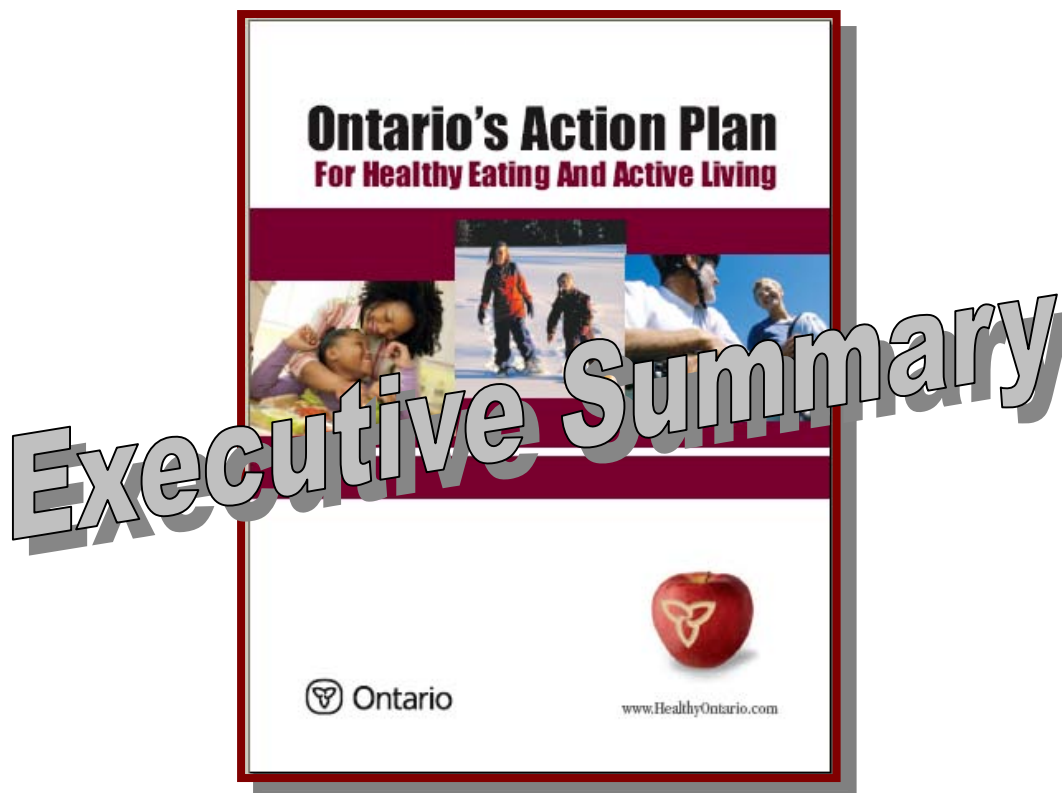


**MINISTRY OF HEALTH PROMOTION
SUBMISSION**

**THE RELIABILITY AND VALIDITY OF USING SELF-
REPORTED CLOTHING SIZE AS A PROXY FOR WAIST
CIRCUMFERENCE AT THE POPULATION LEVEL**



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EXECUTIVE SUMMARY

At a glance

- This study examined whether or not there is a reliable and valid practical means of obtaining a waist circumference measurement, a key indicator of obesity, for use at a population level in a Canadian setting.
- Only 66% of the study population were able to report a current waist circumference measurement, suggesting that simply asking people to self-report their waist circumference is not a useful means to obtain a reliable and valid population-based waist circumference measurement at this time.
- Clothing size can be used as a valid proxy to predict waist circumference and can be reliably and easily obtained by telephone survey in a large population.
- In men, jean size accurately predicts waist circumference (based on the developed predictive equations) and can accurately classify the percentage of the population at increased health risk based on Canadian healthy body weight guidelines (waist circumference > 102 cm).
- In women, pant size accurately predicts waist circumference (based on the developed predictive equations); however caution should be exerted when using the predicted waist circumference to classify the percentage of the population at increased health risk based on Canadian healthy body weight guidelines (waist circumference > 88 cm).

Background

Obesity is a leading risk factor for a variety of diseases, including type 2 diabetes, cardiovascular disease and certain forms of cancer. Although an increase in total body adiposity or fatness (body mass index or BMI ≥ 30 kg/m²) is associated with an increased health risk, research demonstrates that the distribution of adipose (fat) tissue within certain areas of the body, in particular the abdominal region, may be more important in determining health risk than total adiposity. Waist circumference (WC) is both a more accurate measure of visceral adiposity and better predictor of health risk compared to the traditional measure of BMI. However, the majority of studies that have utilized WC have done so with a self-measurement protocol (i.e. participants were given a tape measure and instructions as to how to measure their WC). The use of self-measured WC on a larger scale may be impractical as it requires prior mailing of tape measures and instructions to participants. Therefore, a proxy to predict WC may prove useful, especially if feasible for use in a telephone survey. A previous study in Britain demonstrated that clothing size correlated strongly with WC, however whether or not clothing size is useful as a proxy to predict WC in a Canadian setting remains unknown.

Purpose

The purpose of the present study was to 1) assess whether or not participants were able to report their current WC measurement without actual measurement and 2) examine the reliability and validity of using clothing size as a proxy to predict WC.

Methods

Participants

Study participants were recruited from London, Ontario and surrounding areas at local churches, the local market and the Central Branch of the YMCA. Due to the fact that both age and gender have been reported to affect WC measurement, study recruitment was conducted to obtain participants in the following categories: 1) men, aged 18-49 years, 2) men, aged 50-80 years, 3) women, aged 18-49 years and 4) women, aged 50-80 years.

Experimental procedures

After obtaining informed consent and contact information, participants (n = 151) were contacted by telephone to complete the same survey on two occasions separated by at least one week. This survey consisted of questions concerning the participant's current WC measurement (self-reported WC; srWC), current clothing size (pant size, based on manufacturer size, for women, and jean size, in inches, for men; CS), the fit of current clothing (i.e. how tight or loose the clothing fit) and the position of clothing in relation to their umbilicus or belly button. Following the completion of both surveys, the participants had their WC measured by a trained professional (trWC) at the place of recruitment. Also at the time of measurement, participants completed a socio-demographic questionnaire to obtain information about their age, ethnocultural background and current educational, employment and income levels.

Statistical Analysis

The reliability and validity of srWC was tested using statistical techniques such as paired t-test, Pearson Correlation and cross tabulation analysis, where appropriate. Linear regression equations were developed using two thirds of the study population (n = 195) to

determine whether or not CS could be used as a proxy to predict WC measurement. The validity of the predictive equations were tested using an external sample (the remaining one third of the study population; $n = 98$) and appropriate statistical methods were used.

Key findings

The findings of the present study demonstrate that only 66% of participants were able to report a current WC measurement. Due to the fact that 34% of participants were unable to provide a WC measurement, it appears that simply asking individuals “what is your current waistline measurement?” may be of limited use at the population level at the present time. The lack of ability to provide a current WC value may be due to the fact that WC is not a routine anthropometric measurement in Canada (e.g. at doctor’s offices and/or fitness clubs). Regardless, the present study’s findings are comparable to a previous study that reported that participants underestimate their WC (-4.9 cm) (2), despite the strong association between srWC and trWC. Furthermore, the agreement between srWC and trWC with respect to classifying the percentage of the population at increased health risk based on Canadian healthy body weight guidelines (> 102 cm in men and > 88 cm in women) was low and resulted in a high degree of misclassification (21% in men and 15% in women).

Due to the fact that 34% of participants were unable to provide a current WC value, a proxy to predict WC is warranted. The present study demonstrates that not only are participants able to report their current CS (100% response rate), but they can do so with a good degree of reliability (i.e. no differences were observed in self-reported CS between the same survey on two occasions). Furthermore, CS is strongly correlated with trWC. These findings are similar to a study conducted by Han et al (1) that examined the use of CS in British men ($n = 201$) and women ($n = 161$). The authors reported an association between trouser size for men and dress size for women and professionally measured WC. Taken together, it appears that CS could be used as a proxy to predict WC.

While the association between trWC and CS was strong, associations do not allow for a direct conclusion to be made about the ability of CS to predict WC. Linear regression equations (see Table 1) were developed to determine whether or not CS could be used as a proxy to predict WC. Results from these equations indicate that CS and fit of clothing explained 89% and 72% of variation of WC in men and women respectively. In addition, there were no differences observed between the mean values for predicted WC (based on predictive equations, preWC) and trWC for both men and women ($p > 0.05$). Furthermore, there was good agreement between preWC and trWC for men ($\kappa = 0.82$) with respect to classifying the percentage of the population at increased health risk based on Canadian healthy body weight guidelines (WC > 102 cm). In fact, preWC decreased the rate of misclassification from 21% (using srWC) to only 8%. In women however, the agreement was somewhat attenuated ($\kappa = 0.60$) and preWC increased the rate of misclassification from 15% (using srWC) to 18%. It is possible that the greater explanation in variation for men is due to a greater

standardization for jean size (e.g. 29, 32, 36) among manufacturers than that of pant size (e.g. 8, 12, 16) for women. Nevertheless, these findings suggest that in women caution should be exerted when using preWC to classify the percentage of the population at increased health risk based on Canadian healthy body weight guidelines (WC > 88 cm).

Table 1. Predictive equations for waist circumference (preWC) based on self-reported clothing size (CS) and fit (CF).

Gender	Equation for preWC
Female	$2.37CS^* + 3.14CF^\dagger + 53.22$
Male	$3.42CS + 2.44CF - 27.98$

*CS = clothing size; pant size (women) or jean size (men).

†CF = 1 (Loose), 2 (Just right), or 3 (Tight).

Implications for Practice

1. Due to the fact that 34% of participants were unable to report a current waist circumference measurement, simply asking individuals to self-report their waist circumference is not a useful means to obtain a reliable and valid population-based waist circumference at this time.
2. Clothing size is a valid proxy to predict waist circumference and can be reliably and easily obtained by telephone survey in a large population.
3. For men, the developed predictive equation (based on jean size and fit of jeans) demonstrated a valid means of predicting waist circumference at the population level and resulted in a low rate of misclassification (8%) with respect to classifying the percentage of the population at increased health risk based on current Canadian healthy body weight guidelines (> 102 cm).
4. For women, the developed predictive equation (based on pant size and fit of pants) demonstrated a valid means of predicting waist circumference at the population level; however an 18% rate of misclassification (~ 1 in 5) was observed suggesting that caution should be exerted when using the predicted waist circumference value to classify the percentage of the population at increased health risk based on current Canadian healthy body weight guidelines (> 88 cm).

Concluding Remarks

In conclusion, based on the present study’s findings, we suggest that the MHP consider using clothing size to predict waist circumference at the population level, while keeping in mind the limitation observed in women when classifying those at increased health risk based on Canadian healthy body weight guidelines.

1. Han TS, Gates E, Truscott E and Lean ME. Clothing size as an indicator of adiposity, ischaemic heart disease and cardiovascular risks. *J Hum Nutr Diet* 18: 423-430, 2005.
2. Spencer EA, Roddam AW and Key TJ. Accuracy of self-reported waist and hip measurements in 4492 EPIC-Oxford participants. *Public Health Nutr* 7: 723-727, 2004.