A Systematic Literature Review of Physical Activity-Based Health Programs for Indigenous Women: Impacts on Physical Activity Levels, Obesity, and Community Building

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Abstract

Indigenous women experience a disproportionate burden of chronic diseases and health challenges related to obesity. The need for culturally relevant programming to support and empower women to optimize health is well established. Participatory physical activity [PA]-focused programming responsive to the sociocultural realities of Indigenous women may hold promise. However, obesity and chronic disease literature for Indigenous women focusing on PA change predominantly discusses individual behaviors, leaving a knowledge gap around the social and environmental supports needed to realize improved outcomes. We searched PubMed, Ovid MEDLINE, CINAHL, Bibliography of Native North Americans, and the University of New Mexico’s Native Health Databases for English language peer-reviewed articles on PA-based programs addressing prevention or management of obesity with Indigenous women as a primary focus. Fifteen articles, representing 13 unique programs, were included in the review. Outcome measures included program attendance and factors influencing program acceptance, PA, biochemical markers and blood pressure, weight and waist circumference measurements, the development of social supports, and nutritional knowledge acquisition. Although some studies found improvements in PA level and other outcomes, the marked variability in study design makes it difficult to draw conclusions about best practices for PA-based wellness and weight management programs for Indigenous women. However, programming that acknowledges and provides accommodation for the complex factors that influence behavior, incorporates cultural and community elements, and integrates opportunities for supportive network development may improve outcomes.

Keywords

Indigenous, physical activity, obesity, women, programming

Introduction

In Canada, Australia, New Zealand, and the United States, the prevalence of obesity, defined as a body mass index [BMI] of > 30 kg/m², and obesity-related diseases are disproportionately high among Indigenous peoples (Alaska Native Epidemiology Center, 2017; Australian Bureau of Statistics, 2008, 2015; Ellison-Loschmann & Pearce, 2006; Health; Public Health Agency of Canada, 2011a; Statistics Canada, n.d.). These countries share similar settler colonial histories and health and social structures leading to inequities in accessing resources, education, and health care. The term Indigenous is difficult to define given the heterogeneity of Indigenous communities’ culture, history, and geographical location. In general, Indigenous is used to refer to populations that resided in a geographical area before colonization, who have distinct cultures and beliefs to the dominant group of
society or those who self-identify as Indigenous, among other criteria (Gracey & King, 2009). Together with marginalization and remoteness for many Indigenous communities, social, political, and environmental drivers have contributed to the increased burden of chronic disease for these otherwise diverse populations (Ellison-Loschmann & Pearce, 2006; Gracey & King, 2009; Public Health Agency of Canada, 2011b; Turin et al., 2016; United Nations, 2013).

Diabetes rates for Indigenous people are as high as two to three times that of non-Indigenous (Anand et al., 2001; Burrow & Ride, 2016; Public Health Agency of Canada, 2011b; Oster et al., 2014; Prince et al., 2018; Young et al., 2000), and rates of stroke and cardiovascular disease are reportedly 15%–20% higher (Anand et al., 2001; Australian Institute of Health and Welfare, 2015; Centers for Disease Control and Prevention, 2016; Reading, 2015; Young et al., 2000). There are limited data in this respect regarding women generally, and even less information specific to Indigenous women (Prince et al., 2018). Recent reviews have highlighted that the young female Indigenous population is growing at a much higher rate than the non-Indigenous female population, escalating the need to understand the potential burden of cardiovascular disease and diabetes on women (Prince et al., 2018).

Health disparities among Indigenous women involve numerous factors interacting at different socio-ecological levels, including individual, family, and community (Allan & Smylie, 2015). In addition, Browne and Smye (2002) noted the medicalization of social problems in health discourses, where human problems and issues such as the complex interplay between individual, social, and structural drivers of poor health outcomes are treated as medical conditions.

Applying a broader lens raises important questions about the role of psychological stress, mental health, and other individual responses to social environments that shape obesity among Indigenous people. For instance, in Canada, healthy and nurturing models for caregiving were disrupted by the Indian Residential Schools system (Truth and Reconciliation Commission of Canada, 2015). A similar process took place in the United States as many Native children were coerced or forced into boarding schools. Indigenous children in Australia were systematically removed from their families and Samoan ways of life and culture were outlawed. Individuals suffered intense emotional and psychological stress due to displacement, were deprived healthy and culturally appropriate role modeling, and were subsequently challenged to model good health to their families. Epigenetic research indicates that trauma from childhood, such as residential school attendance, may yield physical changes that could be passed on through generations (Murgatroyd et al., 2010; Yehuda et al., 2016). Historical traumas and ongoing forms of colonization and racism also degrade community structures, creating a dearth of spiritual supports and infrastructure for activities that support wellness. It is important to reframe obesity, from what Western scholars and health promoters have long seen as “lifestyle choice” to recognize complex factors external to the individual and acknowledge how “choice” is often limited, to help guide new program design to improve the health and well-being of Indigenous women.

Weight management programming literature from non-Indigenous groups indicates that three-pronged approaches are most impactful, focusing on nutrition education, improving physical activity (PA) and behavior change strategies (Hoskin et al., 2014; Lindstrom et al., 2003; Look AHEAD Research Group et al., 2013; Wing & Look AHEAD Research Group, 2014; “YMCA Diabetes Prevention Program,” 2015). Modest changes in diet and PA can lead to reductions of greater than 50% in the incidence of diabetes among individuals with impaired glucose regulation (Tuomilehto et al., 2001). PA in particular has been shown to have extensive benefits in the domains of physical, psychological, emotional, and socio-cultural health (Tremblay & Craig, 2009). By contrast, physical inactivity is a known risk factor for developing obesity and Type 2 diabetes (Tremblay et al., 2010). Historically, PA was relatively high among Indigenous people and was a culturally valued necessity due to a life lived close to the land (Afele-Fa’amuli et al., 2009; Foulds et al., 2011; Pargee et al., 1999). Women typically have lower rates of PA than men (Bassett et al., 2010; Tudor-Locke et al., 2011). As the present rates of PA for Indigenous women are lower than historical rates (Stefanich et al., 2005), health care organizations are promoting programs targeting PA (Heard et al., 2017). The success of such initiatives, however, is likely dependent on health care providers and those who develop and implement health care initiatives having a clear understanding of the socio-political and environmental contexts in which participants live and using community-driven, participatory approaches to program development (Rice et al., 2016).

Rice et al. (2016) reviewed Canadian diabetes prevention/management and obesity-related chronic disease programming for Indigenous people. They identified 13 programs between 2008 and 2014 mainly focused on rural communities. Eleven programs had PA components, only 3 of which reported increases in PA or fitness. Teufel-Shone et al. (2009) reviewed 64 PA-based programs implemented with American Indian and Alaska Native populations in Canada and the United States from 1986 to 2006 and found the majority (57.8%) focused on participants under 18 years of age; 72% were on reservations, and 41% showed significant impacts on health, behaviors, or knowledge. Only one study reported significant improvements in PA levels. Sushames et al. (2016) reviewed 13 studies of PA programming for Indigenous adults in Australia and New Zealand. Six of these assessed PA measurements and only one showed significant improvement. All reviews discussed the challenges of developing and executing rigorous programs in the community demonstrating increased PA. Despite limited improvements
in PA, improvements in other health or fitness outcomes or knowledge of healthy behaviors and self-efficacy were found. The majority of programs reviewed had cultural adaptations, but how or if the programs helped participants develop or improve their social and environmental context in a way that would support long-term, meaningful behavior change was rarely outlined. None of the above reviews offered specific information about how the programs affected an individual’s social environment or vice versa, nor did they suggest gender-specific differences.

We performed a systematic review to summarize the impact of PA-based wellness programs for Indigenous women on PA, weight changes, and participation rates. We also explored which aspects of the programs influenced outcomes, the effect of the programs on participants’ social community, and if changes in social support systems influenced outcomes or participant experience.

**Method**

**Study Identification**

This systematic review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses reporting guidelines (Liberati et al., 2009). We searched PubMed, Ovid MEDLINE, CINAHL, Bibliography of Native North Americans, and the University of New Mexico’s Native Health Databases using keywords and medical subject headings representing: (a) Indigenous people and (b) PA (end date June 2017). These two search concepts were combined using the Boolean operator “AND.” The complete search strategy is presented in the supplemental Appendix. We supplemented our search of English language peer-reviewed databases with a gray literature search, including the following program databases: the Public Health Agency of Canada’s (2011b) Ways, Tried and True, the Just Move It portion of the North American-based non-profit organization Healthy Native Communities Partnership campaign and the Canadian Aboriginal Diabetes Initiative. Finally, we searched Google using the terms “Aboriginal/Indigenous + exercise + program.”

**Study Selection**

We screened citations for internal duplicates within the databases and then for external duplicates between them. Two reviewers independently screened all remaining titles and abstracts. The same reviewers independently screened the full text of all studies identified through abstract screening. Discrepancies were discussed and resolved through a third reviewer.

To be eligible, studies had to evaluate a PA-based program that addressed the prevention or treatment of obesity or promotion of general health in Indigenous women. Studies that included men were included in our work if the results found for men were the same as those found for women and did not confound the conclusions of our study. With respect to PA, the program could include a physically active component or provide education and guidance about PA without actually performing the activity. Diabetes prevention programs were excluded, as these were comprehensively reviewed in the recent Rice et al. (2016) review. Programs that addressed weight loss maintenance were also excluded because individuals in these studies represent a distinct population having already successfully controlled weight. All evaluative study types were considered. Articles focusing on protocols only were excluded. No date limits were applied. The systematic review and protocol were registered at Prospero with the registration number CR42017067742.

**Data Extraction and Synthesis**

One author extracted relevant data from included studies and another verified the extracted data for accuracy. The following information was extracted: study size, type, and location, program details, outcomes specific to PA, weight and anthropometric and cardiometabolic risk, commentary on the development of a community of support for individuals, attrition rates, and limitations. Finally, we extracted specific elements important to the success or failure of the programs reported by the authors. The Mixed Methods Appraisal Tool (MMAT) was used to assess study quality (Hong et al., 2018) (Supplementary Table 1). Heterogeneity of included studies precluded the pooling of quantitative data, and we synthesized findings narratively.

**Results**

The database search identified 4,123 articles; 2,892 remained after duplicates were removed. One additional publication was identified from the original articles as relevant for review as it provided additional information about one of the programs studied (Albright et al., 2012). The total articles screened were 2,893. Title and abstract screening resulted in 32 full-text articles for review. To remove potentially confounding factors and ensure interpretable results, articles were excluded if they dealt with the management of a specific disease other than obesity (number excluded = 11); the population was ineligible (number excluded = 4); it lacked a PA component (number excluded = 1); or the source was inaccessible (number excluded = 1). Although our gray literature search identified PA-based programs, no evaluations were available. In total, our review included 15 articles describing the evaluations of 13 programs (Figure 1).

**Study Characteristics**

Six studies described trials involving randomization (Albright et al., 2014; Canuto et al., 2012, 2013; Lindgärde & Ahren, 2007; Narayan et al., 1998; Witmer et al., 2004), of which
three were randomized controlled trials (RCTs) (Albright et al., 2012, 2014; Canuto et al., 2012, 2013; Witmer et al., 2004). Four were observational studies with pre and postprogram evaluations (Afele-Fa’amuli et al., 2009; Foulds et al., 2011; LaBreche et al., 2016; Lavallée, 2007). Two studies involved postprogram analyses only (Heard et al., 2017; Klomp et al., 2003), and one described developing a multisite program (Pargee et al., 1999). The majority of programs was undertaken in urban settings, one was strictly rural (Afele-Fa’amuli et al., 2009), and three were both urban and rural (Pargee et al., 1999). Three studies were undertaken in Canada (Foulds et al., 2011; Klomp et al., 2003; Lavallée, 2007), six in the United States (Albright et al., 2014; Gellert et al., 2010; LaBreche et al., 2016; Narayan et al., 1998; Pargee et al., 1999; Witmer et al., 2004), one in South America (Lindgärde & Ahren, 2007), and two in Oceania (Afele-Fa’amuli et al., 2009; Heard et al., 2017). The number of participants in single studies ranged from 17 to 641.

**Program Type**

The most common program design was a weekly, in-person group session involving either exercise or exercise and nutrition classes. The most common duration was 12 weeks, although program length varied from 2 months to 2 years. One RCT used telephone conferencing and website tools to
facilitate the program (Albright et al., 2014). One program used a self-directed learning design (Narayan et al., 1998). One program combined weekly exercise classes with an independent training schedule (Foulds et al., 2011). Two studies implemented a flexible drop-in style program (Heard et al., 2017; Klomp et al., 2003; Witmer et al., 2004). One program allowed each community involved to create their own program (Pargee et al., 1999).

**Program Goals**

Across all programs, the main study goal was increased PA levels. Four programs only focused on increased PA levels (Foulds et al., 2011; Klomp et al., 2003; LaBreche et al., 2016; Lavallée, 2007). The remaining studies stated other explicit goals including controlling weight, improving metabolic risk markers and risk factors for chronic disease (Heard et al., 2017; Lindgärde & Ahren, 2007; Narayan et al., 1998), increasing nutrition knowledge (Afele-Fa’amuili et al., 2009; Canuto et al., 2012), preventing heart disease (Witmer et al., 2004), promoting healthy lifestyles (Pargee et al., 1999), and increasing self-efficacy (Albright et al., 2014; Witmer et al., 2004). Increasing social supports was not an explicitly stated goal for any of the programs.

**Outcome Measures**

**Physical activity.** Although PA was a central component of all programs reviewed, seven programs attempted to measure PA. Six programs measured change in PA level through questionnaires, all finding improvements (Albright et al., 2014; Foulds et al., 2011; LaBreche et al., 2016; Narayan et al., 1998; Witmer et al., 2004). The remaining study measured PA levels with accelerometer data only, finding a significant increase in PA for those who reported low PA at baseline (Lindgärde & Ahren, 2007). In studies that included both men and women, it was often not possible to parse separate gender-specific results, so this was not attempted. Each questionnaire was tailored for their particular program. One program used the validated Active Australia PA Survey (AAPAS) and accelerometer data (Albright et al., 2014). The program resulted in self-reported increases in moderate to vigorous PA (MVPA); however, accelerometer data showed an increase in MVPA in both the program and control group and no significant difference between the two (Albright et al., 2014). Another RCT using the Modifiable Activity Questionnaire (MAQ) found increases in both groups with no significant difference between groups (Narayan et al., 1998). An RCT in Peru found that maximum aerobic capacity increased significantly for the group exercising three times per week for 6 months compared with the group exercising once per week (Lindgärde & Ahren, 2007).

**Biochemical markers and blood pressure.** Five studies looked at biochemical markers (Canuto et al., 2012; Foulds et al., 2011; Lindgärde & Ahren, 2007; Narayan et al., 1998; Witmer et al., 2004). One RCT found decreased plasma glucose after the program (Lindgärde & Ahren, 2007) and another found increased 2-hr postload glucose and insulin levels (Narayan et al., 1998). Total cholesterol and low-density lipoprotein improved in one pre/postevaluations (Foulds et al., 2011), and fasting glucose, hemoglobin A1C, triglycerides, and C-reactive protein improved in one RCT (Canuto et al., 2012). Blood pressure improved in one pre/poststudies (Foulds et al., 2011).

**Weight and waist circumference measurements.** Six programs included anthropometric measures of weight, height, BMI, waist circumference (WC), and hip circumference (Afele-Fa’amuili et al., 2009; Canuto et al., 2012; Foulds et al., 2011; Lindgärde & Ahren, 2007; Narayan et al., 1998; Witmer et al., 2004). One program intentionally did not include weight measurements to change the focus of the group to “health” and not weight (Albright et al., 2014). One program found increased BMI and weight in the program group, in which the group was taught to reduce fat intake but not overall calorie intake (Narayan et al., 1998). BMI decreased in three studies (Afele-Fa’amuili et al., 2009; Canuto et al., 2012; Witmer et al., 2004). WC decreased in three studies without decreased weight or BMI (Foulds et al., 2011; Lindgärde & Ahren, 2007; Narayan et al., 1998). Canuto et al. (2012) were unable to use their data due to challenges in accuracy and consistency in measuring WC.

**Developing a community of social support.** Three programs indicated how or if the program contributed to an individual developing a “community of social support” that may encourage healthy lifestyle changes (Canuto et al., 2012, 2013; Heard et al., 2017; Klomp et al., 2003). Four studies indicated the importance of individuals being well supported and comfortable in their group (Afele-Fa’amuili et al., 2009; Lavallée, 2007; Narayan et al., 1998; Witmer et al., 2004). Themes of needing a culturally relevant and safe program and having well-trained and encouraging staff were prevalent in all of these papers. The most direct attempt to facilitate a “community of social support” was in one program that combined sharing circles and a culturally appropriate program manual and cookbook (Witmer et al., 2004). They found participants more inclined to ask for support from health team members after and during the program. Postprogram evaluation of participation in martial arts classes in one study revealed emotional health benefits achieved through “developing a sense of community and feeling less isolated” (Lavallée, 2007). One study indicated that PA became a coping mechanism for stress, replacing eating (Witmer et al., 2004).
Other Outcome Measures

One observational study used questionnaires to evaluate nutritional knowledge pre and postprogram and found a significant increase in nutritional knowledge regarding high fat and high fiber foods (Afele-Fa’amuili et al., 2009). More than half of the participants in a prenatal exercise program agreed the program positively influenced their pregnancy or delivery; however, postprogram analysis was voluntary and may have been biased (Klomp et al., 2003). Finally, one study evaluated and found positive changes in participants’ stage of behavioral change (Witmer et al., 2004).

Program Acceptance and Attendance

Two studies examined motivation for attendance through questionnaires; one found cultural components to be paramount (LaBreche et al., 2016), another found social components were valued more highly (Klomp et al., 2003). Two studies assessed qualitatively through participant interviews found participants identified the cultural aspect of each program as more beneficial to motivation and improving healthy behaviors than the PA component (Heard et al., 2017; Lavallée, 2007). Both studies found high participant satisfaction during postprogram interviews. Two programs observed that lack of enrolment restrictions were important (Foulds et al., 2011; Heard et al., 2017). Most studies discussed the importance of determining barriers to attendance in advance and mitigating these where able.

Attrition rates varied greatly among the 14 programs, ranging from 0% in both the exercise and nutrition program components of (Afele-Fa’amuili et al., 2009) study and the martial arts element of the Lavallée (2007) study to 43% in the Canuto et al. (2012, 2013) Aboriginal and Torres Strait Islander Women’s Fitness Program. Allowing flexibility in program attendance and considering economic status were identified as important for attendance and attrition in two studies (Afele-Fa’amuili et al., 2009; Witmer et al., 2004). A link between full-time employment and attendance was found (Narayan et al., 1998) study. Attrition due to business, pregnancy, and medical issues was reported in the Albright et al. (2014) study. Another found that participants with low attendance had higher weights at baseline and lived farther away (Canuto et al., 2012). Four studies did not discuss attrition rates (Heard et al., 2017; Klomp et al., 2003; LaBreche et al., 2016; Pargee et al., 1999). In their 2014 paper, Canuto et al. discussed the impact of the randomization process and how this affected participants’ and waitlisted people’s views of the program. Many of the women who applied for the program were friends and family, and splitting up people who enrolled together into waitlisted and active groups caused tension, disappointment, and demotivated some women. However, others reported this motivated them further, as they were “lucky enough” to be in the active group or, for waitlisted women, they had time to prepare for the program.

See Table 1 for detailed characteristics of included studies.

Discussion

We examined the impact of PA-based wellness programs for Indigenous women on participants’ activity level and weight and developing social support. Although some studies found improvements in PA level and other outcomes, the low number of studies, and variability in study design make it difficult to draw conclusions about best practices for PA-based wellness and weight management programs for Indigenous women. Generally, the qualitative studies were of higher quality than the quantitative studies included in the review. Common issues among the RCTs included intervention and control groups differing significantly at baseline and limited discussion of whether outcome assessors were blinded to participant groups. Across all study designs, articles included limited information, limiting the ability of the MMAT to assess study quality. One study was not eligible to be assessed using the MMAT (Narayan et al., 1998). Interestingly, within the bounds of our study inclusion screening criteria, there were more urban studies compared with rural. Reasons for this may include increased capacity for both researcher and Indigenous organizations in urban settings. Further investigation would be needed to understand the reasons for this pattern. This review, like those of Rice et al. (2016), Teufel-Shone et al. (2009), and Sushames et al. (2016), highlights the need for further study.

Only six studies measured the effect of the program on PA (Albright et al., 2014; Canuto et al., 2012; Foulds et al., 2011; LaBreche et al., 2016; Narayan et al., 1998; Witmer et al., 2004), and only one measured VO2 max (Lindgärde & Ahren, 2007). Several challenges may arise when attempting to measure PA and physical fitness in real-life programming. VO2 max and accelerometers, considered to provide the most objective measure of PA (Saunders et al., 2015), involve significant cost and logistical barriers. Although pedometers provide a reasonable correlate of overall PA and may be a less expensive alternative to accelerometers, they rely on self-reporting of data (Bassett et al., 2010; Cai et al., 2016; Tudor-Locke et al., 2011). Validated surveys of activity level have been used; however, as noted in this review and that by Rice et al. (2016), survey use to date is inconsistent. Completing surveys can be time consuming, and choosing an appropriate, culturally relevant survey is challenging. Surveys validated in Indigenous populations include the MAQ (Narayan et al., 1998) and the AAPAS (Albright et al., 2014). More consistent use of common validated surveys would facilitate comparability of future studies.

Seven programs assessed weight change and five focused on weight management. Weight (and BMI) increased in the active group or, for waitlisted women, they had time to prepare for the program.
### Table 1. Characteristics of Included Studies.

| Author(s), (year) | Intervention title, (location) Study type, description, and size | Commentary on the development of a community of support for individuals | Weight-related, anthropometric, and cardiometabolic risk outcomes | Physical activity-related outcomes | Study attrition rates and limitations |
|-------------------|---------------------------------------------------------------|---------------------------------------------------------------------|----------------------------------------------------------------|---------------------------------|--------------------------------------|
| Afele-Fa'amuli et al. (2009) | Three villages, American Samoa (rural) | N = 95 (63 women, 32%); These villages, each one randomly assigned to one of the three interventions over 12 weeks: 1) exercise–3/week for 45–60 min; 2) nutrition education—group lessons and discussions; 3) combined | No comments on developing a community of support for this individual. Stress on cultural sensitivity through 1) logistical strategy and translation; 2) information presented with relevance to Samoan populations; 3) staff familiar with culture; 4) materials that reflect the core values and history of Samoans. Allowed a high level of comfort in sessions. | All three programs experienced a significant decrease in BMI. Combined program had the greatest impact on BMI with an average decrease of 4.5% for the women. BMI drop was largest between weeks 8 and 12 in Interventions 2 and 3. Interventions 3 had the highest increase in nutrition knowledge. | Not evaluated. 0% attrition; culturally appropriate. Participants attempted their best performance to demonstrate their appreciation and respect for the “teacher”, who traveled a far distance. Encouragement in class was motivating, and program staff were getting together as Aboriginals, family support, enjoying the program once there, and personal reinforcement. |
| Albright et al. (2009, 2012, 2014, 2015) | No Mi’ikeni Project, “the( scott’s one”)., Honolulu, Hawaii, United States (urban) | N = 20 (100% women). Telephone counseling every 2 weeks, with additional communication through email over 9 weeks. 2013, RCT, N = 228 (100% women). Baseline results. 2014, 2015, RCT, N = 311 (100% women). PA intervention for pregnant women. Compared two interventions over 12 months: 1) 17 tailored telephone conference counseling sessions, residents a peer educator, and provided with a tailored website intervention (TTCW); 2) standard website only intervention | No comments on developing a community of support for the individuals. Baseline questionnaires asked about social support, environment, and barriers. Low scores on social support for exercise. Frequent barriers to exercise included lack of time and family demands. The TTCCW intervention supported women to increase their self-efficacy, overcome barriers, enhance environment, and enlist support. Culturally sensitive approach taken to TTCCW intervention. | Significant decrease in waist circumference (2.7 cm males, 2.2 cm females) for every age group except 40–49 years. | 2014: No attrition data given. PA self-reported and not measured by accelerometers. 2015: 32% attrition rate due to pregnancy. |
| Canesso et al. (2011, pre-study protocol paper including additional arms not reported in results paper) | Atikokani and Timmis Street Valiant Women’s Fitness Program, Adelaide, Australia (urban) | N = 20 (100% women). Telephone counseling every 2 weeks, with additional communication through email over 9 weeks. Participants were also encouraged to do 1,000 steps/day. Participants were sent fortnightly newsletters to provide support and encouragement. Writers received coaching and support. 2012, 2013, 2014: RCT, N = 109 (100% women). Intervention included weekly hour-long exercise classes and four nutrition workshops over 12 weeks. Participants were also encouraged to do 1,000 steps/day. Participants were sent fortnightly newsletters to provide support and encouragement. Writers received coaching and support. 2013: The group environment, positive atmosphere, and feeling comfortable contributed to program success. Encouragement in class was motivating, and program staff were getting together as Aboriginals, family support, enjoying the program once there, and personal reinforcement. | No comments on developing a community of support for the individual. Intervention was successfully completed. | Significant decrease in waist circumference (2.7 cm males, 2.2 cm females) in 3 months post: −2.5 kg and −1.03 kg/m² in BMI compared with 26.7 kg and 4.6 kg/m² at baseline. | 2012: 43% attrition in intervention group. 2013: No attrition data given. PA self-reported and not measured by accelerometers. Limited by a large amount of missing data due to difficulty in enrolling participants. |
| Foulds et al. (2011) | Hearts in Training, British Columbia, Canada, 21 communities (urban, rural, on- and off-reserve) | Pre-post evaluation, N = 273 (215 women, 79%) in 21 communities. Self-selected one of three interventions over 13 weeks: walking, biking, or running. One group was per week (led by an Aboriginal community member), two personalized training sessions, in preparation for 10 km Vancouver Sun Run. | No comments on developing a community of support for the individual. Intervention was successfully completed in the community; not directly affiliated with an institution, academic or otherwise. | Significant decrease in waist circumference (2.7 cm males, 2.2 cm females) for every age group except 40–49 years. | 2012: Significant decrease of weight and BMI immediately after program and 3 months following program (−1.65 kg and −0.66 kg/m² in BMI compared with 26.7 kg and 4.6 kg/m² at baseline). Limitations by self-selected design and lack of control group. Lack of objective measures of PA levels may result in reporting bias. |
| Author(s), (year) | Intervention title (location) | Study type, description, and size | Commentary on the development of a community of support for individuals | Weight-related, anthropometric, and cardiometabolic risk outcomes | Physical activity-related outcomes | Study attrition rates and limitations |
|------------------|-------------------------------|----------------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------|-------------------------------------|
| Gallert et al. (2018) | Nia Ola Mi'kmaq, Nova Scotia, Canada (urban) | Pre-postevaluation of 12-week program, N = 74 (48 women, 26%); Weekly 2-hr educational sessions with good setting for the following week; Focus on weight loss, exercise, nutrition, and risk factor reduction. Fitness classes taught by the program leader. No control group. | Weekly goal set by participants with the support of the entire class. Participants formed small exercise groups. Low attrition attributed to social support; each participant adopted a buddy or small group to provide support to and get support from. Participants often expressed how classes and meet their goals were exciting. | Significant improvements in weight, blood pressure, and total cholesterol (did not do A1C, no significant change in blood glucose). Not evaluated. | Subject to selection bias and the Hawthorne effect. Attrition not reported. Limitations include lack of control group and short-term nature of study with no long-term follow-up to determine if positive changes were maintained. |
| Heard et al. (2017) | Culture X, aerobic dance, Aja, Samoa (urban) | Post-intervention qualitative evaluation, N = 28 (25 women, 89%). Narrated from Culture X participants (over half had been attending for at least one year). Culture X is a community-based dance aerobic program. Hour-long dance aerobic sessions rotated in Samoan values and norms. Held various times each week at various locations. Interviews focused on barriers to PA, attendance, and commitment to the classes. | Confidence addressed through the inclusive and supportive approach, and having previous experience with dance. Common barrier identified was body image. Support from family and friends integral. Participants were able to bring their children and grandchildren to the program, which helped address the barrier of family commitments. Positive support from instructors identified as important. | Not evaluated. | Not evaluated. Small sample size narrows the parameters of findings. Conflict of interest in the interviewer. Interviewee participants who had shown a commitment to the program over a sustained period. |
| Klomp et al. (2003) | Physical exercise class, Saskatoon, Saskatchewan, Canada (urban) | Pre-postprogram evaluation, N = 56 (100% women). 51% completed pre-intervention program evaluation questionnaire of individuals who attended at least 4 weekly sessions of the exercise program. | Designed social time and snacks were important incentives to attend. Researchers mentioned that many women experienced social isolation, felt hopeless, or were in a nonsupportive relationship. They developed a sense of solidarity and community among participants. Positive drop-in format important. Would have liked greater than one session per week. Several women commented strongly that the classes were exclusively for pregnant women, one woman commented, “Aboriginal women are shy, hard-pressed.” | Not evaluated. | Not evaluated. Limited by the fact it was designed after the program had begun and for limited evaluation purposes. Attrition not reported. |
| Labreche et al. (2016) | WINCART—P1 Let’s Move Pilot Program, California, United States. Communities included: Costa Mesa, Hawthorne, Santa Ana, Long Beach, San Diego, and Carson, United States (urban and rural) | Pre-postevaluation, N = 106 (71 women, 67%); 8 difference, organizations, 8 weeks with weekly, hour-long sessions led by a Program Champion. 10 min of activity was included at each meeting termed the “Instant Recess Program.” | No comments on developing a community of support for the individual. Program was implemented in places where the community already gathered (community centers, place of worship). Sense of community was already present. | Not evaluated. | Increase from 2.14 to 2.99 days/week in PA (self-report PA questionnaire pre- and post-intervention). 82% indicated they would continue to exercise more than the next 6 months. Participants enjoyed fun movements and simplicity of the program. Noticed a positive change in attitude toward PA largely due to the cultural aspects of the program. See comments under Community Support column. Not assessed quantitatively. |
| laValle (2007) | Martial arts classes, Toronto, Ontario, Canada (urban) | Mixed-methods evaluation, N = 17 (7 women, 41%); martial arts classes at Indigenous Community Center. Incorporated traditional medicines, purification ceremonies, and gifts. Evaluated program through sharing circles. 11 of 17 participated in symbol making. | Medicine Wheel teachings of health provided Indigenous theoretical basis. All four aspects below were improved by programming: Emotional: lack of identity, feelings of isolation helped through sense of community. Mental: closely tied to emotional through stress relief. Spiritual: importance of links to cultural center and traditional dance instructors. Teaching of Aboriginal heritage. Physical: not the motivation for remaining in the program. Integrate exercise with Indigenous spiritual, and mental benefits. | Not evaluated. | Participants needed to have a certain level of physical health. Difficult to directly translate to Aboriginal communities on reserve or otherwise. |
| Lindgren and Ahren (2007) | Physical activity program for socioeconomic marginalized women of Native American ancestry—Lima, Peru (urban) | Pre-postprogram evaluation, N = 75 (100% women), 5 months. Compared two randomly assigned interventions. 1) 1-hr long exercise class/week 2) 3-hr long exercise classes/week. Both exercise classes consisted of traditional and modern dance. | Study demonstrated that a group physical activity program was feasible in a poor urban area. Attendance was high and attrition low; no comment on why that was the case and no comment on its effect on community building for participants. | Weight changes not significant in either group. Plasma glucose and waist circumference significantly decreased and number of exercise sessions improved results. | VO₂ max (aerobic capacity) improved with three sessions per week. Initial increase associated with wearing the accelerometer and significant increase in MVPA in those who reported low MVPA minutes at baseline versus high minutes. |

(continued)
Table 1. (continued)

| Author(s), (year) | Intervention title, (location) | Study type, description, and size | Commentary on the development of a community of support for individuals | Weight-related, anthropometric, and cardiometabolic risk outcomes | Physical activity-related outcomes | Study attrition rates and limitations |
|-------------------|--------------------------------|----------------------------------|---------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------|-------------------------------------|
| Narayan et al. (1998) | Pima Pride, Pima Action—Gila River Indian Community, Arizona, United States (urban) | Pilot with pre/postevaluation at baseline, 6 months, and 12 months. Compared two randomly assigned interventions of participants who agreed to be randomized (N = 95, 72 women, 76%) | Pima Action group had qualitative data that identified peer support, along with knowledge of food content and choices on healthy eating that supported behavior change. No data on Pride group, but participants stated that their relative success was due to social support factors that appeared to have contributed to low attendance in Action group included lack of transportation, need for childcare, alcohol-related problems, other social factors, and high staff turnover. | Action group’s weight (23.6kg), BMI, SBP, DBP, 2H-PG, and insulin all increased significantly after 12 months. Waist circumference decreased significantly in Pride group after 12 months; weight increased (not significantly—0.8 kg). Significant change in diet in the Pride group. Observation group gained more weight (1.9 kg) than the Pride group, but less than the Action group. | No significant differences in PA between Pride and Action groups. Self-report PA increased significantly in both (Modifiable Activity Questionnaire). | 97% completed 6-month follow-up. 98% completed 12-month follow-up. Pima Pride attendance rate was 21% of meetings. Adherence to interventions was low and declined over time. Female with higher risk for diabetes were more likely to participate and therefore results may not be generalizable. Bias is self-report physical activity may exist due to the fact it was a workplace intervention and participants may want to show success. |
| Pargee et al. (1999) | Cultural Health and Promotion Project, Smith River, Hulet, Greven, Greven, City, Jackson, Arava, Eastern, and Pembina, United States (rural and urban) | Commentary, N = 661 (no gender breakdown provided) across the seven communities (Smith River/Achili: 63, Waiotupea/Achili: 203, Klamath firewalk: 29, Acrocius-intergenerational walk: 75, Bure's/kinnikinick day: 120, Pembina/ community garden: 40, Greven/City: 29) | All activities were community-based. The article was not designed to give details for each activity, therefore no comments on developing a community of support for individuals. However, in developing the coalition, it is noted that they had to be congruent to whether community members involved in organization were becoming overwhelmed and the fact that if the community member ceased to be active then their family and friends would also stop attending the activity. | Not evaluated. | Physical fitness was not a priority in the communities and therefore they needed to be flexible in the focus and learn to all community concerns. No measurements of physical activity. | Attire not reported. Limitations included an initial lack of diversity among the community coalitions. Also, a majority of the 3 years was spent building the trust of the groups the authors worked with. |
| Warner et al. (2004) | Traditions of the Heart, Anchorage, Alaska, United States (urban) | Pilot community-based RCT with pre/postevaluation, N = 154 (125 women, 44 of which were randomized to receive the intervention) all women. Intervention: 12 weeks of weekly 2-hr educational sessions on traditional nutrition and physical activity. Detailed questionnaires on PA, tobacco use, nutrition, and psychosocial well-being at start and 12 weeks. Baseline and 12-month follow-up screening (intervention and control). | 2004: No comments specific to developing a support system except for increased likelihood of asking for support. Improved psychosocial measures in all but one intervention participant. Less likely to blame themselves in stressful situations and more likely to ask for support. Increased stress-induced eating. 2005: Following the program over 12 weeks allowed a community of support on diet to develop between the women. Women attended for the comradery, learning about healthy lifestyle as a bonus. | No statistically significant changes between the intervention and control group in BMI, cholesterol, or blood pressure. | Significant increase in moderate walking and physical activity self-efficacy (“walking a lot”) from 2004 to 1998. No further breakdown available. The use of traditional wellness concepts (i.e., storytelling) seemed to lead to improved adherence. Positive changes included a decrease in sedentary behavior and an increase in moderate-vigorous physical activity and healthy eating. | 84% of intervention group attended at least 2/3 of the weekly sessions. No further breakdown available. The use of traditional wellness concepts (i.e., storytelling) seemed to lead to improved adherence. Positive changes included a decrease in sedentary behavior and an increase in moderate-vigorous physical activity and healthy eating. |

Note: BMI = body mass index; RCT = randomized controlled trial; PA = physical activity; MVPA = moderate-vigorous physical activity; HBIA = hemoglobin A1C; LDL = low-density lipoprotein; HDL = high-density lipoprotein; BP = blood pressure; SBP = systolic blood pressure; DBP = diastolic blood pressure; 2H-PG = 2-h postprandial glucose; TTCW = tailored telephone counselling plus website; MVPA = moderate to vigorous leisure time activity; WINCART = Weaving an Islander Network for Cancer Awareness, Research and Training.
(Narayan et al., 1998), while it decreased in the three programs incorporating a weekly class schedule (Afele-Fa’amuli et al., 2009; Canuto et al., 2012, 2013; Gellert et al., 2010). The Pima studies focused on fat reduction rather than overall calories, fiber, or satiety, which may be why weight was gained. The latter programs were 12 weeks long and had a component combining nutrition education and exercise classes. Afele-Fa’amuli et al. (2009) study compared arms of nutrition education versus exercise classes separately and then combined; combined programs produced the greatest weight loss. These results are consistent with those found in the general population, where the most successful programs utilize multi-pronged approaches (Look AHEAD Research Group, 2014).

Rice et al. (2016) found that despite increased knowledge only half of the programs led to observable behavior change. Similarly, they found that three of four programs measuring self-efficacy showed positive change; however, participants in these studies did not show measurable behavioral change. Such findings may reflect the complex and distinct social determinants of health among participants and demonstrate the importance of iterative approaches to designing programs, which could respond to such factors.

Restructuring social environments and support systems in line with Indigenous values may be beneficial in potentiating change. Marrone’s (2007) review of disparities in health care services offered to Indigenous populations notes that collectivism is valued among many Indigenous peoples, and this has implications for how health professionals should plan care and treatment. Although health researchers must be cautious not to favor “culturalist” explanations of health inequity (Browne & Smye, 2002), Indigenous cultural considerations are undoubtedly necessary when planning health program delivery. Furthermore, Richmond et al. (2007) demonstrate a significant relationship between thriving health status and strong, culturally sensitive, social supports. Studies among minority women also found a strong correlation between PA levels and culturally relevant social support (Eyler et al., 1999; Van Duyn et al., 2007); however, literature describing how to effectively test for and implement such support in health programming is sparse. In all studies in our review that explore social support, participants endorsed the important role it plays in the success of these programs.

All studies reviewed acknowledged the importance of cultural relevancy, and there is now, generally, an overall recognition of the necessity for participatory models of program development and research. Previously published reviews emphasize the importance of programs being community-based and employing principles of participatory research. Developing and evaluating programs reflecting the unique social determinants of health and the complex sociopolitical factors influencing day-to-day choices among Indigenous populations is challenging. Our findings highlight acknowledging these barriers and those strategies addressing them be central to PA-focused programming. Finally, documenting the success of such programming is challenging, as long-term sustainable lifestyle changes are an important goal but require years of follow-up and mixed methodology to capture. Controlled studies, where comparisons could be made, were most informative, followed by studies with mixed-methodology, allowing for a richer “story” of the program’s effects and learnings.

Conclusion

There are limited and heterogeneous data on the effectiveness of PA-based wellness programming for Indigenous women. Despite the challenges, it is important that evaluations recognize and report on the influence of historical, socio-cultural, and environmental factors on Indigenous women’s health behaviors. This review emphasized the need for effective program development with the goal of improving health and well-being of this population. Promising key elements to programming included accessibility, cultural relevance and sensitivity, and the importance of building social supports.

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Supplemental Material

Supplemental material for this article is available online.

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