participants did not disclose their family income range.
BMI, body mass index; GMCBI, group-mediated cognitive–behavioral intervention.

Table 2 Participant health characteristics (N=146)

Characteristics	Urban I and II M (SD)	Rural I and II M (SD)	Total M (SD)
Resting heart rate (bpm)	78.87 (9.86)	82.24 (10.60)	80.44 (10.32)
Systolic blood pressure (mm Hg)	138.54 (14.00)	140.38 (13.89)	139.40 (13.93)
Diastolic blood pressure (mm Hg)	84.56 (8.18)	84.29 (9.50)	84.44 (8.78)
Body mass (kg)	99.10 (13.19)	98.21 (13.44)	98.68 (13.27)
Body mass index (kg/m^2)	36.48 (3.37)	36.50 (2.77)	36.49 (3.09)
Waist circumference (cm)	116.04 (9.02)	115.04 (18.85)	115.58 (9.89)
Ratio of cholesterol over HDL level*	3.79 (0.93)	3.69 (1.14)	3.75 (1.03)

*Thirteen participants did not provide data.
HDL, high-density lipoprotein.

at or below 42, which is the cut point for a positive first stage depression screening.

Effectiveness of InII (GMCBI sessions)

The urban and rural groups receiving InII (GMCBI) had significantly *lower attrition* rates as compared with the non-GMCBI groups during the active interventions (29% vs 50%) and the self-management phase (31% vs 37%). The difference in attrition rates between the two groups for both the active intervention and the self-management phase was significant χ^2 (2)=7.08, p<0.05. However, the *overall attendance* in terms of the number of InI sessions attended groups were not significantly different (72% vs 62%), F(1, 86)=2.17, p>0.05.

The two groups (1 urban and 1 rural) that received GMCBI sessions were similar to the two non-GMCBI groups with regard to their health profile. Both were class II obese (37 vs 35.9 kg/m^2) and the mean age was identical, as was the ratio of females/males. However, the GMCBI group had more urban participants (57% vs 43%) and slightly lower levels of self-reported diagnosed hypertension (36% vs 44%), hyperlipidaemia (25% vs 31%), lung disease (12% vs 21%) and musculoskeletal disease (26% vs. 33%), according to self-reports. However, none of these differences were statistically significant, p>0.05.

Results from the between-subject GMCBI MANOVA revealed that only the change in waist circumference differed significantly between the groups. The change in waist circumference from T0 to T1 (F(1, 57)=5.95, p<0.05) and the change between T1 and T2 (F(1, 57) =5.69, p<0.05) were significantly different between GMCBI and non-GMCBI groups (see table 5 for means across groups). Waist circumference decreased modestly in those receiving GMCBI during the active and self-management phases of the intervention while in the non-GMBI group there was a large decrease in waist circumference during the active phase with an increase in waist circumference observed during self-management.

Differences between urban and rural groups

The examination of the descriptive statistics suggested that the urban and rural groups differed on several variables. In particular, there were more urban participants (N=78) as compared with rural participants (N=68), and the rural participants were older (M=51.85, SD=9.69) than the urban participants (M=49.26, SD=12.01). However, these differences (N and age) were not statistically significant (p>0.05). The urban and rural groups differed in terms of level of education and annual household income. Urban participants reported a higher yearly family income (M=6.09, SD=3.10) as compared with rural participants (M=4.59, SD=2.70), F(1, 137)=9.06, p<0.01; and urban participants received higher levels of education (M=3.63, SD=0.11) as compared with rural participants (M=2.68, SD=0.12), F(1, 144)=35.07, p<0.001. There were no statistical differences with regard to self-reported diagnosis of hypertension, hyperlipidaemia and lung disease.

Results from the between-subject rural and urban locations MANOVA revealed that only the change in the mental health component summary of the SF-36v2 differed significantly between urban and rural groups, F(1, 57)=5.35, p<0.05, with urban participants (M=−1.4325, SD=5.89) reporting lower scores on the SF-36v2 than rural participants (M=1.9230, SD=5.12).

Table 3 Health outcomes using group means between T0, T1 and T2 (N=59)

Health outcomes	T0 M (SD)	T1 M (SD)	T2 M (SD)
Resting heart rate (bpm)	81.49 (10.61)	76.41 (10.20)	76.39 (11.22)
Systolic blood pressure (mm Hg)	141.36 (15.22)	134.85 (13.46)	132.47 (13.31)
Body mass index (kg/m^2)	36.11 (3.12)	35.15 (3.38)	35.14 (3.84)
Waist circumference (cm)	115.11 (9.04)	110.92 (10.56)	110.30 (10.77)
SF-36v2 Mental health summary[46]	49.21 (17.20)	52.63 (14.08)	52.73 (14.85)

Table 4 Bonferroni post-hoc results for all health outcomes across T0, T1 and T2 (N=59)

Health outcomes	M (SD)	T0–T1 p value	T0–T2 p value	T1–T2 p value
Resting heart rate (bpm)		0.001	0.006	1.00
T0	81.49 (10.61)			
T1	76.41 (10.20)			
T2	76.39 (11.22)			
Systolic blood pressure (mm Hg)		0.001	<0.001	0.627
T0	141.36 (15.22)			
T1	134.85 (13.46)			
T2	132.47 (13.31)			
Body mass index (kg/m^2)		<0.001	0.004	1.00
T0	36.11 (3.12)			
T1	35.15 (3.38)			
T2	35.14 (3.84)			
Waist circumference (cm)		<0.001	<0.001	1.00
T0	115.11 (9.04)			
T1	110.92 (10.56)			
T2	110.30 (10.77)			
SF-36v2 Mental health summary		0.01	0.01	1.00
T0	49.21 (11.31)			
T1	52.63 (8.60)			
T2	52.73 (9.05)			

Moreover, post-hoc comparisons revealed that the difference in mental health scores between the urban and rural groups were only significant between T1 and T2, suggesting that rural participants were able to maintain their mental health better during the self-management phase than their urban counterparts (see table 6).

Table 5 Means and SDs for the health outcomes difference scores between group-mediated cognitive–behavioral intervention (GMCBI) groups (N=59)

Change in health outcomes	GMCBI group Mean	GMCBI group SD	Non-GMCBI group Mean	Non-GMCBI group SD
Resting heart rate (bpm)				
D1	−4.97	10.38	−5.27	10.36
D2	−3.59	11.02	−7.64	13.85
D3	1.38	11.38	−2.36	10.81
Systolic blood pressure (mm Hg)				
D1	−7.62	13.64	−4.64	11.49
D2	−9.35	17.71	−8.09	15.51
D3	−1.73	13.83	−3.45	15.44
Body mass index (kg/m^2)				
D1	−0.93	1.38	−1.02	1.78
D2	−1.00	2.50	−0.92	1.67
D3	−0.07	2.11	0.10	0.94
Waist circumference (cm)				
D1*	−2.45	6.76	−7.10	7.60
D2	−5.16	9.64	−4.22	5.07
D3*	−2.71	8.61	2.88	8.86
Mental health component summary				
D1	3.60	9.67	3.12	7.21
D2	3.68	9.37	3.27	8.52
D3	0.08	6.56	0.15	4.22

D1=T1−T0, D2=T2−T0; D3=T2−T1.
*p<0.05.
Negative values represent a reduction.

DISCUSSION

Weight loss is a significant challenge, particularly for older adults.[47] Although many participants were still obese at the end of the intervention, they possessed a much healthier obese phenotype in that several important health measures improved for the target population as a result of the current intervention. The dropout rate, or therapy incompliance, was high but consistent with other similar programmes.[48 49] In fact, research suggests a lack of compliance with even less demanding therapies, such as taking oral medications for hypertension.[50] Poor compliance with medical therapy is considered common, and may significantly impact outcomes of chronic disease issues requiring serious attention.[51]

On the basis of our study results, it is evident that the GMCBI sessions are an important component of any lifestyle therapy as participants adhered to the intervention longer than did those who did not receive GMCBI. While both groups most likely experienced many of the same challenges, the GMCBI sessions dealt directly with these challenges and helped people persevere. By discussing challenges directly, participants may have indirectly eliminated the bank of acceptable rationalisations for their non-participation.[29] In addition, the GMCBI groups were also able to maintain their reduced waist circumference better than the non-GMCBI group during the self-management period.

Nevertheless, to make a programme like this sustainable in the community, dropout is a serious concern. Although all participants appeared motivated, many

Table 6 Means and SDs for the health outcomes difference scores between urban and rural groups (N=59)

Change in health outcomes	Urban group		Rural group	
	Mean	SD	Mean	SD
Resting heart rate (bpm)				
D1	−5.13	10.91	−5.04	9.71
D2	−2.53	12.96	−8.15	10.67
D3	2.60	11.22	−3.11	10.60
Systolic blood pressure (mm Hg)				
D1	−4.88	14.27	−8.44	10.87
D2	−6.56	16.17	−11.63	17.41
D3	−1.69	12.12	−3.19	16.81
Body mass index (kg/m^2)				
D1	−1.11	1.35	−0.78	1.72
D2	−0.84	1.83	−1.12	2.61
D3	0.27	1.45	−0.34	2.04
Waist circumference (cm)				
D1	−4.14	7.90	−4.24	6.85
D2	−6.29	7.79	−3.06	8.47
D3	−2.15	11.31	3.06	8.47
Mental health component summary				
D1	3.85	7.27	2.92	10.39
D2	2.41	7.65	4.85	10.36
D3*	−1.43	5.89	1.92	5.12

D1=T1−T0, D2=T2−T0; D3=T2−T1.
*p<0.05.
Negative values represent a reduction.

were not *yet* ready to commit to making lifestyle changes. However, among those who completed the intervention, the sense of camaraderie and support that developed was important in their continuation on the path of lifestyle changes. This is consistent with the teaching of GMCBI.[52] Community programmes may need to accept that participants may need to join lifestyle change programmes several times before they successfully complete staying in a programme, akin to what often happens in smoking cessation programmes.[53]

In general, the question of whether participants resided in rural or urban communities did not have an impact on the health outcomes, with the exception that rural participants scored more favourably on the mental health component summary of the SF-36v2. This is somewhat surprising considering that the rural participants had lower incomes and less education. Although income and education may impact health, the sample size was too small to examine the socioeconomic background and its impact on outcomes. Interestingly, there was no difference in BMI between the urban and rural groups before, during and after the intervention as is often reported, even though the rural participants had less education and lower incomes. They had slightly higher levels of self-reported diagnosed chronic disease, and a greater incidence of smoking, but lower levels of scoring positive for depression on the SF-36v2. Therefore, this study has demonstrated that rural participants should be offered lifestyle change programmes as often as urban participants, despite the fact that many rural communities lack 'proper' exercise facilities.[54] In fact, this study shows that significant health improvements can be made using existing community space such as a meeting hall or community centre and little equipment so long as knowledgeable exercise and nutritional staff are available to implement and lead the programme. During the self-management phase, participants did not make additional gains and some trended towards their preintervention state, suggesting that even after 6 months of intensive regular contact with programme staff the participants had not fully adopted new lifestyle behaviours. This is consistent with other studies and suggests that obese adults may benefit from programming that continues contact in some form for an extended period.[55]

The challenges of community-based programming/limitations

This intervention was conducted in a real-world environment and sought to strike a balance between scientific control and allowing the intervention to unfold as it would in any community circumstance. Every attempt was made to ensure that the intervention was consistent between the four sites despite physical differences in facilities (walking track vs no walking track). The realities of conducting an intensive prolonged community-based intervention include but are not limited to cancelling sessions due to snowstorms, bad roads and changing seasonal weather. Although these issues are difficult to quantify, they play a significant role in delivering an intervention in a community setting. The January and September start date of the intervention for the groups may have had an impact on the attrition, although both periods covered a substantial part of the winter months, traditionally a time in New Brunswick when people reduce outdoor activities. Initially, we wanted to focus on class I and II obese people for health and safety reasons; however, in the end, we did include 13% of participants who had a slightly higher BMI than 40 kg/m^2 because of the numbers we needed to have enrolled in each site.

This study relied on self-referred or physician-referred participants, with the majority of participants being female and having a BMI between 30 and 42 kg/m^2, thus introducing selection bias. The intervention used premeasure and postmeasure and did not use a control group. The potential lack of experimental control was at least partially overcome by using experienced, well-trained staff and objective measures that can be reliably obtained under differing field conditions. Despite these limitations, this study embodies the direct translation of laboratory and clinical-based best practices for treating obesity through increased physical activity, nutritional education and counselling and allows for evaluation of their efficacy in a real-world setting.

Future directions

We learnt that a 6-month intervention is not long enough. Considering that, on average, participants were

able to attend three quarters of the sessions, it seems that a longer intervention would be more beneficial. More work needs to be conducted to ensure adherence to lifestyle interventions for people who are already motivated to make changes, to reduce dropout.

CONCLUSION

Primary healthcare providers should use other trained certified professionals to assist in the treatment of obesity in utilising non-pharmaceutical lifestyle changes in their own communities. Simple physical activity group programmes led by CSEP-CEPs or CSEP-CPTs and nutritional group education programmes led by RDs should become an extended part of the primary healthcare community. GMCBI appears to be particularly effective in helping obese patients achieve success in overcoming the barriers that lie between them and their participation in healthy lifestyle activities. Programmes need to be designed in such a way as to allow obese patients to make several attempts at making lifestyle changes.

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