Knowledge about aging and worry in older adults: Testing the mediating role of intolerance of uncertainty

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Abstract

Objectives—This study aims to explore the relationship between knowledge about aging and severity of worry in older adults, and to test the potential mediational role of intolerance of uncertainty.

Method—The sample was composed of 120 community-dwelling older adults, with a mean of age of 71.0 years (SD = 6.3). Mediational analyses and structural equation modeling were used to analyze and compare different models.

Results—Greater knowledge about aging was negatively related to both intolerance of uncertainty and worry, and its effect on worry was partially mediated by intolerance of uncertainty. The mediational model obtained an excellent fit to the data (i.e. Goodness of fit index (GFI) = 0.995) and clearly had a better fit than alternative models.

Conclusion—These results suggest that a good knowledge of the aging process could help decrease aversive uncertainty and thus reduce the level of worry among older adults. Thus, educational programs to increase knowledge about aging could serve as one preventive strategy for anxiety in old age.

Keywords

stereotypes; GAD; beliefs about aging; FAQ

Introduction

During the last two decades, interest in the phenomenon of worry and its correlates has increased exponentially. Despite this burgeoning body of research, worry remains an understudied phenomenon in the elderly, even though excessive or pathological worry has

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been associated with high costs in both public and private medical settings as well as with marked impairment in the quality of life of older adults (Stanley & Beck, 2000; Wetherell et al., 2004). Worry would seem an inevitable consequence of growing old because aging often involves an increase in sources of stress (e.g. health problems, loss of social relationships and lack of autonomy). Paradoxically, however, levels of worry in older adults seem to be lower than in younger adults (Wisocki, 1988).

As Beck and Averill (2004) point out, a critical issue in research on worry in older adults is whether worry is invariant across the life cycle. It has been suggested that physiological, cognitive and behavioral changes that accompany normal aging may modify the manifestation of worry, ways of coping with worry, worry content, and even the definition of Generalized Anxiety Disorder (GAD; Montorio, Nuevo, Márquez, Izal, & Losada, 2003; Stanley & Beck, 2000; Wetherell, Le Roux, & Gatz, 2003). Recent evidence also points to differences in anxiety in the elderly, with a potentially different role of worry, as age appears to be inversely associated with worry and unrelated to somatic and affective symptoms of anxiety (Brenes, 2006).

Theoretical and empirical perspectives suggest that one of the main resources with which to cope successfully with the additional stress of aging could come from a knowledge of aging processes and positive attitudes about older people (e.g. Levy, 2003). A better knowledge of the processes of change related to aging would normalize them, make them more predictable, and facilitate better acceptance and coping strategies (Baltes & Baltes, 1990). Thus, it is possible that the degree to which the individual has knowledge about aging could influence the effectiveness of coping with additional sources of stress and ultimately with worry and anxiety levels. Conversely, lack of knowledge or negative stereotypes about old age could increase the frequency of worry about aging, leading to higher levels of anxiety (Levy, 2003; Neikrug, 2003).

Based on these ideas, Neikrug (1998) conducted a study to analyze the relationship between worry and knowledge about aging. He found significant negative correlations (between −0.18 and −0.27) between several types of worry content and knowledge about aging. Along the same lines, Nuevo, Montorio, and Cabrera (2006) performed hierarchical regression analyses and found that knowledge about aging remained a significant predictor of worry even after controlling for frequency of worry about several domains of worry characteristic of older adults. Thus, preliminary evidence suggests that greater knowledge about aging is related to lower worry severity among elderly people and may be one factor that differentiates worry in older and younger adults.

A core etiological variable in one of the most compelling current models of the development of pathological worry is intolerance of uncertainty (e.g. Dugas, Gagnon, Ladouceur, & Freeston, 1998). Research suggests that individuals with higher levels of worry and generalized anxiety prefer a certain negative outcome to one that is unknown (Dugas, Buhr, & Ladouceur, 2004), suggesting that intolerance of uncertainty may lead to the development and maintenance of pathological worry. In fact, in both clinical and experimental studies Dugas's group has found that changes in intolerance of uncertainty precede changes in worry level (Dugas & Ladouceur, 2000; Ladouceur, Gosselin, & Dugas, 2000).

Intolerance of uncertainty may play a role in the relationship between knowledge about aging and worry in older adults. Adequate knowledge of the changes associated with aging could reduce the level of uncertainty and increase tolerance of those changes. Similarly, a high level of knowledge about aging could increase the predictability and perceived control over potential threats associated with the aging process. As threats to perceived control – for example, those related to health problems – appear to play an important role in emotional regulation for older adults (Heckhausen & Schulz, 1995; Rodin & Timko, 1992), knowledge about aging could play an important role in protecting against the negative emotional consequences of those events.

Although intolerance of uncertainty is often considered a stable trait, several studies suggest that it is in fact modifiable. For example, Ladouceur et al. (2000) experimentally manipulated levels of intolerance of uncertainty using changes in the information about probability of outcomes provided in an experimental task. Futhermore, one of the aims of treatment protocols based on an intolerance of uncertainty model is to reduce this intolerance (Ladouceur, Léger, Dugas, & Freeston, 2004). Because knowledge about aging includes information about the probability of occurrence of normative or non-normative events, increasing such knowledge could reduce intolerance of uncertainty in older adults, thereby reducing anxiety and worry.

Negative stereotypes about aging, which can arise from lack of knowledge, are frequently acquired early in life and are usually very resistant to change over the life cycle (Ory, Hoffman, Hawkins, Sanner, & Mockenhapt, 2003). These stereotypes may become more salient as individuals age and incorporate those beliefs into their identity (Levy, Slade, Kunkel, & Kasl, 2002). Accurate knowledge about aging may counteract this process by increasing tolerance of the uncertainty associated with aging, thereby reducing worry and anxiety.

Thus, consistent with Dugas' model and both theoretical and empirical data in gerontology, intolerance of uncertainty could play a mediating role between knowledge about aging and severity of worry: older persons with little knowledge about aging and high intolerance of uncertainty may develop or experience an exacerbation of pathological worry, and conversely, older people with greater knowledge about aging may be less likely to harbor negative stereotypes, more tolerant of uncertainty related to aging, and thus less prone to excessive worry.

The present study aims to explore the relationship between knowledge about aging and severity of worry in older adults. Specifically, we hypothesize that higher levels of knowledge about aging are associated with lower worry severity, and that this relationship is mediated by intolerance of uncertainty. Also, because knowledge about aging could be a function of age and educational level (e.g. Neikrug, 1998), a model including these variables and the direct and indirect effects (via intolerance of uncertainty) of knowledge about aging on worry was tested and compared with more restrictive models using structural equation modeling.

Method

Subjects

One-hundred and twenty persons between 55 and 88 years old (mean = 71.0 years, SD = 6.3) were recruited from senior centers in Madrid, Spain. In terms of gender, 58.3% were women (mean age = 70.4,SD = 6.5), and 41.7% were men (mean age = 71.9,SD = 6.0). Most (59.2%) were married, with 31.7% widowed, 5.8% single and 3.3% divorced. Education was coded as 1 = none, 2 = primary school, 3 = secondary school, 4 = higher education. Mean educational level was 2.43 (SD = 0.75), suggesting that most participants had completed at least primary school (5.8% reported that they had not completed any formal education, although all of them were able to read and write).

Measures

Worry was measured with an abbreviated version of the Penn State Worry Questionnaire (PSWQ-A), with eight Likert-scale items scored 1–5, designed to assess excessive and uncontrollable worry. It measures a general tendency to worry without reference to specific worry content. The PSWQ-A is a short form of a 16-item scale (Meyer, Miller, Metzger, & Borkovec, 1990) that has been widely validated in clinical and non-clinical populations of all ages from a variety of cultural and linguistic backgrounds. The PSWQ-A has demonstrated good psychometric properties (Crittendon & Hopko, 2006; Hopko et al., 2003), and the Spanish version used in the present study (Nuevo, Montorio, & Ruiz, 2002) has demonstrated measurement invariance in a comparison between American and Spanish samples of older adults (Nuevo, Mackintosh, Gatz, Montorio, & Wetherell, 2007).

Knowledge about aging was assessed with a Spanish version of the Facts about Aging Quiz (FAQ; Palmore, 1977). The original FAQ includes 25 true/false items that measure knowledge of facts about biological [e.g. 'the five senses (sight, hearing, taste, touch, and smell) all tend to weaken in old age'], psychological (e.g. 'the majority of old people feel miserable most of the time') and social (e.g. 'at least one-tenth of the aged are living in long-term care institutions, such as nursing homes, mental hospitals, homes for the aged, etc.') aspects of aging. For the Spanish version used here (Nuevo et al., 2006) the original 25 items were reduced to 16. Table 1 presents the correct response and the percentage of correct answers from the study sample.

Intolerance of uncertainty was measured with a brief version of the Intolerance of Uncertainty Scale (IUS), which comprises six items taken from the first factor obtained in the analyses for developing the scale (Freeston, Rhéaume, Letarte, Dugas, & Ladouceur, 1994). The 27-item IUS was designed to assess the degree to which a person has difficulty tolerating uncertainty, and the first factor consists of items representing the idea that uncertainty is unacceptable and should be avoided (e.g. 'I can't stand being taken by surprise'). The IUS has demonstrated excellent internal consistency (Buhr & Dugas, 2002; Freeston et al., 1994) and adequate test–retest reliability (Buhr & Dugas, 2002; Dugas, Freeston, & Ladouceur, 1997), as well as good convergent and discriminant validity for GAD (Buhr & Dugas, 2002; Freeston et al., 1994; Dugas et al., 1998), and it appears sensitive to clinical change subsequent to cognitive-behavioural therapy (Ladouceur et al.,

2000). The shortened Spanish version used here (Nuevo, Montorio, & Márquez, 2004) has also demonstrated good psychometric properties in preliminary analyses with Spanish older adults (Nuevo et al., 2004).

Procedure

Persons involved in leisure activities in four public community centers for older adults in Madrid, Spain were asked to complete study measures under the supervision of an experimenter. Items were written in large font and instructions and sample questions were included at the beginning of every page to compensate for visual impairment and lack of familiarity with self-report questionnaires. No additional explanations of the contents of the items were provided. Information about the study was provided orally by the investigator and verbal consent was obtained from each participant. The potential presence of cognitive impairment, visual deficits or difficulty reading was evaluated by observation during the completion of the initial demographic questionnaire. No participants appeared to have difficulty completing the questionnaires and adequate time was provided to do so.

Statistical analyses

All analyses were performed using SPSS release 14.0 and AMOS release 6.0. First, tests of normality, linearity, heterocedasticity and multicollinearity were performed. Second, we performed descriptive and correlational analyses for the variables included in the study. Next, a mediation model was tested to determine whether intolerance of uncertainty accounted for the relationship between knowledge about aging and worry (Baron & Kenny, 1986; Preacher & Hayes, 2004). Additionally, an extension of the Baron and Kenny procedure appropriate for low power scenarios, the Sobel test, was then performed, together with a bootstrapping procedure for generating a confidence interval. Finally, we compared several structural equation models to a baseline model that included the effects of education level on knowledge about aging, the relationship between knowledge about aging and worry, the relationship between knowledge about aging and intolerance of uncertainty, and the relationship between intolerance of uncertainty and worry. Age was not included in the model because it was not significantly associated with any of the other variables under investigation and paths from age to other variables were not significant. This baseline model (A) was compared with two alternatives: (B) a model including only the paths from knowledge about aging to intolerance of uncertainty and from intolerance of uncertainty to worry, without the direct path between knowledge about aging and worry; and (C) a model with the paths linking intolerance of uncertainty and knowledge about aging to worry, but without the path from knowledge about aging to intolerance of uncertainty. Since these models are nested, the change in model fit can be assessed by computing the difference between the respective chisquare statistics. Finally, intolerance of uncertainty could act as a moderator between knowledge about aging and worry; that is, knowledge about aging could help to reduce worry more strongly among those who are more tolerant of uncertainty. Thus, we tested a model keeping the direct paths from knowledge about aging and intolerance of uncertainty to worry and including an interaction effect between intolerance of uncertainty and knowledge about aging.

Results

Distribution of the sample

The assumption of multivariate normality which underlies the use of statistical modeling was assessed using Mardia's coefficient of multivariate kurtosis (Mardia, 1970). The analysis revealed that the data did not violate the multivariate normality assumption (multivariate kurtosis normalized estimate = 1.63; CR = 1.29); univariate kurtosis values ranged from −0.159 to −0.771 (mean = 0.46,SD = 0.31), and univariate skewness values ranged from −0.078 to 0.723 (mean = 0.39; SD = 0.34). The presence of potential outliers was tested according to Mahalanobis distance to the centroid with a probability under the $p < 0.001$ threshold (Tabachnick & Fidell, 1996). According to that criterion, no case was considered an outlier.

Descriptive and correlational analyses

Means and standard deviations of all variables and their intercorrelations are presented in Table 2. Correlations among the main variables were statistically significant and in the expected direction (i.e. a negative relationship between FAQ and PSWQ-A scores and a positive relationship between IUS and PSWQ-A). Education level had a low but statistically significant positive correlation with FAQ score ($p = 0.039$), whereas it had negative but not significant correlations with the PSWQ-A and IUS.

Mediational analysis

A mediational analysis was performed to test the indirect effect of knowledge about aging on worry as mediated by intolerance of uncertainty. According to Baron and Kenny (1986), perfect or complete mediation is said to have occurred when the effect of an independent variable (in the present study, knowledge about aging) on a dependent variable (worry) decreases to zero with the inclusion of the mediator (intolerance of uncertainty). In this sample, the direct effect of knowledge about aging on worry was negative and significant (i.e. greater knowledge about aging was related to lower worry severity; B = −1.248; SE = 0.221; $p < 0.0001$), the effect of knowledge about aging on intolerance of uncertainty was also negative and significant (B = −0.642; SE = 0.126; $p < 0.0001$), the effect of intolerance of uncertainty on worry was positive and significant (B = 1.225, SE = 0.116; $p < 0.0001$), but the effect of knowledge about aging on worry after controlling for intolerance of uncertainty remained statistically different from zero (B = −0.461, SE = 0.175; p = 0.0096). Therefore, Baron and Kenny criteria were not fulfilled and complete mediation could not be established.

However, as discussed by Preacher and Hayes (2004), the Baron and Kenny method presents several problems, particularly low statistical power, and alternative methods provide a better test of the mediational hypothesis by analyzing the significance of the indirect effect between knowledge about aging and worry. In the present study, the Sobel test indicated that the indirect effect of knowledge about aging on worry, through intolerance of uncertainty, was −0.7867 (95% CI = −1.12/0.45; $p < 0.0001$). Additionally, we bootstrapped (5000 bootstrap samples) the sampling distribution to derive a confidence interval that makes no assumptions about normality and reduces the potential problems

related to power (Efron & Tibshirani, 1993). Results pointed to a significant indirect effect (mean = −0.7854; 99% CI = −1.256/−0.378, $p < 0.0001$).

Path analysis

To examine the pattern of associations among the variables, path analysis using the robust maximum likelihood method was employed to test the fit of different models. As indicated above, a baseline model was established according with *a priori* assumptions involving the effects of age and education level on knowledge about aging, the direct paths from knowledge about aging to intolerance of uncertainty and worry, and the path intolerance of uncertainty to worry. This model demonstrated good fit indices (e.g. Minimum sample discrepancy/degrees of freedom (CMIN/DF) = 1.119; GFI = 0.985), but standardized solutions revealed that the specified paths between age and knowledge about aging, as well as the correlation between age and education, were very weak (−0.01 and −0.15 respectively) and not significant. Therefore age was dropped to improve the parsimony of the model. This new model (without age) was considered the baseline model for further analyses. This baseline model demonstrated an excellent fit to the data, (e.g. CMIN/DF = 0.562; GFI = 0.995), including a not significant ($p = 0.570$) chi-square of 1.123 with two degrees of freedom. *Z*-test scores revealed that all paths were significant and in the expected direction, and there were no sources of misspecification. The squared multiple correlation (R^2) for worry was 0.599. As shown in Table 3, the Akaike Information Criteria (AIC) indicated a marked improvement in the model in relation to the *a priori* model (from 26.48 to 17.12). This baseline model is represented in Figure 1 with the standardized regression weights.

Model B (removing the direct effect of knowledge about aging on worry) produced a significant increase in the chi-square [$\chi^2(1) = 6.870$; $p = 0.0087$], indicating a significant worsening of model fit. Likewise, the model C (removing the direct effect of knowledge about aging on intolerance of uncertainty) produced a significant increase in chi-square [$\chi^2(1) = 4.711$; $p < 0.0001$]. The fit indices and regression weights for each model are presented in Table 3.

The moderation model indicated a marked worsening of the fit: (CMIN/DF = 57.4; GFI = 0.713). Furthermore, the regression weight of the interaction between knowledge about aging and intolerance of uncertainty was extremely low and not significant ($B = 0.002$; $p = 0.831$).

Discussion

The primary objective of the study was to test the relationship between knowledge about aging and worry severity in older adults, and specifically to test the mediational role of intolerance of uncertainty. Thus, results of the study provide additional support for the role of knowledge about aging in worry severity in the elderly, showing both direct and indirect effects through intolerance of uncertainty. According to the hypothesized model, lack of knowledge about aging may lead to worry both directly and by evoking uncertainty about the aging process. The excellent fit found for the model tested in the path analysis provides preliminary support for these relationships and suggests one way in which the development

and maintenance of chronic worry in the elderly may differ from these processes in younger adults.

These results further suggest the possibility that lower levels of worry in older people may be the result of better knowledge about the aging process, which may lead to greater acceptance of the uncertainties associated with late-life changes. Older adults who hold negative stereotypes about aging may perceive increased threat from the aging process, which increases intolerance of uncertainty and perceived aversiveness of negative events, even those that are extremely unlikely (Dugas et al., 2004).

Although other models could have been tested and mathematically equivalent models could have been interpreted (for instance, knowledge about aging mediating the effect of intolerance of uncertainty on worry), the analyses performed in this study relied on empirical findings and theoretical statements about the stability of knowledge and stereotypes about aging across the lifespan and its increasing relevance to emotional state with aging (e.g. Levy, 2003; Levy et al., 2002). The model was also grounded in the idea that intolerance of uncertainty can be modified by manipulations in the information provided about the probability of various outcomes (Ladouceur et al., 2000). Knowledge about aging could potentially modify the level of intolerance of uncertainty by changing information about the probability of occurrence of relevant events.

Limitations of this study include its cross-sectional nature, which precludes a determination of causality. Second, the shortened version of the FAQ used here has not been specifically validated; although items were selected based on performance in a previous study (Nuevo et al., 2006), the psychometric properties of the composite measure have not been evaluated. Third, in order to determine generalizability, it may be necessary to take cross-cultural differences in stereotypes about aging into account. There is some evidence of comparability of characteristics of worry in the elderly between US and Spanish samples (e.g. Montorio et al., 2003; Nuevo et al., 2007), and the Spanish FAQ was developed with the goal of cultural neutrality (Villar & Triadó, 2000). This has not, however, been formally tested, and cross-cultural comparisons of the models tested here should be performed in the future.

Furthermore, the study examined general intolerance of uncertainty and worry, rather than uncertainty or worry about aging specifically. Finally, the sample was community-based rather than clinical. The last factor would be likely to weaken the results of the study by yielding a restricted range of scores on pathological worry. The fact that findings were significant in spite of these limitations supports the robustness of the model. Moreover, the model retained its excellent fit even with the inclusion of education level, suggesting that knowledge about aging was not simply a proxy for knowledge in general.

This work provides some of the first empirical evidence for the way in which information about aging could affect the presentation of worry in older adults. Further research is obviously needed, but the present work raises the possibility that knowledge about aging could play a significant role in reducing intolerance of uncertainty in later life, with a resulting beneficial effect on worry.

The findings presented here have several potential clinical implications. First, as in younger adults, intolerance of uncertainty appears to play an important role in pathological worry in older adults, supporting additional focus on this construct in research and treatment of late-life worry and generalized anxiety. Second, increasing knowledge about aging in older individuals may reduce worry and also intolerance of uncertainty, a factor that appears to increase vulnerability to worry. An intervention to increase knowledge about aging would likely be less expensive and intensive than existing, more elaborate psychotherapeutic interventions.

Acknowledgments

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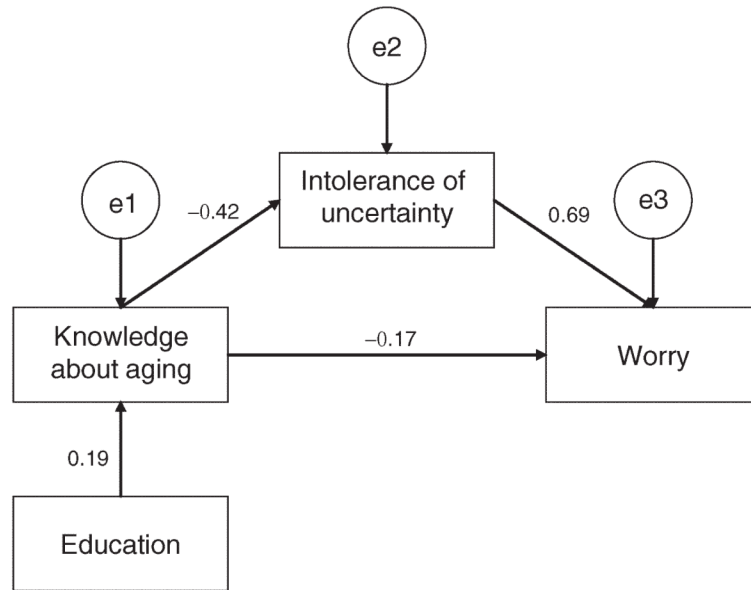
Figure 1.
Representation of the final model (standardized weights).

Table 1

Facts about Aging Questionnaire items and percentage of correct answers in the sample.

FAQ items	Correct response	Percentage correct
The majority of old people are senile	F	29.5
All five senses tend to decline in old age	T	3.9
Most old people have no interest in, or capacity for, sexual relations	F	49.2
The majority of old people feel miserable most of the time	F	38.1
At least one-tenth of the aged are living in long-stay institutions (i.e. nursing homes, mental hospitals, homes for the aged, etc.)	F	66.9
Aged drivers have fewer accidents per person than drivers under age 65	T	23.0
More than 75% of the aged are healthy enough to carry out their normal activities	T	29.5
Old people usually take longer to learn something new	T	5.5
It is almost impossible for most old people to learn new things	F	18.0
The reaction time of most old people tends to be slower than the reaction time of younger people	T	4.7
In general, most old people are pretty much alike	F	46.2
The majority of old people are socially isolated and lonely	F	40.3
Older workers have fewer accidents than younger workers	T	24.2
The majority of older people have incomes below the poverty level	F	37.0
Older people tend to become more religious as they age	F	63.8
The majority of old people are seldom irritated or angry	T	39.8

FAQ, Facts about Aging Questionnaire; T=true; F=false.

Table 2

Correlations among study measures and sociodemographic variables.

Variables	PSWQ-A	IUS	FAQ	Education	Age
1. Worry (PSWQ-A)	-				
2. Intolerance of uncertainty (IUS)	0.758[**]	-			
3. Knowledge about aging (FAQ)	−0.461[**]	−0.424[**]	-		
4. Education level	−0.168	−0.155	0.189[*]	-	
5. Age	−0.109	−0.041	−0.041	−0.153	-
Mean	18.9	6.0	11.1	2.4	71.0
SD	7.2	4.0	2.7	0.8	6.3

[*]
$p<0.05$;

[**]
$p<0.001$.

Table 3

Regression weights (unstandardized) and fit indices for the models.

Path	Model A (baseline)			Model B			Model C		
	Estimate	SE	CR	Estimate	SE	CR	Estimate	SE	CR
Education to Knowledge about aging	0.664	0.32	2.1[*]	0.664	0.32	2.1[*]	0.664	0.32	2.1[*]
Knowledge about aging to Intolerance of uncertainty	−0.642	0.13	−5.1[**]	−0.642	0.13	−5.1[**]	-	-	-
Knowledge about aging to Worry	−0.461	0.17	−2.7[**]	-	-	-	−0.461	0.15	−2.9[**]
Intolerance of uncertainty to Worry	1.2	0.12	10.7[**]	1.4	0.11	12.7[**]	1.2	0.10	11.8[**]
χ^2		1.123			7.983			24.711	
d.f.		2			3			3	
χ^2		-			6.860			23.688	
d.f.		-			1			1	
P		-			0.0088			0.0000	
CFI (Comparative Fit Index)		1.000			.962			0.835	
GFI		0.995			0.969			0.914	
AGFI (Adjusted Goodness of Fit Index)		0.977			0.896			0.714	
RMSEA (Root Mean Square Error of Approximation)		0.000			0.118			0.247	
AIC (Akaike's Information Criteria)		17.12			21.98			38.71	

[*]
p<0.05;

[**]
p<0.01.