

Université de Sherbrooke

A Mental Health Model of Older Canadians

by

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Maîtrise en gérontologie

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A Mental Health Model of Older Canadians

by

MARTY PATERSON

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## Abstract

Despite the prolific number of studies on psychological well being and distress, few studies have tested the relation between these domains. As well, few models of mental health have been validated for older adults. It is essential to understand the notion of mental health of older adults given the important numbers this population represents. Objectives: The object of this study was to test a measurement model of mental health among older Canadian adults. Construct validation was done for the well being and distress measurement scales and the hypothesis of independence of the two dimensions was examined. The model was tested by age and sex. Method: Data came from the *Canadian Community Health Survey – Cycle 1.2 – Mental Health and Well Being* of Statistics Canada (2002). This transversal epidemiological survey was conducted with 37,000 Canadians, aged 15 and over, living in the community, with 8000 people over age 65. The measurement scales included the Well Being Measurement Manifestation Scale of Massé et al. and the K10 psychological distress scale of Kessler et al. Structural equation models were tested using LISREL 8.71. Results: The 2-factor mental health model was shown to be valid for both men and women aged 55 – 74 and 75 and over. This is consistent with the mental health literature. The well being instrument requires further validation studies. Larger samples of the very old are needed to validate the current study, given the methods used.

## Résumé

Malgré des études prolifiques sur le bien-être et la détresse psychologique, peu d'études ont testé la relation entre ces domaines de la santé mentale. De plus, il y a peu de modèles de la santé mentale qui ont été validés auprès des personnes âgées. Il est essentiel de comprendre la notion de santé mentale des personnes âgées étant donné le nombre important que représente cette population. Objectifs : L'objectif de cette étude était de tester un modèle de mesure de la santé mentale chez les Canadiennes et Canadiens âgés. Une validation de construit a été réalisée pour les échelles de mesures du bien-être et la détresse psychologique et l'hypothèse d'indépendance des deux dimensions a été examinée. Le modèle a été testé selon le sexe et l'âge.

Méthodologie : Les données proviennent de L'Enquête sur la santé dans les collectivités canadiennes – Cycle 1.2 – Santé mentale et Bien-être de Statistique Canada (2002). Cette étude épidémiologique transversale a été réalisée auprès de 37 000 canadiens vivant dans la communauté dont 8 000 personnes de 65 ans et plus. Les échelles de mesures incluent l'Échelle de mesure des manifestations de bien-être psychologique de Massé et al. et le K10, une mesure de détresse psychologique développée par Kessler et al. Les modèles d'équations structurales ont été testés à l'aide de la version 8.71 de LISREL. Résultats : Le modèle 2-facteur était valide pour les hommes et les femmes âgés de 55 – 74 et 75 et plus. Ses résultats sont en accord avec la littérature. L'échelle du bien être besoin plus d'études de validation. Des échantillons plus grands des personnes âgées ont nécessaires pour valider l'étude étant donné les méthodes utilisées.

Key words: mental health, older adults, psychological well being, psychological distress

Mots clés : santé mentale, personnes âgées, bien-être psychologique détresse psychologique

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## Introduction

Population estimates based on Statistics Canada census data show the number of Canadians 65 years of age and older will increase from 3.88 million in 2001 to about 4.81 million by 2011. The number of persons 90 years of age and over will have increased from 149.2 thousand in 2001 to an estimated 269.0 thousand in 2011 – an increase of 44.5% (Statistics Canada). This increasing population of the very old is an important demographic group whose mental health is not well documented, and provides opportunities to improve our understanding of the measurement of mental health among the elderly. As more of this demographic group is included in population surveys, we can examine whether the instruments used to measure mental health are appropriate for older adults.

*The Canadian Community Health Survey, Cycle 1.2: Mental Health and Well being* (CCHS 1.2) offers a unique opportunity to document mental health among older Canadians. Completed in 2002, this cross-Canada survey sampled nearly 37,000 Canadians 15 years of age and older, including nearly 8000 Canadians 65 years of age and older. It is the first populational survey in Canada completely dedicated to mental health. This survey includes two instruments pertinent for the measurement of mental health, one for psychological well being and one for psychological distress. With a large sample of older adults, it will be possible to advance a little more in our understanding of mental health among this population.

The current study includes an analysis of each of the two measurement instruments. Both factor structures and validity for older adults are examined.

The two instruments are then combined in an examination of a mental health measurement model for adults aged 55 and over. This is all done within a structural equation modelling strategy.

**Chapter 1**

**Problem**

## I. Problem

### 1. Research Problem

The World Health Organization (WHO), in their 2005 document *Promoting Mental Health: Concepts, Emerging Evidence, Practice* (World Health Organisation, 2005) considers health to be a multi-faceted phenomenon:

Neither mental nor physical health can exist alone. Mental, physical and social functioning are interdependent. Furthermore, health and illness may co-exist. They are mutually exclusive only if health is defined in a restrictive way as the absence of disease... (p. 2).

This co-existence of illness and health would apply to each health component, such that mental health would also have a positive aspect (psychological well being) and a negative aspect (psychological distress). By extension, psychological well being would be more than just the absence of psychological distress; a point advocated by several researchers (Bradburn, 1969; Massé et al., 1998c; Viet & Ware, 1983). Finally, a two-factor mental health model has not been tested in a representative sample of older and very old adults.

#### 1.1. Pertinence and Originality

The CCHS 1.2 has certain methodological advantages. First, both the measures of psychological well being and psychological distress are referenced for the same one-month time period. This alone is fairly rare and ensures that all

respondents use the same reference time period. Second, the sample has enough individuals 75 years of age and over to allow for better examination of mental health among the very old within an appropriate structured equation modelling (SEM) approach. This also is fairly rare. In addition, by employing a SEM framework, disturbance variance and measurement errors are accounted for in the analysis, potentially yielding more accurate estimates.

## 1.2. General Objectives

The construct validity of the mental health construct was tested. In a first phase, each measurement instrument was validated in confirmatory factor analysis (CFA). Then, the two scales were combined in a CFA of the mental health model, tested among respondents 55 – 74 years of age and 75 years and over.

## **2. Literature Review**

### 2.1. Coming to Terms

The literature refers to many terms that are used interchangeably in discussions of mental health. In an effort to sort out some of these terms, Voyer and Boyer (2001) employed a conceptual analysis of eight commonly used terms: psychological well being, psychological distress, subjective well being, quality of life, morale, satisfaction with life, happiness and mental health. At the

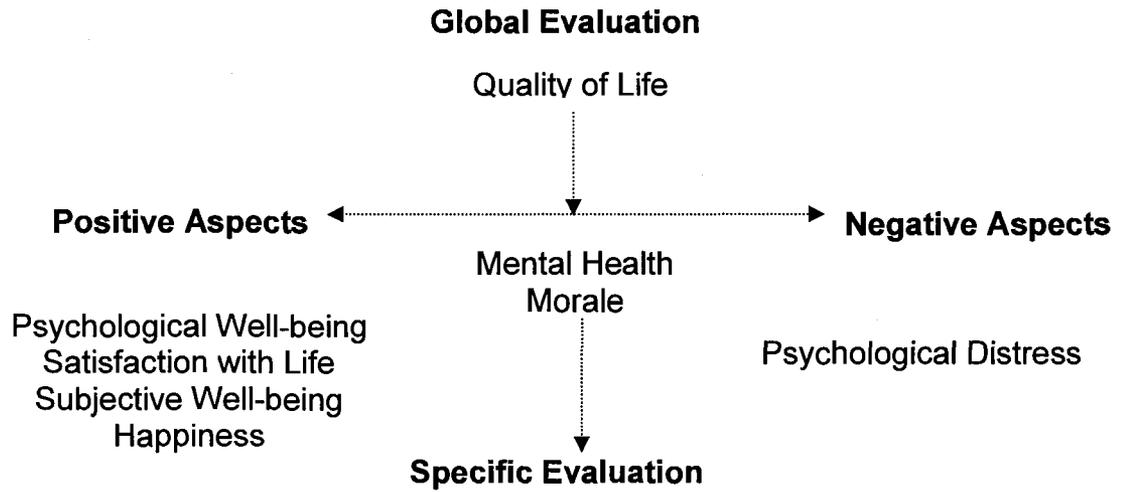
end of the process, Voyer and Boyer provided a hierarchical model (see Figure 1) ranging from general to specific vertically, and positive to negative horizontally. Mental health was shown to be a general, neutral concept; psychological well being as positive, and psychological distress as more specific and negative.

-----  
insert Figure 1 about here  
-----

Since Bradburn (1969) described mental health as the net of positive over negative affect, many researchers have followed this way of conceptualizing mental health (Bradburn, 1969; Diener, Suh, Lucas & Smith, 1999; Lawton, Kleban, Dean, Rajagopal & Parmelee, 1992; Mroczek & Kolarz, 1998). However, affect refers only to emotional states, where as mental health is more complex than just emotions, with other psychological processes also involved; such as memory, perception, and judgement (Diener et al., 1999; Stock, Okun & Benin, 1986). Thus, it would seem to be more appropriate for the study of mental health to replace discussions of positive and negative affect with the more composite constructs of psychological well being and psychological distress. These two terms are used throughout the current article to distinguish the positive and negative components of mental health.

## 2.2. Psychological Well Being

This is a complex notion that includes cognition and emotion, referring to the positive mental state of an individual. This is one's subjective evaluation of



*Figure 1.* Hierarchy of different constructs of psychological states. *Note:* From “Le bien-être psychologique et ses concepts cousins, une analyse conceptuelle comparative,” by P. Voyer and R. Boyer, 2001, *Santé mentale au Québec*, 26 (1) p. 289. Adapted with permission.

how one thinks and feels (Diener et al., 1999; Stock, et al., 1986). The term subjective well being is often used to emphasize that this is the person's own subjective evaluation rather than an objective observation by a second person. Keyes and Waterman (2002) have suggested that "Subjective well being reflects individuals' perceptions and evaluations of their own lives in terms of their affective states and their psychological and social functioning, all being critical dimensions of mental health" (p. 478). Diener et al. (1999) described this construct "... as a general area of scientific interest rather than a single specific construct" (Diener et al. p 277), reflecting the complexity of this field.

Psychological well being has been conceived of as a higher order latent construct, composed of first-order factors (Massé et al., 1998b; Rousseau & Dubé, 1993; Viet & Ware, 1983). Unfortunately, the number and nature of these factors is without consensus.

Massé et al. (1998b) proposed a measurement model with six factors: Control of Self and Events, Happiness, Social Involvement, Self-esteem, Mental Balance, and Sociability for one psychological well being latent variable. These researchers took a unique approach to the development of a psychological well being measurement instrument. In a qualitative phase, these researchers selected a representative sample (N=195) of francophones 15 years and older in the greater Montreal area. During in-home interviews, these people were asked to describe, in their own words, a state of well being that they had experienced, as well as one that someone close to them had experienced. This resulted in over 2000 pages of personal accounts which yielded 1718 signs under 100 types of signs for 37 sub-categories under 4 categories: physical,

behavioural, cognitive and emotional. In a second phase, using exploratory factor analysis, the manifestations of well being contained in these accounts were transformed into the 25-item Psychological Well Being Manifestation Scale (PWBMS) (Massé et al.1998b).

### 2.3 Psychological Distress

Psychological distress is a notion used to describe people who experience clusters of symptoms that "... are not specific to any particular psychiatric disorder" (Dohrenwend, Shrout, Egri, & Mendelsohn, 1980, p. 1229), though most psychiatric patients score high on these measures. Psychological distress has also been described as "... the general concept of maladaptive psychological functioning in the face of stressful life events" (Abeloff et al. 2000, cited in Ridner, 2004, p. 5).

The measurement of non-specific psychological distress emerged in the U.S. from World War II screening of soldiers who might experience difficulties in stressful situations (Dohrenwend, Shrout, Egri & Mendelsohn, 1980), and has evolved to epidemiological screening for mental disorders in general populations (Kessler et al., 2002). Dohrenwend et al. developed the Psychiatric Epidemiology Research Interview (PERI), which was designed for screening general populations for prevalence of major psychiatric disorders. At the time, most instruments had been developed using specific populations. Several researchers have proposed or tested factor structures of psychological distress with first-order factors of affective and cognitive elements comprising the higher-

order latent factor of psychological distress (Massé et al., 1998a; Prévile, Potvin & Boyer, 1995; Viet & Ware, 1983). There is not yet full consensus as to the appropriate factor structure for these models.

Kessler et al. (2002) also developed a measurement instrument designed to screen general populations for severe mental illnesses. Their goal was to develop a screening tool as short as possible to be used in annual U.S. national health surveys. Kessler and his colleagues began with 18 current psychological distress scales. They reduced the initial 612 items to ten and six. These instruments, the K10 and K6, have been shown to be very effective at screening for severe mental illness in general populations (Kessler et al., 2003).

The K10 has been reanalysed using data from two Australian population surveys (Brooks, Beard & Steel, 2006). These authors argued that an eigenvalue of 1 in factor analysis might be too restrictive, and more information may be available if the cut-off rule were relaxed. They reported a hierarchical factor structure for the K10, whereas Kessler et al. (2003) had reported a single-factor structure.

#### 2.4. Two-Factor Mental Health Models

There has been much work done in this area, though most studies use positive and negative affect as measures of subjective well being. The emotion literature has well established that positive and negative emotions are not simply two ends of a single continuum (Diener & Emmons, 1985; Diener et al., 1999; Keyes & Waterman, 2002; Lucas, Diener & Suh, 1996). Research has also

indicated that each of the concepts psychological well being and psychological distress are complex and yield somewhat different profiles (Massé et al., 1998c; Mroczek & Kolarz, 1998; Ryff & Keyes, 1995). However, many of the various attempts at empirical proof and validation of these theories have not been entirely conclusive, and few have studied the very old.

Veit and Ware (1983), working for the Rand Corporation, developed the Mental Health Inventory (MHI) for the Rand Health Insurance Experiment, using samples from six sites in the United States (N = 5,000). These authors concluded that psychological well being and psychological distress are not exactly opposites of each other, having a correlation of -0.75 between them. The eldest subjects in this study were only 69 years of age.

There was no time reference to the scales used in that study. That is, questions were not confined to any particular time period, such as the last month or last two weeks. This is very important, and is the major methodological flaw in research in this area. It is possible that respondents may have experienced psychological well being and distress sequentially rather than simultaneously, but the tests were not sensitive to this. Thus, the utility of the results of this study is compromised.

Zautra, Guarnaccia and Reich (1988) used the MHI of Veit and Ware, the PERI Demoralisation Composite, and the Bradburn Positive Affect Scale to test the independence of psychological well being and psychological distress among subjects aged 60 to 80 years. These authors reported a coefficient of -.80 between psychological well being and psychological distress. They report that a single-factor model had too many specification errors, so the two-factor model

was retained. They did not test their model for age or sex differences, and the same time-frame problems as mentioned above were carried over, as neither the MHI nor the PERI are given any time reference.

Corey Keyes (2002) has suggested that it is possible to score on both well being and depression measures at the same time. According to Keyes, positive mental health includes emotional, psychological and social well being. Using data from the MacArthur Foundation's Midlife in the United States survey, positive mental health was a composite score based on a six-item positive affect scale, the Ryff Well Being scale and the Social Well Being scale. High scores on the composite index were labelled *Flourishing*, while low scores were labelled *Languishing*. The Composite International Diagnostic Interview Short Form (CIDI-SF) was employed to measure clinical depression symptoms (Keyes, 2002).

These authors introduced new terminology to describe the concepts involved rather than adding precision to concepts already in use. Once again the time references for the two measures were not equal. The CIDI-SF was referenced for the year preceding the interview, while the well being scales had no time references at all. The sample contained no elderly subjects

Massé et al. (1998c) test the correlation between psychological well being and psychological distress using their own two scales. Both scales were referenced for the past month. The authors report a correlation of -0.65 between the two factors of psychological well being and psychological distress (Massé et al., 1998c). This correlation is low enough to suggest that the two instruments do not measure exactly the same thing, though they are strongly related. Their

sample of 400 contained individuals aged 15 and over, but was insufficient to explore results specifically for elderly age groups.

It would appear that the relationship between psychological well being and psychological distress is not as well documented as we would like, especially for the elderly. With improved methodology it should be possible to demonstrate more satisfactorily that psychological well being and psychological distress are two components of mental health measurement, and that this holds for the elderly.

### 3. Hypothesis

In this study, the plausibility of a first-order two-factor measurement model was tested. The hypothesis was that the correlation between measures of psychological well being and psychological distress would be high, though substantially less than 1, indicating that the two scales are measuring the same construct, though not mere opposites.

The measurement model can be described in the LISREL notation using the following structural equations:

$$x_i = \lambda_{i,m}\xi_m + \delta_{i,i} \quad (1)$$

$$y_j = \lambda_{j,n}\eta_n + \varepsilon_{j,j} \quad (2)$$

$$\eta_n = \gamma_{n,m}\xi_m + \zeta_{n,n} \quad (3)$$

These equations are represented in Figure 2, where the  $\xi_m$  (ksis) are latent constructs representing observed exogenous variables ( $x_i$ ). The  $\eta_n$  (eta) represents the well being latent construct, as measured by the manifest variables ( $y_j$ ). The  $\lambda_{i,m}$  (lambdas) and  $\delta_{i,j}$  (theta-deltas) refer to the validity coefficients and the measurement errors of the observed exogenous variables. The  $\lambda_{j,n}$  (lambdas) and  $\epsilon_{j,j}$  (theta-epsilons) refer to the validity coefficients and the measurement errors of the observed endogenous variables. The  $\gamma_{n,m}$  (gammas) represent path coefficients between the latent exogenous variables and the well being latent construct. Finally,  $\zeta_{n,n}$  (zeta) refers to influences on the latent construct not measured in this study.

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 insert Figure 2 about here  
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In latent variable systems, an alternative measure of reliability is coefficient  $H$  (Hancock & Mueller, 2001).  $H$  takes into account the contribution of each item, regardless of its sign. The reliability of a scale is not less than that of the best item in the scale, such that a poor item does not reduce the usefulness of a good item. Coefficient  $H$  is calculated by:

$$H = 1 / [1 + (1 / [\sum \lambda^2 / (1 - \lambda^2)])] \quad (4)$$

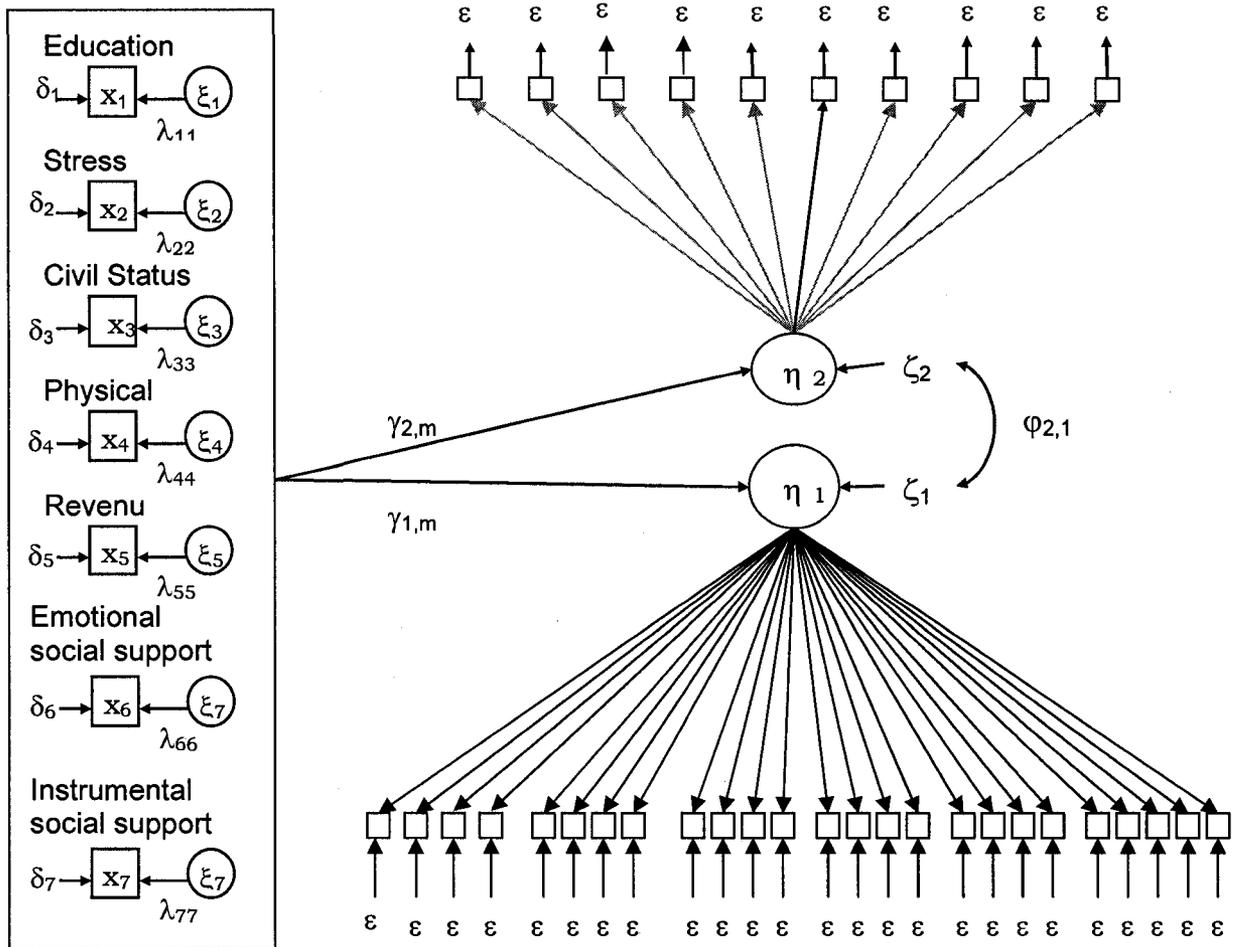


Figure 2. Hypothetical measurement model of mental health

The comparisons of these coefficients and their applications in SEM are beyond the scope of this article, though they certainly warrant further examination. Both the Cronbach  $\alpha$  and  $H$  reliability coefficients will be reported here.

## **Chapter II**

### **Methods**

## **II. Methods**

### **1. Strategy of Acquisition**

The main objective of the current study was to test the relation between psychological well being and psychological distress among the elderly. As construct validation tests, the current study was a correlational study, thus a cross-sectional design was appropriate.

### **2. Strategy of Observation**

#### *2.1. Sample*

This study was done using data from The Canadian Community Health Survey, Cycle 1.2: Mental Health and Well-being (CCHS 1.2) a cross-sectional survey (N = 36,984), including Canadians 15 years of age and older, living in the community. Excluded were Aboriginals living on reserves, military personnel, and people living in institutions and in remote areas. The CCHS 1.2 uses a complex stratified sampling strategy. Only one person was selected from each household, with unequal probabilities of selection (Béland, Dufour & Gravel, 2001). Details of the survey design have been described elsewhere (Béland, Dufour & Gravel, 2001; Bambino, Singh, Dufour, Kennedy & Lindeyer, 1998).

Face-to-face computer-assisted interviews were conducted in respondents' homes by Statistics Canada interviewers. Interviews lasted up to about 90 minutes, depending on how many sections were to be completed. Further

details are available on the Data Research Centers section of the Statistics Canada web site.

## 2.2 Measures

Psychological Well being was measured with the 25-item Well being Manifestation Measure Scale developed by Massé et al. (1998b). The CCHS 1.2 refers to this as the Psychological Well being Manifestation Scale (PWBMS). This scale is referenced for the month preceding the interview and uses a five-point response scale from *always* to *never*. The authors report a Cronbach alpha of 0.93 for this scale. Psychological Distress was measured with the 10-item K10 Psychological Distress Scale (Kessler et al. 2002). The instrument is referenced for the month preceding the interview and has five response options from *all of the time* to *none of the time*. A Cronbach alpha of 0.89 is reported for the K10.

Associated factors included education (1 = less than secondary, 2 = secondary, 3 = other post secondary, 4 = post secondary graduate). Annual personal income was grouped into five categories: 1 = \$9,999 or less, 2 = \$10,000 – \$19,999, 3 = \$20,000 – \$39,999, 4 = \$40,000 – \$59,999, 5 = \$60,000 and over. Self-perceived stress was measured with a single item with 5 choices from *not at all* to *extremely*. Self-perceived physical health was measured with one item with 5 choices: *excellent* to *poor*. Social support was measured with the affective and tangible scales of the MOS Social Support Survey (Sherbourne & Stewart, 1991). These also had five choices, with higher scores meaning more support. Alphas of .96 and .92 are reported for the

emotional and tangible scales respectively. In the current article, these are referred to as emotional and instrumental social support. This is more coherent with terminology found in the literature. Civil status was dicotomized such that 1 represents living as a single, 2 represents living as a couple. Age was grouped into two categories (56-75, 76 and over). These categories were chosen to represent adults near or in retirement, and the elderly.

### *2.3 Analysis*

Simple listwise deletion was used to eliminate cases with missing data. This left 32,181 cases with complete data on all variables. When variables are categorical and their distributions highly asymmetrical, as they were here, then the polychoric correlation matrix should be analysed using the asymptotic covariance matrix (AC) and the weighted least squares (WLS) method to estimate the parameters (Bollen, 1989; Wirth & Edwards, 2007). Polychoric correlations are estimates of the correlations between ordinal variables without the assumption of bivariate normal distribution. The AC matrix is the weight matrix containing the variances and covariances of these estimates used by the WLS fitting function. These matrices were calculated using PRELIS 2.71, a LISREL 8.71 utility program (Jöreskog & Sörbom, 2001). Since sample size directly influences  $\chi^2$ , several indices were used to evaluate the plausibility of each model and its fit to the data. The Root Mean Square Error of Approximation (RMSEA) fit indicator is one of the most reliable (Hu & Bentler, 1999). Values less than .05 indicate acceptable model fit. All tests were done at

the 95% significance level.

First, confirmatory factor analysis (CFA) was done on each of the scales of psychological well being and psychological distress. Then, the validity of the mental health construct was tested freeing the coefficient of association between the constructs. At this step, the hypothesis that psychological well being and psychological distress were part of the same construct was tested. This was equivalent to testing that the  $\Phi$  (phi) matrix was diagonal. Then, the associations between both psychological well being and psychological distress and the external variables were examined to document specificity of each construct. This was done for men and women in the 55 – 74 as well as 75 and over age groups.

## **Chapter III**

### **Results**

### **III Results**

This section contains three articles. The first describes the validation study of the Well Being Manifestation Scale. The second article describes the validation study of the K10 psychological distress scale. The third study examines the mental health measurement model.

Running head: VALIDATION OF THE PWBMMS

Validation of the Psychological Well Being Manifestation Measure Scale among  
Older Canadians using the Canadian Community Health Survey, Cycle 1.2  
and Structural Equation Modelling

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## Abstract

The current study tested the plausibility of a conceptual model of the Well Being Manifestation Measurement Scale using data from the Canadian Community Health Survey, Cycle 1.2 and a structural equation modeling strategy. A single-factor model was found to be as plausible as the original six-factor first-order model. Given the lack of theoretical justification for the original factor structure, the more parsimonious model was retained. This model was shown to be plausible for both men and women aged 55 – 74 and 75 years and over. More validation work remains to be done with this instrument. As well, larger samples of older adults are needed given the methods used in the current study.

## **Validation of the Well Being Manifestation Measure Scale**

Population estimates based on Statistics Canada census data show the number of Canadians 65 years of age and older will increase from 3.88 million in 2001 to about 4.81 million by 2011. The number of persons 90 years of age and over will have increased from 149.2 thousand in 2001 to an estimated 269.0 thousand in 2011 – an increase of 44.5% (Statistics Canada). This increasing population of the very old is an important demographic group whose mental health is not well documented and provides opportunities to improve our understanding of the dynamics of psychological well being among the elderly.

*The Canadian Community Health Survey, Cycle 1.2: Mental Health and Well being* (CCHS 1.2) offers a unique opportunity to document psychological well being among older Canadians. Completed in 2002, this cross-Canada survey sampled nearly 37,000 Canadians 15 years of age and older, including nearly 8000 Canadians 65 years of age and older. It is the first populational survey in Canada completely dedicated to mental health.

Psychological well being is a complex notion that includes cognition and emotion, referring to the positive mental state of an individual. This is one's subjective evaluation of how one thinks and feels (Diener, Suh, Lucas & Smith, 1999; Stock, Okun & Benin, 1986). The term subjective well being is often used to emphasize that this is the person's own subjective evaluation rather than an objective observation by a second person. Keyes and Waterman (2002) have suggested that "Subjective well being reflects individuals' perceptions and evaluations of their own lives in terms of their affective states and their

psychological and social functioning, all being critical dimensions of mental health” (p. 478). Diener et al. (1999) described this construct “... as a general area of scientific interest rather than a single specific construct” (Diener et al. p 277), reflecting the complexity of this field. Psychological well being has been conceived of as a higher order latent construct, composed of first-order factors (Massé et al., 1998b; Rousseau & Dubé, 1993; Viet & Ware, 1983).

Unfortunately, the number and nature of these factors is without consensus.

Massé et al. (1998a) proposed a measurement model with six factors: Control of Self and Events, Happiness, Social Involvement, Self-esteem, Mental Balance, and Sociability for one psychological well being latent variable. These researchers took a unique approach to the development of a psychological well being measurement instrument. In a qualitative phase, these researchers selected a representative sample (N=195) of francophones 15 years and older in the greater Montreal area. During in-home interviews, these people were asked to describe, in their own words, a state of well being that they had experienced, as well as one that someone close to them had experienced. This resulted in over 2000 pages of personal accounts which yielded 1718 signs under 100 types of signs for 37 sub-categories under 4 categories: physical, behavioural, cognitive and emotional. In a second phase, using exploratory factor analysis (EFA), the manifestations of well being contained in these accounts were transformed into the 25-item Well being Manifestation Measure Scale (WBMMS) (Massé et al. 1998a).

This ethnosemantic model is an interesting a sort of ground up process, where psychological well being is defined in terms of “ordinary” peoples’

personal accounts of psychological states; rather than from expert or diagnostic criteria. Massé et al. (1998b) claim that this adds a certain content validity to the measurement scale:

... from an ethnosemantic perspective, we rid ourselves from the empiricist symptomatic approach. We should analyse the signs people recognize as meaningful, and signs to which they refer to live, to express and to communicate their distress and well being in a specific socio-cultural context (Massé et al. 1998b, p. 481).

## Objectives

The current article tested the factor structure of the PWBMS measurement model using data from the CCHS 1.2 and a structural equation modelling (SEM) strategy. The instrument was tested in terms of sex and age, with particular attention given to the elderly. This step was done removing the influence of seven exogenous variables: level of education, self-perceived stress, civil status, self-perceived physical health, personal income, emotional and instrumental social support.

The measurement model can be described in the LISREL notation using the following structural equations:

$$x_i = \lambda_{i,m}\xi_m + \delta_{i,i} \quad (1)$$

$$y_j = \lambda_{j,n}\eta_n + \varepsilon_{j,j} \quad (2)$$

$$\eta_n = \gamma_{n,m}\xi_m + \zeta_{n,n} \quad (3)$$

These equations are represented in Figure 1, where the  $\xi_m$  (ksis) are latent constructs representing observed exogenous variables ( $x_i$ ). The  $\eta_n$  (eta) represents the well being latent construct, as measured by the manifest variables ( $y_j$ ). The  $\lambda_{i,m}$  (lambdas) and  $\delta_{i,i}$  (theta-deltas) refer to the validity coefficients and the measurement errors of the observed exogenous variables. The  $\lambda_{j,n}$  (lambdas) and  $\varepsilon_{j,j}$  (theta-epsilons) refer to the validity coefficients and the measurement errors of the observed endogenous variables. The  $\gamma_{n,m}$  (gammas) represent path coefficients between the latent exogenous variables and the well being latent construct. Finally,  $\zeta_{n,n}$  (zeta) refers to influences on the latent construct not measured in this study.

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 insert Figure 1 about here  
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In latent variable systems, an alternative measure of reliability is coefficient  $H$  (Hancock & Mueller, 2001).  $H$  takes into account the contribution of each item, regardless of its sign. The reliability of a scale is not less than that of the best item in the scale, such that a poor item does not reduce the usefulness of a good item. Coefficient  $H$  is calculated by:

$$H = 1 / [1 + (1 / [\sum \lambda^2 / (1 - \lambda^2)])] \quad (4)$$

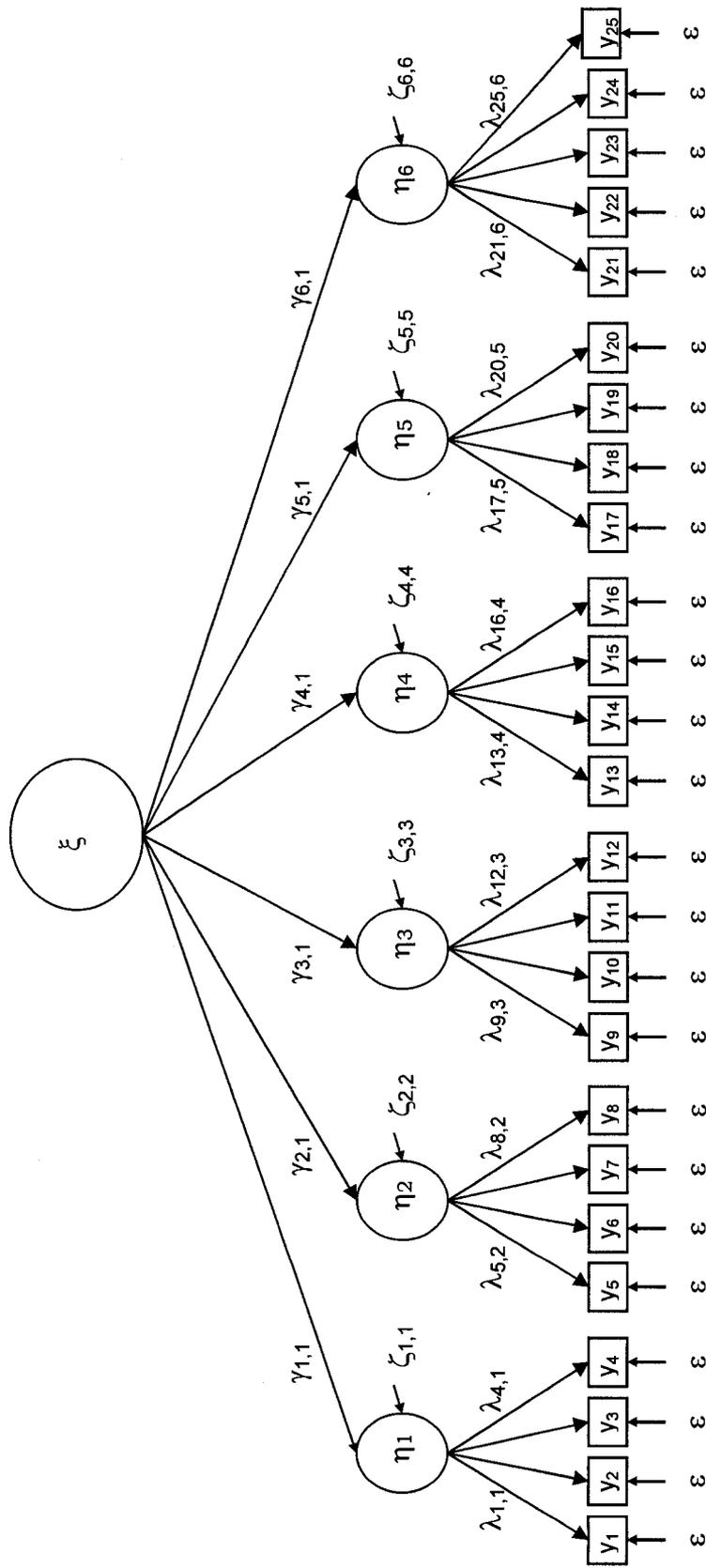


Figure 1. Measurement model of psychological well being

The comparisons of these coefficients and their applications in SEM are beyond the scope of this article, though they certainly warrant further examination. Both the Cronbach  $\alpha$  and  $H$  reliability coefficients will be reported here.

## **Method**

This study was done using data from The Canadian Community Health Survey, Cycle 1.2: Mental Health and Well-being (CCHS 1.2) a cross-sectional survey (N = 36,984), including Canadians 15 years of age and older, living in the community. Excluded were Aboriginals living on reserves, military personnel, and people living in institutions and in remote areas. The CCHS 1.2 uses a complex stratified sampling strategy. Only one person was selected from each household, with unequal probabilities of selection (Béland, Dufour & Gravel, 2001). Details of the survey design have been described elsewhere (Béland, et al., 2001; Bambino, Singh, Dufour, Kennedy & Lindeyer, 1998). Face-to-face computer-assisted interviews were conducted in respondents' homes by Statistics Canada interviewers. Interviews lasted up to about 90 minutes, depending on how many sections were to be completed. Further details are available on the Data Research Centers section of the Statistics Canada web site.

*Measures:* The *Well Being Manifestation Measure Scale* (Massé et al., 1998b) is named as the *Psychological Well-being Manifestation Scale* in the CCHS, 1.2. This latter title will be retained henceforth. The 25-item instrument is referenced for the month preceding the interview and uses a five-point response scale from *almost always* to *never*. A Cronbach alpha of 0.93 was reported for this scale (Massé et al.).

Associated factors included education (1 = less than secondary, 2 = secondary, 3 = other post secondary, 4 = post secondary graduate). Annual personal income was grouped into five categories: 1 = \$9,999 or less, 2 = \$10,000 – \$19,999, 3 = \$20,000 – \$39,999, 4 = \$40,000 – \$59,999, 5 = \$60,000 and over. Self-perceived stress was measured with a single item with 5 choices: *not at all* to *extremely*. Self-perceived physical health was measured with one item with 5 choices: *excellent* to *poor*. Social support was measured with the affective and tangible scales of the MOS Social Support Survey (Sherbourne & Stewart, 1991).. These also had five choices, with higher scores meaning more support. Reliability coefficients of .96 and .92 are reported for the emotional and tangible scales respectively. In the current article, these are referred to as emotional and instrumental social support. This is more coherent with terminology found in the literature. Civil status was dichotomised such that 1 represents living as a single and 2 represents living as a couple. Age was grouped into four categories (15-35 years, 36-55, 56-75, 76 and over). These categories were chosen to represent older adults near or in retirement, and the elderly.

*Analysis:* Simple listwise deletion was used to eliminate cases with missing data. This left 32,181 cases with complete data on all variables. Confirmatory factor analysis was done using a structural equation modelling strategy. When variables are categorical and their distributions highly asymmetrical, as they were here, then the polychoric correlation matrix should be analysed using the asymptotic covariance matrix and the weighted least squares method to estimate the parameters (Bollen, 1989). Polychoric correlations are estimates of the correlations between ordinal variables without the assumption of bivariate normal distribution. The asymptotic covariance matrix is the weight matrix containing the variances and covariances of these estimates used by the weighted least squares fitting function. These were calculated using PRELIS 2.71, a LISREL 8.71 utility program (Jöreskog & Sörbom, 2001).

Since sample size directly effects chi squared, several indices were used to evaluate the plausibility of each model. The adjusted goodness of fit index (AGFI) is an overall fit index that shows how well the population covariance matrix has been reproduced. It also adjusts for the degrees of freedom, rewarding simpler models. Values closer to 1 represent better fit. The Root Mean Square Error of Approximation (RMSEA) fit indicator is one of the most reliable (Hu & Bentler, 1999). Values less than .05 indicate acceptable model fit. Akaike's information criterion (AIC) is used to compare non-hierarchical models. The consistent AIC (CAIC) adjusts for sample size. In both cases, the model with the lowest value is the better one. All tests were done at the 95% significance level. All tests were performed including the sample weight variable contained in the CCHS 1.2 data file. This variable, provided by Statistics

Canada, takes into account the sampling plan effect of the CCHS 1.2 survey to represent the general Canadian population.

## Results

The response rate for the CCHS 1.2 was 77% nationally, varying from 73.4% in Ontario to 82.4% in Manitoba (CCHS 1.2 document file). Sociodemographic characteristics of the sample are presented in table 1. In the general sample, 54.6% of respondents were women, 52.6% were living as couples. A full 45.7% had post-secondary education, while 27.8% had less than secondary education. The majority (69.3%) reported good to very good physical health.

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insert Table 1 about here  
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In the first step, the second-order measurement model of the PWBMS as reported by Massé et al. (1998) was tested without the associated variables. This model ( $M_0$ ) had 25 items as indicators for six first-order factors for one Well Being latent second-order construct (see Figure 1). Modification information suggested that the model would be significantly improved by freeing correlations between the error terms for items 6,3; 19,3; and 3,2. This modified model is  $M_1$

Table 1

*Sociodemographic characteristics of the CCHS 1.2 respondents*

	N	%*
Age		
55-74	6243	19.4
75+	1866	05.8
Sex		
Female	17571	54.6
Male	14610	45.4
Civil status		
Couple	16927	52.6
Single	15254	47.4
Education		
< Secondary	8947	27.8
Secondary	5793	18.0
Some post-sec.	2735	08.5
Post-sec. Grad.	14706	45.7
Income (thousands)		
< 9.99	6925	21.5
10 – 29.99	5992	18.6
30 – 49.99	9629	29.9
50 – 79.99	5477	17.0
80+	4158	12.9
Self-perceived physical health		
Excellent	5734	17.8
Very good	11623	36.1
Good	10691	33.2
Fair	3225	10.0
Poor	908	02.8

weighted data

In Table 2. The chi squared remained high. This was related to the excessive power due to the sample size. The model had good fit according to the AGFI and RMSEA. The six gamma values were all very high (.95, .97, .97, 1.00, .99, .98), suggesting that these factors were equally related to the psychological well being construct. Standardized factor loadings, contained in the lambda matrix, ranged from .67 to .95. These are shown in Table 3. The item reliability as calculated by  $H$  was .99, demonstrating high internal reliability ( $\alpha = .94$ ).

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insert Tables 2 & 3 about here  
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In a second step, a more parsimonious single first-order factor model ( $M_2$ ) with only one latent Well Being construct was tested. Table 3 shows that standardized lambda parameter estimates were virtually unchanged compared to  $M_1$ . Changes were rarely more than .01. Indicators of model fit increased slightly. The reliability coefficient  $H$  was .98 ( $\alpha = .94$ ) in this solution. The same error term correlations were freed for  $M_2$  as  $M_1$ . As indicated by the RMSEA, AIC, CIAC and AGFI indices, the model fit did not change significantly, suggesting  $M_2$ , the more parsimonious model, to also be plausible. In a final step, the associations between the respondents' sociodemographic and health characteristics were examined for men and women aged 55 to 74 years, and 75 and over. All models in Table 4 show satisfactory fit according to RMSEA and AGFI suggesting that the one-factor model was

Table 2

*Confirmatory factor analysis of the Psychological Well Being Manifestation Scale*

Model	$\chi^2$	df	p	AGFI	RMSEA	AIC	CAIC	$\Delta$ CAIC
6 factor model (M <sub>1</sub> )	12788.26	267	.00	.98	.038	12 904.26	13 449.71	1 199.10
1 factor model (M <sub>2</sub> )	14057.10	273	.00	.98	.040	14 161.10	14 648.81	

Note. From weighted data. Both models have the same correlated error terms.

M<sub>1</sub> = model with six first-order factors, M<sub>2</sub> = single-factor model, AGFI = adjusted goodness of fit index,

RMSEA = Root Mean Squared Error of Approximation, AIC = Akaike's information criterion, CAIC = consistent version of AIC.

N = 32,181

Table 3

## Factor loadings for the Psychological Well-Being Manifestation Scale

Items	6-factor model (M <sub>1</sub> ) N = 32,181	1-factor model (M <sub>2</sub> ) N = 21,181	Factor loadings ( $\lambda$ )			
			men 55-74 (M <sub>2</sub> ) n = 3372	men 75+ (M <sub>2</sub> ) n = 1301	women 55-74 (M <sub>2</sub> ) n = 3957	women 75+ (M <sub>2</sub> ) n = 1674
Stability ( $\eta_1$ ) $\gamma_{11} = .95$ $\zeta_{11} = .08$						
1. Felt self-confident	.78	.77	.80	.78	.80	.84
2. Felt satisfied with accomplishments	.87	.86	.87	.89	.87	.88
3. Were a go-getter	.62	.62	.64	.75	.61	.67
4. Felt emotionally balanced	.90	.88	.90	.91	.89	.90
Sociability ( $\eta_2$ ) $\gamma_{21} = .97$ $\zeta_{22} = .05$						
5. Felt loved and appreciated	.81	.80	.84	.80	.81	.85
6. Had goals and ambitions	.73	.73	.74	.86	.74	.82
7. Felt like having fun	.76	.75	.75	.82	.77	.85
8. Felt useful	.90	.89	.92	.95	.89	.93
Control of self ( $\eta_3$ ) $\gamma_{31} = .97$ $\zeta_{33} = .04$						
9. Smiled easily	.88	.87	.88	.90	.89	.91
10. Were true to yourself	.85	.84	.87	.89	.85	.86
11. Were a good listener	.73	.72	.77	.78	.74	.79
12. Were curious and interested	.83	.82	.83	.83	.84	.90
Emotional balance ( $\eta_4$ ) $\gamma_{41} = 1.00$ $\zeta_{44} = .01$						
13. Were able to sort things out	.84	.84	.86	.85	.85	.89
14. Found life exciting	.91	.91	.93	.93	.92	.94
15. Your life was well balanced	.86	.86	.86	.84	.87	.91
16. Were calm and level-headed	.85	.84	.85	.89	.87	.88
Self-esteem ( $\eta_{15}$ ) $\gamma_{51} = .99$ $\zeta_{55} = .01$						
17. Were able to find answers to problems	.88	.88	.88	.88	.89	.94
18. Got along well with everyone	.82	.82	.85	.90	.82	.85
19. Lived at a normal pace	.67	.67	.68	.67	.69	.70
20. Had the impression of really enjoying life	.95	.94	.96	.95	.95	.97
Happiness ( $\eta_{16}$ ) $\gamma_{61} = .98$ $\zeta_{66} = .03$						
21. Had a good sense of humour	.83	.82	.84	.86	.84	.88

22. Felt good, at peace with yourself	.95	.96	.96	.96	.97
23. Felt healthy and in good shape	.77	.78	.80	.79	.85
24. Were able to face difficult situations	.90	.93	.93	.90	.93
25. Your morale was good	.95	.95	.96	.95	.97
H	.99	.90	.99	.99	.99
$\alpha$	.94				

Note: Standardized coefficients. All values significant at  $p < .01$

plausible in the four groups. The factor loadings are in Table 3.

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insert Table 4 about here  
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Standardised gamma coefficients between the associated variables and the well-being construct for the four groups are presented in Table 5. No important differences were observed between age groups for men, or between elderly men and elderly women. This supports the concomitant validity of the PWBMS. However, the associated factors were poorly related to scores for women aged 55-74 years.

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insert Table 5 about here  
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## **Discussion**

The measurement model tested with weighted least squares yielded results that support the original factor structure ( $M_1$ ) proposed by Massé et al (1998).

However, our results suggested that a single-factor model to be just as plausible. The factor loadings were statistically significant, ranging from .69 to .95, for both models and were virtually identical. The reliability of the instrument was also equivalent between the two models. The two models thus appeared to be equivalent, with the single-factor model was a more parsimonious model.

Table 4

*Confirmatory factor analysis of the Psychological Well Being Manifestation Scale*

*with associated variables: sex by age*

Model	N	$\chi^2$	df	p	AGFI	RMSEA	AIC	CAIC
Men 55-74	3372	23196.12	441	.00	.98	.038	23370.23	24195.68
Men 75+	1301	41845.73	440	.00	.97	.051	42021.73	42856.77
Women 55-74	3957	22982.18	441	.00	.98	.038	23156.18	23981.74
Women 75+	1674	32498.69	440	.00	.98	.045	33368.93	34194.48

Note. AGFI = adjusted goodness of fit, RMSEA = Root Mean Squared Error of Approximation, AIC = Akaike's information criterion, CAIC = consistent Akaike's information criterion.

Table 5

*Direct Effect of Exogenous Variables on Respondent's Psychological Well Being Status*

Variable		Men 55-74 (n = 3372)	Men 75+ (n = 1301)	Women 55-74 (n = 3957)	Women 75+ (n = 1674)
Education	( $\xi_1$ )	-.46**	-.25**	-.44**	-.45**
Stress	( $\xi_1$ )	.07**	.12*	.00	-.04**
Physical health	( $\xi_1$ )	.03**	.04*	.01**	.07**
Income	( $\xi_1$ )	-.01	-.04**	.00	-.01**
Civil status	( $\xi_1$ )	.08**	.52**	.00	.07**
Instrumental Social Support	( $\xi_1$ )	-.02**	-.57**	.00	-.05**
Emotional Social Support	( $\xi_1$ )	.03**	-.64**	-.02**	-.07**

Note. All values are standardized gamma coefficients.

\*p > .05. \*\*p > .01.

Significant associations were found between psychological well being ( $M_2$ ) and all associated factors for both men and women aged 75 and over. Only the association with personal income was not significant for men aged 55 – 74. On the other hand, only the associations with education, perceived physical health, and emotional social support were significant for women aged 55 – 74. With the exception of income, there was no change in the relations between the exogenous variables and well being for the two age groups of men. There was important change between the two age groups of women. This suggests that there may be an interaction effect between age and sex on the well being measure. Detailed analysis of these effects is secondary to the purpose of the current study.

These results are in the same direction as previous research. For example, Clark, Marshall, Ryff and Rosenthal (2000) found that among Canadian seniors, physical health and functionality were highly correlated with well being, more so than any other sociodemographic variables, though education and income were also important.

Other researchers (Ryff & Keyes, 1995) have confirmed first-order factor models of well-being measures. These researchers also based their work on the substantive theory in this area of research. The model examined in the current study was devoid of such theoretical foundations, thus there was no basis to argue for the more complex factor structure when a more parsimonious model was shown to be equally plausible. This does not mean that the original complex structure could not be sustained if appropriate theoretical arguments were provided.

The concurrent validity of the PWBMS has not been verified. The instrument needs to be tested against other existing valid measures of psychological well being, both in the same sample. This is an essential part of the validation process for a new instrument (Pedhazur & Schmelkin, 1991; Thorndike, 1949).

Limits to this study are related to the method used. Item-level analysis with LISREL using WLS and the AC matrix requires large samples. In the current study, men 75 years and over, as well as women 75 years and over, had relatively small sample sizes. This may have had an influence on the accuracy of the parameter estimates for these groups.

*Conclusions:* In so far as this study is concerned, the PWBMS appears to show discriminate validity among older adults and the elderly. More detailed research is needed to further examine the manifestations of well being in this population, especially the very old. The hierarchical factor structure was as plausible as a simple factor structure in this study. The literature is rich in well being research, however Massé et al. (1998) chose to forego that research in an attempt to develop a well being scale based on qualitative research. As such, there is no theoretical framework to support the proposed complex form. Without that, we opted for the more parsimonious model. Further work should be done to test the concurrent validity of the PWBMS against other established measurement instruments.

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Running head: VALIDATION OF THE K10

Validation of the K10 Psychological Distress Scale among Older Canadians  
using the Canadian Community Health Survey, Cycle 1.2  
and Structural Equation Modelling  
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## Abstract

The current study tested the plausibility of a conceptual model of the K10 psychological distress measure among Canadians aged 55 and over using data from the Canadian Community Health Survey, Cycle 1.2 and a structural equation modelling strategy. Confirmatory factor analysis of the factor structure of the psychological distress suggested a single-factor structure to be more plausible than a hierarchical structure. The model was found to be plausible for men and women aged 55 – 74 and 75 and over. Certain methodological concerns are also discussed.

## Validation of K10 Psychological Distress Scale

Population estimates based on Statistics Canada census data show the number of Canadians 65 years of age and older will increase from 3.88 million in 2001 to about 4.81 million by 2011. The number of persons 90 years of age and over will have increased from 149.2 thousand in 2001 to an estimated 269.0 thousand in 2011 – an increase of 44.5% (Statistics Canada). This increasing population of the elderly is an important demographic group whose mental health is not well documented and provides opportunities to improve our understanding of the dynamics of psychological distress among the elderly. Prevalence rates of psychological distress for elderly populations range from 6% to 37% (Préville, Hébert, Bravo & Boyer, 2002).

In Canada, few studies have been conducted on the mental health status of the older adult population. *The Canadian Community Health Survey, Cycle 1.2: Mental Health and Well-being* (CCHS 1.2) offers a unique opportunity to document psychological distress among older Canadians. Completed in 2002, this cross-Canada survey sampled nearly 37,000 Canadians 15 years of age and older. The CCHS 1.2 includes the K10 psychological distress measure (Kessler et al. 2002).

The K10 was developed by Kessler et al. (2002) to screen general populations for severe mental illnesses (SMI). Their mandate was to develop a screening tool as short as possible to be used in annual U.S. national health surveys. Kessler and his colleagues began with 18 current psychological distress scales. Using item retention theory, they reduced the initial 612 items to

ten and six. These instruments, the K10 and K6, have been shown to be very effective at screening for SMI in general populations (Kessler et al., 2003).

The K10 has been reanalysed using data from two Australian population surveys (Brooks, Beard & Steel, 2006). These authors argued that an eigen value of 1 in factor analysis might be too restrictive, and more information may be available if the cut-off rules were relaxed. They reported a hierarchical factor structure for the K10, whereas Kessler et al. (2003) had reported a single-factor structure.

## Objectives

The current article tested the plausibility of a measurement model of the K10 psychological distress scale using data from the CCHS 1.2 and a structural equation modelling (SEM) strategy. The instrument was tested in terms of sex and age, with particular attention given to the elderly. This step was done removing the influence of seven exogenous variables: level of education, self-perceived stress, civil status, self-perceived physical health, personal income, emotional and instrumental social support.

The measurement model can be described in the LISREL notation using the following structural equations:

$$y_j = \lambda_{j,n}\eta_n + \varepsilon_{j,j} \quad (1)$$

$$\eta_n = \gamma_{n,m}\xi_m + \zeta_{n,n} \quad (2)$$

These equations are represented in Figure 1, where the  $\xi_m$  (ksis) are latent constructs. The  $\eta_n$  (eta) represent the latent first-order constructs of psychological distress, as measured by the manifest variables ( $y_j$ ). The  $\lambda_{j,n}$  (lambdas) and  $\varepsilon_{j,j}$  (epsilon) refer to the validity coefficients and the measurement errors of the observed variables. The  $\gamma_{n,m}$  (gammas) represent regression coefficients between the latent variables. Finally,  $\zeta_{n,n}$  (zeta) refers to influences on the latent constructs not measured in this study.

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 insert Figure 1 about here  
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In latent variable systems, an alternative measure of reliability is coefficient  $H$  (Hancock & Mueller, 2001).  $H$  takes into account the contribution of each item, regardless of its sign. The reliability of a scale is not less than that of the best item in the scale, such that a poor item does not reduce the usefulness of a good item. Coefficient  $H$  is calculated by:

$$H = 1 / [1 + (1 / [\sum \lambda^2 / (1 - \lambda^2)])] \quad (4)$$

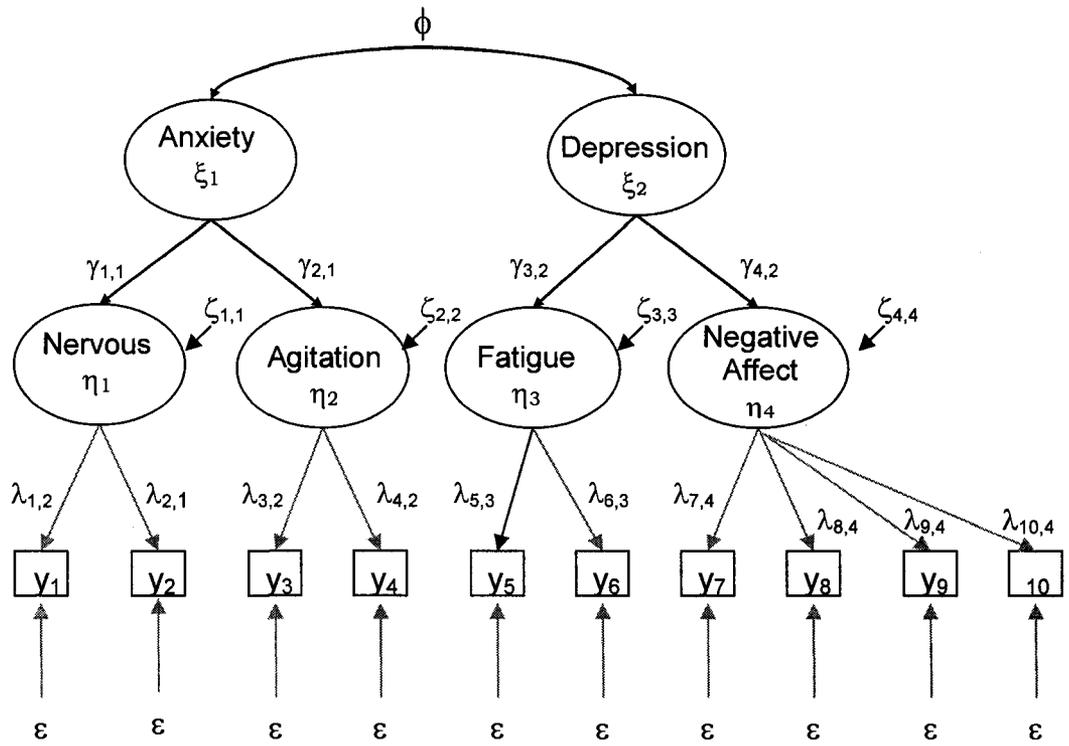


Figure 1. Measurement model of psychological distress

The comparisons of these coefficients and their applications in SEM are beyond the scope of this article, though they certainly warrant further examination. Both the Cronbach  $\alpha$  and  $H$  reliability coefficients will be reported here.

## **Method**

This study was done using data from The Canadian Community Health Survey, Cycle 1.2: Mental Health and Well-being (CCHS 1.2) a cross-sectional survey (N = 36,984), including Canadians 15 years of age and older, living in the community. Excluded were Aboriginals living on reserves, military personnel, and people living in institutions and in remote areas. The CCHS 1.2 uses a complex stratified sampling strategy. Only one person was selected from each household, with unequal probabilities of selection (Béland, Dufour & Gravel, 2001). Details of the survey design have been described elsewhere (Béland, et al., 2001; Gambino, Singh, Dufour, Kennedy & Lindeyer, 1998). Face-to-face computer-assisted interviews were conducted in respondents' homes by Statistics Canada interviewers. Interviews lasted up to about 90 minutes, depending on how many sections were to be completed. Further details are available on the Data Research Centers section of the Statistics Canada web site.

*Measures:* Psychological Distress was measured with the 10-item K10 Psychological Distress Scale (Kessler et al. 2002). The instrument is referenced for the month preceding the interview and has five response options from *all of the time* to *none of the time*. A Cronbach alpha of 0.89 is reported for the K10 (Kessler).

Associated factors included education (1 = less than secondary, 2 = secondary, 3 = other post secondary, 4 = post secondary graduate). Annual personal income was grouped into five categories: 1 = \$9,999 or less, 2 = \$10,000 – \$19,999, 3 = \$20,000 – \$39,999, 4 = \$40,000 – \$59,999, 5 = \$60,000 and over. Self-perceived stress was measured with a single item with 5 response choices: *not at all* to *extremely*. Self-perceived physical health was measured with one item with 5 choices: *excellent* to *poor*. Social support was measured with the affective and tangible scales of the MOS Social Support Survey (Sherbourne & Stewart, 1991). These also had five choices, with higher scores meaning more support. Alphas of .96 and .92 are reported for the emotional and tangible scales respectively. In the current article, these are referred to as emotional and instrumental social support. This is more coherent with terminology found in the literature. Civil status was dicotomized such that 1 represents living as a single, 2 represents living as a couple. Age was grouped into two categories (56-75, 76 and over). These categories were chosen to represent older adults near or in retirement, and the elderly.

*Analysis:* Simple listwise deletion was used to eliminate cases with missing data. This left 32,181 cases with complete data on all variables. The plausibility of the conceptual model proposed by Kessler et al. (2002) was tested using a structural equation modelling strategy. When variables are categorical and their distributions highly asymmetrical, as they were here, then the polychoric correlation matrix should be analysed using the asymptotic covariance matrix and the weighted least squares method to estimate the model's parameters (Bollen, 1989). Polychoric correlations are estimates of the correlations between ordinal variables without the assumption of bivariate normal distribution. The asymptotic covariance matrix is the weight matrix containing the variances and covariances of these estimates used by the weighted least squares fitting function. These were calculated using PRELIS 2.71, a LISREL 8.71 utility program (Jöreskog & Sörbom, 2001).

Since sample size directly effects chi squared, several indices were used to evaluate the plausibility of each model. The adjusted goodness of fit index (AGFI) is an overall fit index that shows how well the population covariance matrix has been reproduced. It also adjusts for the degrees of freedom, rewarding simpler models. Values closer to 1 represent better fit. The Root Mean Square Error of Approximation (RMSEA) fit indicator is one of the most reliable (Hu & Bentler, 1999). Values less than .05 indicate acceptable model fit. Akaike's information criterion (AIC) is used to compare non-hierarchical models. The consistent AIC (CAIC) adjusts for sample size. In both cases, the model with the lowest value is the better one. All tests were done at the 95% significance level. All tests were performed including the sample weight variable

contained in the CCHS 1.2 data file. This variable, provided by Statistics Canada, takes into account the sampling plan effect of the CCHS 1.2 survey to represent the general Canadian population.

## Results

The response rate for the CCHS 1.2 was 77% nationally, varying from 73.4% in Ontario to 82.4% in Manitoba (CCHS 1.2 document file). Sociodemographic characteristics of the sample are presented in Table 1. In the general sample, 54.6% of respondents were women, 52.6% were living as couples. A full 45.7% had post-secondary education, while 27.8% had less than secondary education. The majority (69.3%) reported good to very good physical health.

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insert Table 1 about here  
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The six-factor model proposed by Brooks, Beard, & Steel (2006) was tested first ( $M_1$ ). Results in Table 2 indicate that this model was plausible. However, it also had important specification problems. A two-factor model ( $M_2$ ) with Anxiety and Depression as latent variables was then tested. As seen in Table 2, this showed slightly less adequate fit than  $M_1$ . The correlation between the factors ( $\phi_{2,1}$ ), was .94, suggesting that the two factors should be merged into one. A third model ( $M_3$ ) equivalent to the original K10 model was then

Table 1

*Sociodemographic characteristics of the CCHS 1.2 respondents*

	N	%*
Age		
55-74	6243	19.4
75+	1866	05.8
Sex		
Female	17571	54.6
Male	14610	45.4
Civil status		
Couple	16927	52.6
Single	15254	47.4
Education		
< Secondary	8947	27.8
Secondary	5793	18.0
Some post-sec.	2735	08.5
Post-sec. Grad.	14706	45.7
Income (thousands)		
< 9.99	6925	21.5
10 – 29.99	5992	18.6
30 – 49.99	9629	29.9
50 – 79.99	5477	17.0
80+	4158	12.9
Self-perceived physical health		
Excellent	5734	17.8
Very good	11623	36.1
Good	10691	33.2
Fair	3225	10.0
Poor	908	02.8

\*weighted data

tested. This model showed slightly less adequate fit than  $M_2$ . Both  $M_2$  and  $M_3$  were adjusted with the same modification indicators. The instrument contains three pairs of items where one item measures frequency of symptoms (item 1: felt nervous) while the other measures intensity (item 2: so nervous can't sit still). Each of these three pairs was allowed to correlate. Fit improved substantially in both models. Factor loadings between models did not change more than .03 (for two items only). Internal reliability for  $M_3$  was  $H = .93$ ,  $\alpha = .88$ .

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insert Table 2 about here  
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At this step,  $M_3$  was retained as the best measurement model and was tested with the seven co-variables. This was done for both men and women in each of age group. The factor loadings are in Table 3 and are significant for all groups. Table 4 shows good model fit for all groups.

The final step was to test the model including the associated variables. Table 5 provides the standardised gamma coefficients between these variables and the latent variable of psychological distress. As can be seen in the table, the patterns of significance are not consistent across sex or age.

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insert Tables 3 - 5 about here  
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Table 2

*K10 Confirmatory Factor Analyses*

Model	$X^2$	df	p	AGFI	RMSEA	AIC	CACI	$\Delta$ CAIC
6 factor ( $M_1$ )	1490.88	29	.00	.99	.040	1542.88	1786.74	141.98
2 Factor ( $M_2$ )	1655.62	31	.00	.99	.040	1703.62	1928.72	168.11
1 factor ( $M_3$ )	1835.11	32	.00	.99	.042	1881.11	2096.83	

*Note.* From weighted data. AGFI = adjusted goodness of fit index, RMSEA = Root Mean Squared Error of Approximation, AIC = Akaike's information criterion, CAIC = consistent version of AIC. N = 32,181.

Table 3

Factor Loadings for the K10 Psychological Distress Scale.

Items	Factor loadings ( $\lambda$ )						
	6 factor (M <sub>1</sub> ) N = 32,181	2 factor (M <sub>2</sub> ) N = 32,181	1 factor (M <sub>3</sub> ) N = 32,181	men 55-74 (M <sub>3</sub> ) n = 3372	men 75+ (M <sub>3</sub> ) n = 1301	women 55-74 (M <sub>3</sub> ) n = 3957	women 75+ (M <sub>3</sub> ) n = 1674
Anxiety ( $\xi_1$ ) $\phi_{11} = .56$ (M <sub>1</sub> ), $.75$ (M <sub>2</sub> ) Nervous ( $\eta_1$ ) $\gamma_{11} = .88^{**}$ $\zeta_{11} = .23^{**}$							
1. Nervous	.83	.73	.70	.70	.70	.71	.73
2. So Nervous	.99	.87	.84	.84	.85	.84	.89
Agitation ( $\eta_2$ ) $\gamma_{22} = .77^{**}$ $\zeta_{22} = .41^{**}$							
3. Restless	.88	.68	.66	.65	.71	.69	.74
4. So Restless	.97	.75	.73	.69	.77	.73	.81
Depression ( $\xi_2$ ) $\phi_{22} = .79$ (M <sub>1</sub> ), $.59$ (M <sub>2</sub> )							
Fatigue ( $\eta_3$ ) $\gamma_{33} = .94^{**}$ $\zeta_{33} = .11^{**}$							
5. Tired	.68	.66	.66	.66	.71	.64	.72
6. Effort	.80	.77	.76	.76	.81	.79	.83
Negative Affect ( $\eta_4$ ) $\gamma_{44} = .99^{**}$ $\zeta_{44} = .03^{**}$							
7. Hopeless	.89	.89	.88	.90	.89	.90	.93
8. Worthless	.90	.90	.90	.91	.91	.92	.91
9. Sad	.84	.83	.83	.83	.86	.85	.86
10. So Sad	.92	.92	.92	.93	.96	.93	.94
H	.99	.93	.93	.96	.97	.96	.97
$\alpha$			.88				.97

Note. Phi values are estimates. All other values are standardised. All values significant at  $p < .01$   
 $\phi_{21}$  (M<sub>1</sub>) = .63,  $\phi_{21}$  (M<sub>2</sub>) = .62,  $\phi_{11}$  (M<sub>3</sub>) = .81.

Table 4

*Confirmatory factor analysis of K10 with exogenous variables: sex by age*

Model	N	X <sup>2</sup>	df	p	AGFI	RMSEA	AIC	CAIC
Men 55-74	3372	3645.87	93	.00	1.00	.033	3765.87	4335.22
Men 75+	1301	6795.78	94	.00	.99	.045	306.00	7473.64
Women 55-74	3957	449.06	93	.00	1.00	.031	569.06	1006.06
Women 75+	1674	315.19	94	.00	.99	.038	433.19	812.14

*Note.* AGFI = adjusted goodness of fit index, RMSEA = Root Mean Squared Error of Approximation,  
AIC = Akaike's information criterion, CAIC = consistent version of AIC.

Table 5

*Direct Effect of Exogenous Variables on Respondent's Psychological Distress*

Variable		Group			
		Men 55-74 (n = 3372)	Men 75+ (n = 1301)	Women 55-74 (n = 3957)	Women 75+ (n = 1674)
Education	( $\xi_1$ )	.59**	.60**	.60**	.62**
Stress	( $\xi_2$ )	-.07**	-.03**	-.06**	.00
Physical health	( $\xi_3$ )	-.02**	.00	.02	-.02
Income	( $\xi_4$ )	.02**	-.01*	.04**	.00
Civil status	( $\xi_5$ )	-.02**	.00	-.01	-.10**
Instrumental Social Support	( $\xi_6$ )	.03**	-.03**	-.03	.02
Emotional Social Support	( $\xi_7$ )	-.05**	0..01	.07**	.06*

Note. Standardized gamma coefficients.

\*p > .05. \*\*p > .01.

## Discussion

The objective of this study was to test the plausibility of three conceptual models of the K10 (Kessler et al. 2002) psychological distress measurement instrument for Canadians aged 55 and over. A structural equation modelling strategy and the weighted least squares fitting function were used. Results supported a single-factor model that represents the instrument as presented by Kessler et al.

This model had an internal reliability of  $\alpha = .88$ ,  $H = .93$  for the full CCHS 1.2 sample of respondents aged 15 and over. All validity coefficients were highly significant. This was also found for both men and women in both the 55 – 74 and 75 and over age groups. This is in accord with the validity results reported by Kessler et al. (2002, 2003) who claimed that the K10 was a valid instrument for the population in general, including the elderly.

The correlation of the K10 with education was highly significant for all four groups, showing more education to be associated with lower levels of psychological distress. This effect was higher for men than for women. Stress was also highly significant for all groups except women aged 75 and over. Lower levels of stress were associated with lower levels of psychological distress. This effect also was higher for men than for women. Physical health was only significant for men aged 55 – 74. This finding is not in accord with previous research (Clarke et al., 2000; Mroczek & Kolarz, 1998) which suggests that physical health may be the most important co-variable. Income was highly correlated with the younger groups of both sexes, but was not significant for

older women. Interestingly, income was associated with increased psychological distress for older men. Civil status was significant for men aged 55 – 74 and women aged 75 and over. In both cases, living with another person associated with higher levels of psychological distress. These results do not concord with the literature (Mroczek & Kolarz, 1998). Instrumental social support was significant for men but not for women. However, the effect was opposite between the two age groups. Instrumental support was associated with lower levels of psychological distress for the younger men, but associated with higher levels of psychological distress among older men. Emotional social support was associated with higher levels of psychological distress for the younger men, but was not significant for men aged 75 and over. For women of both age groups, more emotional support was associated with less psychological distress.

The patterns of associations between the exogenous variables and the psychological distress measure varied across age groups for both sexes, suggesting a possible age effect. Though interesting, analysis of these associations is secondary to the purpose of the current article. Since the architects of the instrument did not speak of these associations, we cannot compare these findings with theirs.

The conceptual model proposed by Brooks, Beard & Steel (2006) was also tested. Fit indicators suggested that this was a well-adjusted model. However, modification information produced by the LISREL program suggested many parameters be freed. Freeing these parameters would have resulted in important reductions of  $X^2$ , however the parameters suggested could not have

been justified in any theoretically meaningful way. This information suggested that the model was inappropriate in this data set, under the analyses conditions employed in this study. This model was therefore not retained.

The third model that was tested had two factors, Anxiety and Depression. Though this had certain theoretical relevance, this model was not distinguishable from the single-factor model. As well, the correlation of .94 between the two factors suggested that a single factor was more appropriate.

Limitations to the current study arise from the method used. The weighted least squared fitting function requires an asymptotic covariance matrix which can be quite large, depending on the number of parameters in the model (Wirth & Edwards, 2007). The sample sizes here, especially for the eldest groups, may not have been sufficient to produce a stable matrix, which may have influenced the results. In order to surpass this difficulty, samples closer to 4000 respondents in each group would be more appropriate. Unfortunately, this puts more pressure on research requirements. Few research bodies can afford such large studies. Furthermore, analysing categorical data with LISREL presents certain challenges. The program is better developed for continuous variables than it is for categorical data, as was used here.

*Conclusion:* The current study found the K10 measure of psychological distress to be a valid instrument for use with elderly adults. However, these results did not agree with Brooks, Beard & Steele (2006) regarding the factor structure of the K10. Studies with large samples of the elderly, especially longitudinal studies, are required to explore in greater detail the nature and extent of psychological distress among the elderly.

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Running head: MENTAL HEALTH AMONG OLDER CANADIANS

A Mental Health Measurement Model among Older Canadians using the  
Canadian Community Health Survey, Cycle 1.2  
and Structural Equation Modelling

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## **Abstract**

The current study tested a 2-factor model of mental health among Canadians aged 55 years and over with data from the Canadian Community Health Survey, Cycle 1.2 and a structural equations modelling strategy. The Psychological Well Being Manifestation Measurement Scale and the K10 psychological distress scale were used as components in the mental health model. Confirmatory factor analyses of each scale showed single-factor structures to be most plausible for each instrument. These results are contrary to the original factor structure proposed for the well being measure, and consistent with that of the K10. A 2-factor mental health model was found to be more plausible than a 1-factor model. This model was plausible for both men and women aged 55 – 74 and 75 and over. This is consistent with the mental health literature. The well being instrument requires more validation studies. Larger samples of the very old are needed to validate the current study given the methods used.

## **A Mental Health Measurement Model among Older Canadians**

Population estimates based on Statistics Canada census data show the number of Canadians 65 years of age and older will increase from 3.88 million in 2001 to about 4.81 million by 2011. The number of persons 90 years of age and over will have increased from 149.2 thousand in 2001 to an estimated 269.0 thousand in 2011 – an increase of 44.5% (Statistics Canada). This increasing population of the very old is an important demographic group whose mental health is not well documented, and provides opportunities to improve our understanding of the dynamics of mental health among the elderly.

The World Health Organization (WHO), in their 2005 document *Promoting Mental Health: Concepts, Emerging Evidence, Practice* (World Health Organization, 2005) considers health to be a multi-faceted phenomenon:

Neither mental nor physical health can exist alone. Mental, physical and social functioning are interdependent. Furthermore, health and illness may co-exist. They are mutually exclusive only if health is defined in a restrictive way as the absence of disease... (p. 2).

This co-existence of illness and health would apply to each health component, such that mental health would also have a positive aspect (psychological well being) and a negative aspect (psychological distress). By extension, psychological well being would be more than just the absence of psychological distress; a point advocated by several researchers (Bradburn, 1969; Massé et al., 1998c; Viet & Ware, 1983).

Psychological Well being is a complex notion that includes cognition and emotion, referring to the positive mental state of an individual. This is one's subjective evaluation of how one thinks and feels Diener, Suh, Lucas & Smith, 1999; Stock, Okun & Benin, 1986). Keyes and Waterman (2002) have suggested that "Subjective well being reflects individuals' perceptions and evaluations of their own lives in terms of their affective states and their psychological and social functioning, all being critical dimensions of mental health" (p. 478). Diener et al. (1999) described this construct "... as a general area of scientific interest rather than a single specific construct" (Diener et al. p 277).

Massé et al. (1998b) proposed a measurement model with six factors: Control of Self and Events, Happiness, Social Involvement, Self-esteem, Mental Balance, and Sociability for one psychological well being latent variable. This is the 25-item Well Being Manifestation Measure Scale (WBMMS). This instrument was developed following a qualitative study by the same authors.

Psychological distress is a notion used to describe people who experience clusters of symptoms that "... are not specific to any particular psychiatric disorder" (Dohrenwend, Shrout, Egri, & Mendelsohn, 1980, p. 1229), though most psychiatric patients score high on these measures.

Kessler et al. (2002) also developed a measurement instrument designed to screen general populations for severe mental illnesses. Their mandate was to develop a screening tool as short as possible to be used in annual U.S. national health surveys. Kessler and his colleagues began with 18 current psychological distress scales. Using item retention theory, they reduced the initial 612 items to

ten. This instrument, the K10, has been shown to be very effective at screening for severe mental illness in general populations (Kessler et al., 2003).

There has been much work done in the area of mental health. However, few studies have examined this issue for the old and the very old. Most studies either do not have samples older than 75 years, or they group all subjects 65 and over into a single category.

### Objectives

The current article examined the plausibility of a first-order two-factor model among Canadians aged 55-74 and 75 and over. We also documented the associations between both components of mental health and the respondents' predisposing characteristics.

The measurement model can be described in the LISREL notation using the following structural equations:

$$x_i = \lambda_{i,m}\xi_m + \delta_{i,i} \quad (1)$$

$$y_j = \lambda_{j,n}\eta_n + \varepsilon_{j,j} \quad (2)$$

$$\eta_n = \gamma_{n,m}\xi_m + \zeta_{n,n} \quad (3)$$

These equations are represented in Figure 1, where the  $\xi_m$  (ksis) are latent constructs representing observed exogenous variables ( $x_i$ ). The  $\eta_1$  (eta) represents the well being latent construct,  $\eta_2$  is the psychological distress

measure. These are measured by the manifest variables ( $y_j$ ). To reduce clutter in the figure, these are only shown as boxes. The  $\lambda_{i,m}$  (lambdas) and  $\delta_{i,j}$  (deltas) refer to the validity coefficients and the measurement errors of the observed

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 insert Figure 1 about here  
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exogenous variables. The  $\lambda_{j,n}$  (lambdas) and  $\varepsilon_{j,j}$  (epsilons) refer to the validity coefficients and the measurement errors of the observed endogenous variables. The  $\gamma_{n,m}$  (gammas) represent path coefficients between the latent exogenous variables and the latent endogenous variables. Finally,  $\zeta_{n,n}$  (zeta) refers to influences on the latent constructs not measured in this study.

In latent variable systems, an alternative measure of reliability is coefficient  $H$  (Hancock & Mueller, 2001).  $H$  takes into account the contribution of each item, regardless of its sign. The reliability of a scale is not less than that of the best item in the scale, such that a poor item does not reduce the usefulness of a good item. Coefficient  $H$  is calculated by:

$$H = 1 / [1 + (1 / [\sum \lambda^2 / (1 - \lambda^2)])] \quad (4)$$

The comparisons of these coefficients and their applications in SEM are beyond the scope of this article, though they certainly warrant further examination. Both the Cronbach  $\alpha$  and  $H$  reliability coefficients will be reported here.

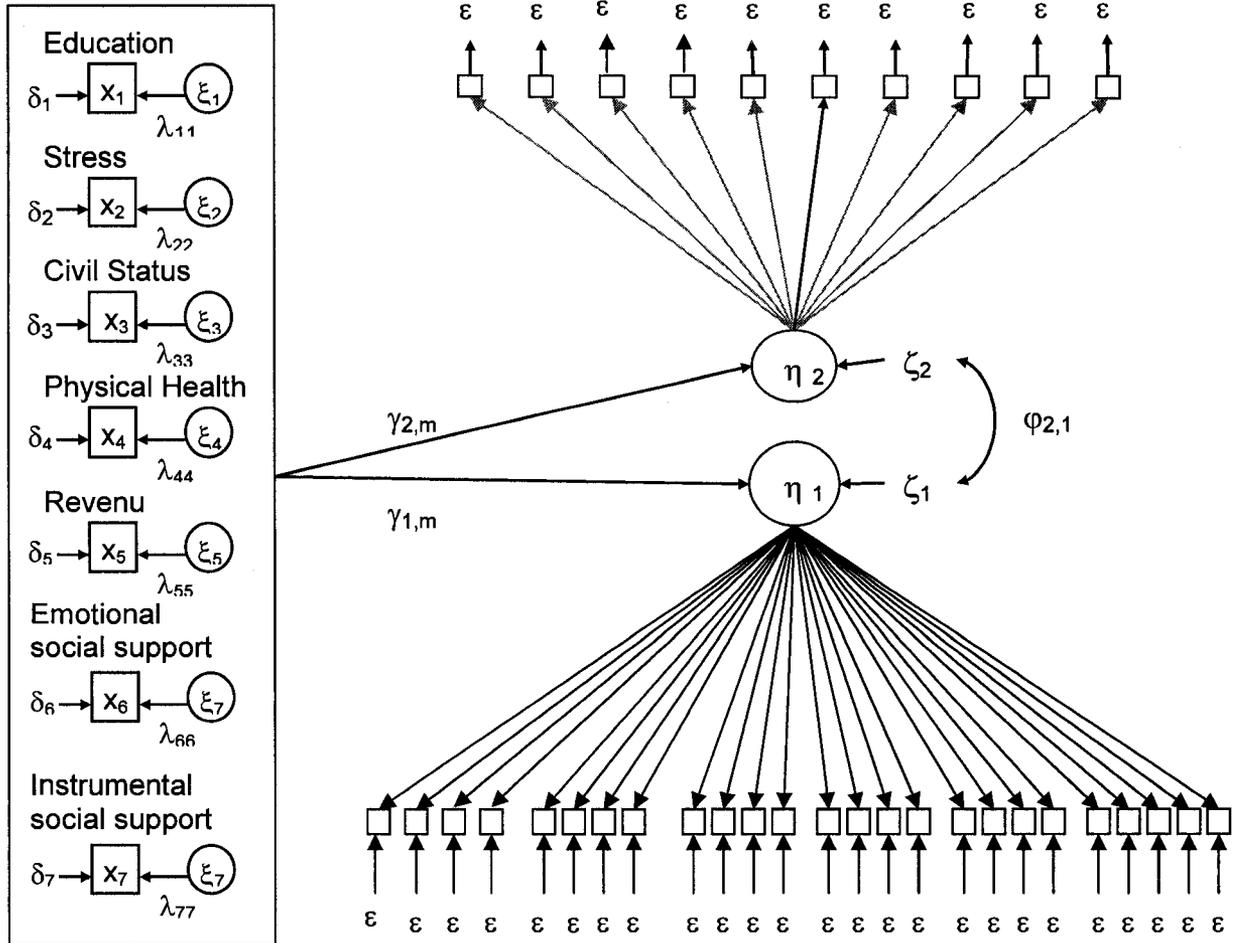


Figure 1. Hypothetical measurement model of mental health

## Method

*Sample:* This study was done using data from The Canadian Community Health Survey, Cycle 1.2: Mental Health and Well-being (CCHS 1.2) a cross-sectional survey (N = 36,984), including Canadians 15 years of age and older, living in the community. Excluded were Aboriginals living on reserves, military personnel, and people living in institutions and in remote areas. The CCHS 1.2 uses a complex stratified sampling strategy. Only one person was selected from each household, with unequal probabilities of selection (Béland, Dufour & Gravel, 2001).. Details of the survey design have been described elsewhere (Béland, et al., 2001; Bambino, Singh, Dufour, Kennedy & Lindeyer, 1998).

Face-to-face computer-assisted interviews were conducted in respondents' homes by Statistics Canada interviewers. Interviews lasted up to about 90 minutes, depending on how many sections were to be completed. Further details are available on the Data Research Centers section of the Statistics Canada web site.

*Measures:* Psychological Well being was measured with the 25-item Well being Manifestation Measure Scale developed by Massé et al. (1998b). The CCHS 1.2 refers to this as the Psychological Well being Manifestation Scale (PWBMS). This scale is referenced for the month preceding the interview and uses a five-point response scale from *always* to *never*. The authors report a Cronbach alpha of 0.93 for this scale. Psychological Distress was measured with the 10-item K10 Psychological Distress Scale (Kessler et al. 2002). The instrument is

referenced for the month preceding the interview and has five response options from *all of the time* to *none of the time*. A Cronbach alpha of 0.89 is reported for the K10.

Associated factors included education (1 = less than secondary, 2 = secondary, 3 = other post secondary, 4 = post secondary graduate). Annual personal income was grouped into five categories: 1 = \$9,999 or less, 2 = \$10,000 – \$19,999, 3 = \$20,000 – \$39,999, 4 = \$40,000 – \$59,999, 5 = \$60,000 and over. Self-perceived stress was measured with a single item with 5 choices: *not at all* to *extremely*. Self-perceived physical health was measured with one item with 5 choices: *excellent* to *poor*. Social support was measured with the affective and tangible scales of the MOS Social Support Survey (Sherbourne & Stewart, 1991). These also had five choices, with higher scores meaning more support. Alphas of .96 and .92 are reported for the emotional and tangible scales respectively. In the current article, these are referred to as emotional and instrumental social support. This is more coherent with terminology found in the literature. Civil status was dicotomized such that 1 represents living as a single, 2 represents living as a couple. Age was grouped into two categories (56-75, 76 and over). These categories were chosen to represent young adults, middle adults, older adults near or in retirement, and the elderly.

*Analysis:* Simple listwise deletion was used to eliminate cases with missing data. This left 32,181 cases with complete data on all variables. When variables are categorical and their distributions highly asymmetrical, as they were here, then

the polychoric correlation matrix should be analysed using the asymptotic covariance matrix (AC) and the weighted least squares (WLS) method to estimate the parameters (Bollen, 1989; Wirth & Edwards, 2007). Polychoric correlations are estimates of the correlations between ordinal variables without the assumption of bivariate normal distribution. The AC matrix is the weight matrix containing the variances and covariances of these estimates used by the WLS fitting function. These matrices were calculated using PRELIS 2.71, a LISREL 8.71 utility program (Jöreskog & Sörbom, 2001). Since sample size directly influences  $\chi^2$ , several indices were used to evaluate the plausibility of each model and its fit to the data. The Root Mean Square Error of Approximation (RMSEA) fit indicator is one of the most reliable (Hu & Bentler, 1999). Values less than .05 indicate acceptable model fit. All tests were done at the 95% significance level.

First, confirmatory factor analysis (CFA) was done on each of the scales of psychological well being and psychological distress. Then, the validity of the mental health construct was tested freeing the coefficient of association between the constructs. At this step, the hypothesis that psychological well being and psychological distress were part of the same construct was tested. This was equivalent to testing that the  $\Phi$  (phi) matrix was diagonal. Then, the associations between both psychological well being and psychological distress and the external variables were examined to document specificity of each construct. This was done for men and women in the 55 – 74 as well as 75 and over age groups.

## Results

The response rate for the CCHS 1.2 was 77% nationally, varying from 73.4% in Ontario to 82.4% in Manitoba (CCHS 1.2 document file). Sociodemographic characteristics of the sample are presented in Table 1. In the general sample, 54.6% of respondents were women, 52.6% were living as couples. A full 45.7% had post-secondary education, while 27.8% had less than secondary education. The majority (69.3%) reported good to very good physical health. All tests were performed using the sample weight variable contained in the CCHS 1.2 data file. This variable, provided by Statistics Canada, weights each respondent to the general Canadian population taking into account the sampling plan.

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insert Table 1 about here  
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Table 2 shows results of the confirmatory factor analyses of the single-factor and two-factor models tested on the general sample. The AFGI and RMSEA both show the two models to have good fit. The two-factor model specifying psychological well being and psychological distress had considerably better fit according to CAIC, with a difference of 9273.47. The correlation between psychological well being and psychological distress was  $-.86$ . This correlation suggests a very strong relationship between the two constructs and in the direction expected. Table 3 shows the factor loadings for the two models were all highly significant. The difference in the CIAC strongly suggests that the two-factor model is the better model, which is in keeping with the literature on mental

Table 1

*Sociodemographic characteristics of the CCHS 1.2 respondents*

	N	%*
Age		
55-74	6243	19.4
75+	1866	05.8
Sex		
Female	17571	54.6
Male	14610	45.4
Civil status		
Couple	16927	52.6
Single	15254	47.4
Education		
< Secondary	8947	27.8
Secondary	5793	18.0
Some post-sec.	2735	08.5
Post-sec. Grad.	14706	45.7
Income (thousands)		
< 9.99	6925	21.5
10 – 29.99	5992	18.6
30 – 49.99	9629	29.9
50 – 79.99	5477	17.0
80+	4158	12.9
Self-perceived physical health		
Excellent	5734	17.8
Very good	11623	36.1
Good	10691	33.2
Fair	3225	10.0
Poor	908	02.8

\*weighted data

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insert Table 2 & 3 about here  
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health. Consequently, the two-factor model is retained here.

At this stage, the two-factor model was tested with the associated variables. This was done for men and women in both the 55 – 74 and 75 and over age groups. In Table 4, AGFI shows excellent model fit for all groups. The RMSEA fit indicator shows good fit for men and women in the 55 – 74 age group. Fit is less adequate for the 75 and over groups. This may be in part because of the relatively low sample size for the model size. This is also reflected in the high chi squared value for these two groups.

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insert Table 4 & 5 about here  
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Table 5 shows the gamma coefficients between the exogenous variables and the mental health components. All were significant except for three, which concerned women aged 55 – 74 years. In this group, physical health and instrumental social support were not related to the psychological distress component. Civil status was not significant for the well being component.

Table 2

*Mental Health Confirmatory Factor Analysis*

Model	X <sup>2</sup>	df	AGFI	RMSEA	AIC	CAIC	ΔCIAC
1 Factor	21543.41	560	.98	.034	28 015.82	28 672.36	
2 Factor	18545.45	555	.99	.032	18 695.45	19 398.89	9273.47

Note. AGFI = adjusted goodness of fit index, RMSEA = Root Mean Squared Error of Approximation, AIC = Akaike's information criterion, CAIC = consistent version of AIC.  $\phi_{2,1} = -.86$   
 N = 32,181.

Table 3

## Factor loadings for the Mental Health Models

Items	Factor loadings ( $\lambda$ )					
	1-factor model (M <sub>1</sub> )	2-factor model (M <sub>2</sub> )	men 55-74 (M <sub>2</sub> )	men 75+ (M <sub>2</sub> )	women 55-74 (M <sub>2</sub> )	women 75+ (M <sub>2</sub> )
	N = 32 181	N = 32 181	n = 3372	n = 1301	n = 3957	n = 1674
1. Felt self-confident	-.81	.79	.84	.83	.82	.91
2. Felt satisfied with accomplishments	-.88	.86	.90	.94	.89	.92
3. Were a go-getter	-.67	.62	.72	.76	.64	.68
4. Felt emotionally balanced	-.93	.91	.94	.97	.92	.98
5. Felt loved and appreciated	-.81	.80	.87	.88	.86	.87
6. Had goals and ambitions	-.78	.72	.81	.92	.81	.83
7. Felt like having fun	-.76	.76	.78	.89	.79	.87
8. Felt useful	-.91	.89	.94	.95	.92	.95
9. Smiled easily	-.88	.87	.89	.93	.93	.94
10. Were true to yourself	-.86	.85	.89	.94	.87	.90
11. Were a good listener	-.71	.72	.80	.81	.75	.84
12. Were curious and interested	-.81	.82	.84	.89	.84	.92
13. Were able to sort things out	-.87	.85	.89	.94	.88	.94
14. Found life exciting	-.93	.92	.94	.98	.94	.96
15. Your life was well balanced	-.87	.87	.88	.92	.91	.94
16. Were calm and level-headed	-.89	.87	.88	.92	.91	.94
17. Were able to find answers to	-.91	.89	.90	.94	.92	.96



Table 4

Group	N	$\chi^2$	df	AGFI	RMSEA
Men 55-74	3372	42494.62	788	1.00	.038
Men 75+	1301	105643.39	784	.98	.061
Women 55-74	3957	41198.90	786	1.00	.038
Women 75+	1674	79388.26	786	.98	.053

*Note.* AGFI = adjusted goodness of fit index, RMSEA = Root Mean Squared Error of Approximation.

Table 5

*Direct Effect of Exogenous Variables on Respondent's Mental Health*

Variable		Group			
		Men 55-74 (n = 3372)	Men 75+ (n = 1301)	Women 55-74 (n = 3957)	Women 75+ (n = 1674)
Education	$(\xi_1)$	-.61** <sup>a</sup>	-.41**	-.65**	-.72**
		.75** <sup>b</sup>	.57**	.78**	.82**
Stress	$(\xi_2)$	.08**	.06**	.01**	-.01*
		-.07**	-.02**	-.04**	.01**
Physical health	$(\xi_3)$	.03**	-.04**	-.03**	.06**
		-.07**	.16**	0.0	-.06**
Income	$(\xi_4)$	-.03**	-.07**	-.07**	-.02**
		.04**	.04**	.07**	.02**
Civil status	$(\xi_5)$	.05**	.27**	-0.01	.18**
		-.05**	-.12**	.02**	-.18**
Instrumental Social Support	$(\xi_6)$	-.03**	-.22**	.02**	-.10**
		.06**	.04**	0.0	.09**
Emotional Social Support	$(\xi_7)$	.05**	-.30**	-.02**	-.11**
		-.06**	.09**	.05**	.09**

Note. Standardized gamma coefficients. <sup>a</sup> Well being, <sup>b</sup> distress

## Discussion and Conclusion

The current study tested a two-factor mental health measurement model among older Canadians. Confirmatory factor analysis suggested that both the single and two-factor mental health models were plausible. Both the AGFI and RMSEA fit indicators suggested very good model fit for both models. The high correlation of  $-.86$  between psychological well being and psychological distress is quite high, and might suggest that both components measure the same construct. The CAIC coefficient, on the other hand, indicated that the two-factor model was the better one. There is substantial support in the literature on mental health for a two-factor construct (WHO, 2005). Thus, we are inclined to maintain the mental health measure as a two-factor model, though justification for doing so, based on the results of the current study, is slim.

The two-factor model was plausible and showed good fit for men and women in the two age groups studied under the influence of the exogenous variables. However, the models for the 75 and over age groups had specification problems. This may be in part due to the low sample sizes for these groups, given the size of models to be analysed within the method used. The weighted least squares fitting function and the asymptotic covariance matrix requires very large sample sizes. The sample sizes for the groups created in this study may have been low enough to cause disturbances in the results.

The correlations of the exogenous variables were significant in all cases except three. These latter cases occurred for women aged 55-74 years. In many cases, the correlation was the same for both psychological well being and

psychological distress, with opposite signs. This indicates that the associated variables had similar relationships with both measures. These remained quite stable across age and sex groups.

There remains concerns about the validity of the psychological well being instrument. Not all the steps involved in developing and validating a psychometric instrument have been carried out on the WBMMS, in particular comparisons with other established instruments.

The a-theoretical approach of its authors makes discussion of the theoretical foundations of the instrument impossible. Normally, it is one's theory about a subject that guides the building of an instrument. That theory also provides justification for the model presented. In the case of the WBMMS, this information is simply non-existent. Thus, in the current study, there was no reason available to justify maintaining a more complex factor structure when a simpler one was just as plausible.

Overall then, with the concerns about the psychological well being measure and sample size issues, we are left without a solid conclusion as to the main question of the study. The two-factor mental health model was retained on rather slim grounds. Part of the justification was based on the literature on mental health. However, that discussion would also benefit from more rigorous use of terminology.

The stakes of this debate are important. Large population studies are very expensive to conduct. If a questionnaire can be eliminated as being redundant, then all the better. There is much more work to be done as to the number of items required to capture a construct such as mental health. Kessler et al (2002)

managed to pare down 612 items to ten and six. Another study should test the psychological well being and psychological distress instruments employed in the CCHS 1.2 against the single item of mental health that was included as a screening item.

The debate over psychological well being and psychological distress as two factors of mental health leaves aside other components of mental health. This is after all a very broad concept and probably will never be narrowed down to a unified theory any time soon. It is just the same a very fascinating field of study and should be pursued with all the rigour worthy of such a subject.

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## **Chapter IV**

### **Discussion and Conclusion**

#### **IV. Discussion and Conclusion**

The current study tested a measurement model of mental health among older Canadians, using data from the CCHS 1.2 and a structural equation modelling strategy. The Well Being Manifestation Measurement Scale (Massé et al. 1998) and the K10 psychological distress scale (Kessler et al., 2002) were included in the model. Confirmatory factor analysis was performed on each scale to test the fit to this data set. The CCHS 1.2 is the first population survey to use the well being measure, which is referred to in the CCHS 1.2 as the Psychological Well Being Measurement Scale (PWBMS). The psychometric properties of the K10 have been previously documented (Kessler, 2002, 2003). An alternative factor structure for the K10 has been proposed (Brooks et al., 2006).

The PWBMS measurement model tested with weighted least squares yielded results that support the original factor structure proposed by Massé et al (1998). However, our results suggested that a single-factor model was just as plausible. The factor loadings were statistically significant, ranging from .69 to .95, for both models and were virtually identical. The reliability of the instrument was also equivalent between the two models. The two models thus appeared to be equivalent, while the single-factor model was a more parsimonious model. The authors of this instrument did not offer any theoretical framework for the factor structure. In the absence of such information, we have no justification to maintain a complex factor structure when a simpler one is shown to be equivalent. Thus, the single-factor model was retained in the current study.

The single-factor model was plausible for both men and women aged 55 – 74 and 75 and over. Significant associations were found between psychological well being and all associated factors for both men and women aged 75 and over. Only the association with personal income was not significant for men aged 55 – 74. On the other hand, only the associations with education, perceived physical health, and emotional social support were significant for women aged 55 – 74.

These results are consistent with previous research. For example, Clark et al. (2000) found that among Canadian seniors, physical health and functionality were highly correlated with well being, more so than any other sociodemographic variables, though education and income were also important.

Testing of the conceptual models of the K10 (Kessler et al. 2002) psychological distress measurement instrument supported a single-factor model that represents the instrument as presented by Kessler et al. This model had an internal reliability of  $\alpha = .88$ ,  $H = .93$  for the sample aged 15 and over. All validity coefficients were highly significant. This was also found for both men and women in both the 55 – 74 and 75 and over age groups. This is in accord with the validity results reported by Kessler et al. (2002, 2003) who claimed that the K10 was a valid instrument for the population in general, including the elderly.

The conceptual model proposed by Brooks, Beard & Steel (2006) was also tested. Fit indicators suggested that this was a well-adjusted model. However, the model had numerous specification errors. This information suggested that the model was inappropriate in this data set, under the analyses conditions

employed in this study. This model was therefore not retained.

The third model that was tested had two factors, Anxiety and Depression. Though this had certain theoretical relevance, this model was not distinguishable from the single-factor model. As well, the correlation of .94 between the two factors suggested that a single factor was more appropriate.

The correlation of the K10 with education was highly significant for all four groups, showing more education to be associated with lower levels of psychological distress. This effect was higher for men than for women. Stress was also highly significant for all groups except women aged 75 and over. Lower levels of stress were associated with lower levels of psychological distress. This effect also was higher for men than for women. Physical health was only significant for men aged 55 – 74. This finding is not in accord with previous research (Clarke et al., 2000; Mroczek & Kolarz, 1998) which suggests that physical health may be the most important co-variable. Income was highly correlated with the younger groups of both sexes, but was not significant for older women. Interestingly, income was associated with increased psychological distress for older men. Civil status was significant for men aged 55 – 74 and women aged 75 and over. In both cases, living with another person associated with higher levels of psychological distress. These results do not concord with the literature (ex. Mroczek & Kolarz, 1998). Instrumental social support was significant for men but not for women. However, the effect was opposite between the two age groups. Instrumental support was associated with lower levels of psychological distress for the younger men, but associated with higher levels of psychological distress among older men. Emotional social support was

associated with higher levels of psychological distress for the younger men, but was not significant for men aged 75 and over. For women of both age groups, more emotional support was associated with less psychological distress. The correlations of the exogenous variables were significant in all cases except three. These latter cases occurred for women aged 55-74 years. In many cases, the correlation was the same for both psychological well being and psychological distress, with opposite signs. This indicates that the associated variables had similar relationships with both measures. These remained quite stable across age and sex groups.

Confirmatory factor analysis of the mental health model suggested that both the single and two-factor mental health models were plausible. Both the AGFI and RMSEA fit indicators suggested very good model fit for both models. The high correlation of  $-.86$  between psychological well being and psychological distress is expected, since both components measure the same construct. The CAIC indicated that the two-factor model was the better one. The literature on mental health has long established mental health to be a two-factor construct (WHO, 2005). Thus, we are inclined to maintain the mental health measure as a two-factor model.

The two-factor model was plausible and showed good fit for men and women in the two age groups studied under the influence of the exogenous variables. However, the models for the 75 and over age groups had specification problems. This may be in part due to the low sample sizes for these groups, given the size of models to be analysed. The influence of these variables was

significant in all cases except three. These latter cases occurred for women aged 55-74 years.

Important limitations for this study arise from the method used. The literature is clear that when using SEM analysis and categorical data, WLS is appropriate, while ML is not. In the case SEM, ordinal data requires weighted least squares, an asymptotic covariance matrix and an appropriate sample size. The AC is a symmetric matrix of size  $[p(p+1)] / 2$ . With 42 manifest variables ( $x = 7$ ,  $y = 35$ ) in the full model, the asymptotic covariance matrix required a sample size larger than 900 to be stable (Wirth & Edwards, 2007). The elderly men in the current study had a sample size of 1301, and elderly women had a sample size of 1674. We are probably straining the samples' abilities to support these types of analyses. Weighting the data also inflated the results for the elderly groups. Larger samples of the elderly would be required to reduce the possibility of bias in these analyses.

An important avenue to explore is what Diener et al. (1999) refer to as item valences or emotional intensity of items. For example, item 3 of the PWBMS: *(During the past month) you were a "go-getter", you took on lots of projects,* consistently showed poor validity and is probably less pertinent to people 75 years and older than to younger people. People approaching and in early retirement may be taking on new projects, whereas people approaching 90 probably are not. This is not news, but the analyses of Massé et al. (1998b) did not account for such age effects. The methods of Kessler et al. (2002) were reported to have accounted for age and gender effects. The current study found such effects. Items in mental health measurement instruments would need to be

more carefully examined for valance levels and relevance for the elderly. This age related valency might explain in part the specification problems of the models for the 75+ groups in the current study.

The concurrent validity of the PWBMS has not been verified. The instrument needs to be tested against other existing valid measures of psychological well being, both in the same sample. This is an essential part of the validation process for a new instrument (Pedhazur & Schmelkin, 1991; Thorndike, 1949). The PWBMS remains devoid of any theoretical framework. There is a rich body of literature on this topic, but the instrument's developers chose to put that aside. Thus, we cannot examine the arguments for the instrument's structure. As Bollen (1989) points out, any research should include at least as much substantive information as possible concerning the problem at hand. In terms of measuring psychological well being, this information is substantial.

It may also be useful to attempt to reduce the number of items in the model. It may be possible to reduce the well being measure from 25 items to some lesser amount and still capture adequately the construct. This would have the effect of reducing the number of parameters in the model, would reduce the size of the asymptotic covariance matrix and would reduce the size of the sample required to do the analysis. This is indeed the approach used in the development of the K10 (Kessler et al., 2002)

Internal reliability as measured by  $H$  was higher than that measured by  $\alpha$ . This is supportive of Hancock & Mueller's (2001) claims. Further discussion of

this coefficient is left to more methodological papers.

*Conclusion:* This study set out to test whether mental health should be measured as one or two factors, and whether this model applies to the elderly. The two-factor solution was retained, and was plausible for men and women aged 55 - 74 and 75 and over. Further research is needed with larger samples of the very old to further our understanding of mental health with advancing age, within the methodological context used in this study.

More theoretical and psychometric works remains do be done with the measurement of mental health among the elderly.

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