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Factor structure of the de Jong Gierveld loneliness scale in Spanish elderly adults

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Título: Estructura factorial de la escala de soledad de de Jong Gierveld en personas mayores españolas.
Resumen: La soledad es un importante componente en la medición del bienestar subjetivo de las personas mayores. El instrumento más influyente en Europa es la escala de soledad de 11 ítems de De Jong Gierveld (DJGLS; de Jong Gierveld y Kamphuis, 1985). El objetivo de esta investigación era examinar la estructura interna de la versión española de la DJGLS. La muestra estaba compuesta por 328 personas mayores (*M* = 75.53, Rango = 60-99 años) no institucionalizadas. Los análisis factoriales mostraron que la escala era esencialmente unidimensional (*RMR* = .088, *AGFI* = .97). La fiabilidad fue de .91. No se encontraron razones sustantivas ni estadísticas para considerar la existencia de un segundo factor. Nuestros resultados revelaron algunos problemas de los ítems para medir los aspectos sociales y emocionales de la soledad como factores distintos. Se resalta la necesidad de mejorar la escala y de tener en cuenta las diferencias entre las culturas colectivistas e individualistas en el uso de los instrumentos que miden el bienestar.
Palabras clave: Soledad; personas mayores; validez; análisis factorial; colectivismo-individualismo.

Abstract: Loneliness is an important component in the measurement of subjective well-being of elderly adults. The most influential instrument in Europe is the 11-item de Jong Gierveld loneliness scale (DJGLS; de Jong Gierveld and Kamphuis, 1985). The aim of this study was to examine, throughout factorial techniques, the internal structure the Spanish version of the DJGLS. Data were gathered from 328 community-dwelling elderly adults (*M* = 75.53, Range: 60-99 years). The factor analysis techniques revealed that the scale was essentially unidimensional (*RMR* = .088, *AGFI* = .970, *NFI* = .966). Reliability was .91. Neither substantive nor statistical reasons were found to consider the existence of a second factor. Our findings also revealed some psychometric problems in the measurement of the social and emotional aspects of loneliness. Emphasis is placed on the need to improve the scale and bear in mind the differences between collectivist and individualist cultures in the use of scales measuring well-being.
Key words: Loneliness; elderly adults, validity; factorial analysis; collectivism-individualism.

Introduction

Loneliness is a subjective experience that is both unpleasant and emotionally distressing and one that everybody tries to avoid (Rokach, 2012). From the perspective of psychology and other related disciplines loneliness has been considered a fundamental component of the quality of life and well-being in elderly adults (Dykstra, 2009; Cattan, White, Bond, & Learnouth, 2005). European studies estimate that nearly 40% of people older than 65 experience some degree of loneliness (Dykstra, 2009). In Spain, loneliness is the main fear in old age after illness (IMSERSO, 2008).

Currently there is generalized consensus regarding loneliness as a negative subjective experience resulting from: (a) the discrepancy between the quantity and quality of existing relations, and (b) the standards concerning interpersonal relationships (Peplau & Perlman, 1982). The concept of *discrepancy* and the evaluative component allow loneliness to be differentiated from social isolation and allow the explanation of different experiences of loneliness in objectively equal situations. In this experience, two components described by Weiss (1973) can be distinguished: *social loneliness* and *emotional loneliness*. The former refers to the perception of a lack of a broader, engaging social network (e.g., siblings, friends or neighbours). It tends to be linked to social and situational factors, such that it is more frequent in elderly adults without children or friends and with little contact with their social network members (van Tilburg, Havens, & de Jong Gierveld, 2004). The second is defined as an experience characterized by intense feelings of emptiness, abandonment or desolation due to the lack of a romantic partner or close relationships. In Spain, this type of loneliness is more frequent among women, people who have been widowed, and those with chronic diseases (Ayala et al., 2012; Prieto-Flores, Forjaz, Fernández-Mayoralas, Rojo-Pérez, & Martínez-Martín, 2011).

The differentiation of the types of loneliness is important from the point of view of intervention: while social loneliness can be palliated by means of social integration strategies (Masi, Chen, Hawkley, & Cacioppo, 2011), emotional loneliness is more refractory to change and may require clinical intervention (Ayalon, Shiovitz-Ezra, & Yuval, 2012).

Far from being a simple phenomenon, the experience of loneliness is the result of a complex interaction among personal, social, health and cultural factors (Pinquart & Sorensen, 2001). Although from the perspective of personality it has mainly been considered a *state*, different authors consider that it is more of a *trait*, with heritability values close to 50% (Boomsma, Cacioppo, Muthén, Asparouhov, & Clark, 2007). At social level, among the changes occurring in the last stages of the lifespan that are associated with loneliness are the loss of members of the close social network (Dykstra, 2009), the loss of roles (Prieto-Florez et al., 2011), the "empty nest" syndrome (Liu & Guo, 2007) and decreases in income (de Jong Gierveld & Hagestad, 2006). Regarding physical health, its relationship with loneliness is bidirectional. On one hand, health problems that limit mobility are risk factors for experiencing loneliness (Heylen, 2010; Ayala et al., 2012), and on the other, loneliness has negative effects on the neuroendocrine, immune and cardiovascular systems. Loneliness has been associated with a poorer quality of sleep, high blood pressure and chronic fatigue, and with a greater

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risk of morbidity and mortality, even after controlling for the effect of other sociodemographic and health variables (Momtaz et al., 2012; Hawkley, Preacher, & Cacioppo, 2010; Tilvis, Laitala, Routasalo, & Pitkälä, 2011).

Most authors have studied loneliness in the context of subjective well-being and quality of life. Different lines of evidence have shown a strong relationship between loneliness and suicidal ideation (Cukrowicz, Cheavens, van Orden, Ragain, & Cook, 2011), depression (Vanhalst, Luyckx, Raes, & Goossens, 2012) and anxiety (Long and Martin, 2000). It has also been negatively correlated to satisfaction with life, even when the effect of age has been taken into account (Demakakos, Nunn, & Nazroo, 2010).

Specifically, loneliness has proved to be one of the best predictors of satisfaction with life when children leave the home or when loved ones are lost (Liu & Guo, 2008; Sun, Waldron, Gitelson, & Ho, 2012). The reason is that social aspects represent important domains of satisfaction with life (Diener, Emmons, Larsen, & Griffin, 1985; Goodwin, Cook, & Yung, 2001). This includes the assessment of interpersonal relationships, bearing in mind the cultural standards under which they occur (Pavot & Diener, 2008).

The measurement of loneliness and cultural factors

For decades, measuring loneliness has been a challenge for researchers. However, the number of instruments developed to accomplish this continues to be relatively low. In the United States the use of the UCLA loneliness scale (Russell, 1996) has predominated. In Europe, the most used instrument is the 11-item de Jong Gierveld loneliness scale (DJGLS; de Jong Gierveld & Kamphuis, 1985). Currently, the DJGLS is spreading to Eastern and Asian countries (de Jong Gierveld & van Tilburg, 2010; Leung; de Jong Gierveld & Lam, 2008) and it has been adopted as the instrument of choice in epidemiological studies in Australia, Russia, Bulgaria and Japan (de Jong Gierveld & van Tilburg, 2010; Sansoni, Marosszeky, Sansoni, & Fleming, 2010).

Developed from the cognitive model (Peplau & Perlman, 1982), the scale considers *social deprivation* as the most essential component of loneliness (de Jong Gierveld & Kamphuis, 1985). This concept refers to the nature and intensity of the deficits perceived in social relations. The DJGLS was elaborated from 28 items grouped in five content categories related to social deprivation and attachment. Five of the items, formulated positively, ask about the availability of emotionally close people (e.g., "There is always someone I can talk to about my day-to-day problems.") Another six items, formulated negatively, ask about the emotions experienced due to the absence of close relationships (e.g., "I experience a general sense of emptiness.")

It should be recalled that the experience of loneliness is strongly related to the cultural context in which it arises (de Jong Gierveld & van Tilburg, 2010; Rokach, 2007). Some related components, such as "emotional closeness" or "friendship", are learned culturally and affect the experience of emotions (Adams, Anderson, & Adonu, 2004). Cultural factors could partly explain the differences in the levels of loneliness observed between Northern (more individualist) and Southern (more collectivist) European countries (Fokkema, de Jong Gierveld, & Dykstra, 2012; Sánchez, de Jong Gierveld, & Buz, 2012; Sundström, Fransson, Malmberg, & Davey, 2009). Spain is the second most collectivist country in Europe and The Netherlands is the most individualist (Suh, Diener, Oishi, & Triandis, 1998). According to Hofstede´s rankings (see www.geert-hofstede.com) The Netherlands is much more individualistic than Spain (ranks = 80 and 51, respectively). Unlike individualist cultures, collectivist cultures are characterized by a strong orientation towards the family and a strong commitment to the norms of social interaction (Rokach, 2012). For example, confirming the proposals of Adams et al. (2004) concerning the degree of intimacy and closeness of each culture, higher levels of loneliness have been reported for Spain than for The Netherlands (Sánchez et al., 2012). These differences should be guaranteed by examining the psychometric properties of the instruments used, especially when the data come from such different cultures.

The unidimensionality vs. the bidimensionality of the DJGLS

The internal structure of the DJGLS currently remains under debate (Grygiel, Hummenny, Rebisz, Switaj, & Sikorskay, 2012; Shiovitz-Ezra & Ayalon, 2012). Although it was created as a Rasch-type scale, the results concerning its unidimensionality have been ambiguous since its construction because "some plots appeared to indicate on underlying dimension, whereas others indicated two underlying dimensions" (de Jong Gierveld & Kamphuis, 1985, p. 295). The existence of a second dimension was attributed to a methodological artifact, due to the positively and negatively worded items, since "there were no theoretical grounds for bidimensionality" (p. 295). Additionally, the scale was developed to detect the *degree* not the *type* of loneliness, which has been frequently defended in different studies (e.g., de Jong Gierveld, van Tilburg, & Dykstra, 2006). Regarding internal structure, the authors concluded that their results should not be interpreted in terms of a test of *strict* unidimensionality but as an indicator that the items at least formed a common latent structure with only a moderate degree of homogeneity. Later, Moorer and Suurmeijer (1993) and van Tilburg and Leeuw (1991) obtained evidence of the unidimensionality of the scale, although they also suggested the existence of a second dimension. Additional studies (de Jong Gierveld & van Tilburg, 1992; van Tilburg, 1988) seeking more homogeneous subscales than the general scale demonstrated the presence of two subscales so-called *social loneliness* and *emotional loneliness*. Despite this, they defended the unidimensionality of the scale, arguing that feelings of loneliness are a heterogeneous experience with social and emotional components and

that such a structure fitted better into the theoretical framework from which it was created.

Nevertheless, since the publication of a cross-cultural research carried out by de Jong Gierveld and van Tilburg (1999) the authors have defended this unidimensionality and at the same time recommended its use as a bidimensional instrument, depending on the research question (de Jong Gierveld and van Tilburg, 2010, 2011). This *new* recommendation on the use of the scale as a unidimensional or a bidimensional instrument was reinforced after the finding of different determinants for social and emotional loneliness subescales (de Jong Gierveld & van Tilburg, 2010; Dykstra & Fokkema, 2007; van Tilburg et al., 2004). In turn, Kunts, Bogaerts and Winkel (2010), Leung et al. (2008), Zammuner (2008), van Baarsen, Smit, Snijders and Knipscheer (1999), and van Baarsen, Snijders, Smit and van Duijn (2001) found evidences of a bidimensional structure based on a greater homogeneity of the subscales as compared with the complete scale. In a study of the 11-items DJGLS in Spain, Buz and Perez-Arrechaederra (in press) found that the scale was *essentially* unidimensional, although some items showed differential item functioning. Furthermore, they deleted two items because they had high residuals. The divergences of the results when attempting to define the scale's internal structure has led to some confusion, prompting some authors to suggest that "it can be considered both a unidimensional and a bidimensional instrument" (e.g., Heylen, 2010, p. 1183) or designate it as "the bidimensional 11-item scale of de Jong Gierveld scale" (Zammuner, 2008, p. 112).

Despite its importance as a measuring instrument for epidemiological and clinical purposes, no validation studies of the 11-item DJGLS have been published with Spanish samples using CFA techniques. Accordingly, the aim of the present study was to translate, adapt and test the hypothesis of one- or two-factor solutions, and examine the reliability of the DJGLS in a non-clinical sample of Spanish elderly adults using factorial techniques. We also examined its divergent validity through its association with the Satisfaction with Life Scale (SWLS, Diener, Emmons, Larsen, & Griffin, 1985), since both concepts are related conceptually. A review of previous studies (e.g., Goodwin et al., 2001, Iecovich, 2013; Liu & Guo, 2008) led us to expect a moderate negative relationship between both scales.

Method

Participants

Table 1 shows the descriptive results of the sociodemographic and health variables of the participants. We collected data from 360 community-dwelling elderly adults, who were participating in a larger study addressing the image and social participation of elderly people. A quota sampling was used with stratifications according to age (60-74; 75+) and gender. Thus, to achieve a balanced distribution of gender within age groups, it was necessary for us to oversample older men. We discarded the data of the participants who did not complete the DJGLS and the SWL (8.88% of missings). The final sample included 328 participants (M = 75.53, DT = 9.49, range = 60-99). Of these, 54.9% were women and the most frequent marital status was "married" (46.3%). Nearly 80% had children (M = 2.54, DT = 2.16) and lived at home with their partner but without their children (37.2%). The highest level of education reached by most participants was primary school (61%). The assessment given by the participants concerning their health was *good* or *very good* in 58.6% of cases.

According to data from IMSERSO (2008) the participant's characteristics were comparable with the profile of the general Spanish elderly population.

Table 1. Descriptive statistics of the sample (N = 328).

Variables	%	*Mean*	*SD*	Range
Age[a]		75.53	9.48	60-99
Gender				
Male	45.1			
Female	54.9			
Marital status				
Married	46.3			
Widowed	41.2			
Divorced	3			
Never married	9.5			
Number of children		2.54	2.16	0-13
Living arrangements				
Living with spouse	37.7			
Living with spouse and children	15.2			
Father/mother with children	9.8			
Living alone	27.7			
Other situations	10.1			
Educational level				
Illiterate	0.9			
No formal education	12.2			
Primary school	61.8			
Secondary school	18.6			
University studies	6.1			
Others	0.6			
Self-rated health				
Very good	9.5			
Good	49.1			
Fair	29.9			
Poor	9.8			
Very poor	1.8			

Note. [a]n = 320 due to missing values.

Instruments

We applied the 11-item *DJGLS* (de Jong Gierveld & Kamphuis, 1985). As recommended by the original authors, none of the items referred directly lo loneliness and the word loneliness was not used in the set of items. These items had three response categories (3 = *yes*, 2 = *more or less*, 1 = *No*). The final score ranged between 0 ("no loneliness") and 11 ("extreme loneliness"). The manual of the scale indicates that the three response categories must be dichotomized. *More or less* is not considered to be a neutral response. Thus, if the response *more or less* or *yes* is given to a negatively worded

item a scale point is assigned to the emotional loneliness score. The same rule is applied if the response *more or less* or *no* is given to a positively worded item. The loneliness total score is based on the sum of emotional and social loneliness scores (ranges from 0 "no loneliness" to 11 "extreme loneliness").

The scale was first translated from Dutch into Spanish (forward translation) by a bilingual and bicultural translator, and later translated back into Spanish by an independent bilingual person. Owing to the expected difficulties in finding the connotative meaning and nuances of some items, the English version of the scale was taken into account by the research team in order to discuss the translations. Consensus was reached through discussion. After this process, several items were found to be ambiguous or imprecise, and the Spanish translation was reworded. For example, in item 6 "Ik vind mijn kring van kennissen te beperkt" the Spanish literal translation of *kennissen* is *conocidos* (acquaintances), although in Spain the term *acquaintances* is not used to refer to the same sort of people as in The Netherlands. Unlike Spanish, in Dutch *kennissen* is used to refer to people with whom there is some degree of friendship. We thus avoided including in the same item, -as in the English version ("I feel my circle of *friends* and *acquaintances* is too limited")-, people as different as friends and acquaintances, owing to the problems that this poses regarding validity. In item 10 "Vaak voel ik me in de steek gelaten" (in English "I often feel rejected") we translated *gelaten* as *abandonado* (abandoned) instead of *rechazado* (rejected), since this better fits the original meaning of the item. Five elderly adults with different educational levels examined the final version in order to determine any difficulty that might have arisen in the formulation of the items. The total score of loneliness obtained with our sample (M = 3.55) was similar to that reported in a cross-cultural study with the same instrument (M =3.24) (Sánchez et al., 2012).

We also evaluated another component of subjective well-being with the Satisfaction with Life Scale (SWLS; Diener et al., 1985). This scale comprises five items that assess the participant's satisfaction with life as whole ("In most ways, my life is close to my ideal", "The conditions of my life are excellent", "I am satisfied with my life", "So far I have gotten the important things I want in life", "If I could live over I would change almost nothing"). We used the translation into Spanish done by two bilingual Spanish-English translators. Respondents indicated the extent to which they agreed with each item on a five-point Likert scale ranging from 1 = *strongly disagree,* to 5 = *strongly agree.* Owing to the ordinal nature and asymmetry of the items we estimated the reliability from the polychoric correlations matrix (Zumbo, Gaderman, & Zeiser, 2007) using FACTOR 8.1 (Lorenzo & Ferrando, 2006). The reliability for the scale was found to be satisfactory (alpha = .81).

Procedure

Data were gathered by contacting the participants through educational, cultural and leisure centres for elderly adults. Following the snowball sampling technique, some participants voluntarily provided the data necessary to contact new participants who did not usually attend such centres. In a second step, we contacted these potential participants by telephone or directly at their homes. Thus, 64% of the sample was recruited from community centres and the remaining 36% from their homes. All participants were informed that the study included questions about the social image of elderly adults, about their social networks, and about their subjective well-being. Prior to participation, the study was explained to participants and informed consent was obtained. Their participation was voluntary and no incentives (e.g., money) were offered in exchange. In all cases, trained interviewers collected the data without the presence of third parties. The trained interviewers were university students from the last year of the Faculty of Communication Sciences who attended a four-hour training workshop and received two academic credits.

Data analysis

We first examined the adequacy of the data, observing the distribution of scores through coefficients of asymmetry and kurtosis. The functioning of the factor analysis depends mainly on this distribution, although it is often ignored (Ferrando & Anguiano-Carrasco, 2010). As in the case of most authors (e.g., Ayala et al., 2012; van Tilburg, Havens & de Jong Gierveld, 2004, van Baarsen et al., 2001), our data showed an asymmetric and leptokurtic distribution. Violation of the multivariate normality (Mardia = 9.98, $p < .001$) and the dichotomization of the items encouraged us to make the estimations with robust methods using as input the matrix of tetrachoric correlations. If we had not done so the use of binary items would have given rise to the appearance of a non-substantive factor, which would have represented an important problem for the factor analysis (Abad, Olea, Ponsoda, & García, 2011). The tests of sample adequacy, Bartlett < .001 y *KMO* = .83, indicated that all the items were substantially related.

Table 2. Skewness and kurtosis coefficients of the 11-item de Jong Gierveld loneliness scale (de Jong Gierveld & Kamphuis, 1985).

	Skewness	Kurtosis
1-There is always someone I can talk to about my day-to-day problems. [Siempre hay alguien con quien puedo hablar de sus problemas diarios]	1.38	-0.09
2-I miss having a really close friend. [*Echo de menos tener un buen amigo/a de verdad*]	0.59	-1.45
3-I experience a general sense of emptiness. [*Siento una sensación de vacío a mi alrededor*]	1.03	-0.94
4-There are plenty of people I can lean on when I have problems. [Hay suficientes personas a las que puedo recurrir en caso de necesidad]	1.16	-0.66
5-I miss the pleasure of the company of others. [*Echo de menos la compañía de otras personas*]	0.82	-1.33
6-I find my circle of friends and acquaintances too limited. [*Pienso que mi círculo de amistades es demasiado limitado*]	0.41	-1.03
7-There are many people I can trust completely. [Tengo mucha gente en la que confiar completamente]	0.22	-1.45
8-There are enough people I feel close. [Hay suficientes personas con las que tengo una amistad muy estrecha]	0.76	-1.42
9-I miss having people around me. [*Echo de menos tener gente a mi alrededor*]	0.67	-1.55
10-I often feel rejected. [*Me siento abandonado/a a menudo*]	1.05	-0.90
11-I can call on my friends whenever I need. [Puedo contar con mis amigos/as siempre que lo necesito]	1.20	-0.57

Note: In italic, the negatively formulated items (emotional loneliness). Positively formulated items must be reversed before scoring.

Firstly, we performed a Confirmatory Factor Analysis (*CFA*) to test the hypothesis of unidimensionality against another two bidimensional models. For parameter estimation we used the unweighted least squares method (Jöreskog, 1977), also applying the *bootstrapping* technique proposed by Byrne (2001) to obtain a more precise measurement of the standard deviations. Thus, we were able to determine the common variance involved in the inter-item correlations; that is, the factor solution with the residuals closest to zero. This method is considered to be the most robust and recommendable one when, as in our case, the tetrachoric matrix was not positive definite (Abad et al., 2011). The statistical package used was the SPSS 19 with AMOS 6.0 for Windows.

Secondly, after examining the results found with the confirmatory analyses, we performed exploratory analyses (*EFA*) observing the factorial solutions of the standardized residuals in order to check how the data were grouped when no restrictions were imposed. Different studies (e.g., Leung et al., 2008; Moorer & Suurmeijer, 1993; van Tilburg et al., 2004) have shown that some items saturate in factors other than those to which they belong theoretically, or saturate with very different factor loadings. This is because the social or emotional component of those items is governed by cultural standards. To accomplish this we used FACTOR 8.1 (Lorenzo-Seva & Ferrando, 2006). For factor extraction we used the unweighted least squares method (Jöreskog, 1977) and to determine the number of factors to retain we employed the parallel analysis method (PA) based on minimum ranks (Horn, 1965) because it is probably the most accurate method (Velicer, Eaton, & Fava, 2000). However, it is recommended to complement it with others, such as analysis of residuals, especially when there is a high risk that the presence of a large first factor that might hide secondary but relevant factors (Hayton, Allen, & Scarpello, 2004).

Results

In the confirmatory phase we tested three models: (a) a unidimensional model that tests the hypothesis that loneliness is a heterogeneous construct composed of different types of subjective experiences of social interaction (de Jong Gierveld & Kamphuis, 1985; Moorer & Suurmeijer, 1993; van Tilburg, 1988); (b) an oblique model that considers that social and emotional loneliness are related theoretically and empirically (Dykstra & Fokkema, 2007; Leung et al., 2008, van Baarsen et al., 1999; van Baarsen et al., 2001), and (c) an orthogonal model that considers the existence of two unrelated types of loneliness (Kunts et al., 2010; Zammuner, 2008). To determine which model best fitted the data, we examined the goodness of fit indices available in AMOS for tetrachoric correlations: *RMR* ≤ .08 (Hu & Bentler, 1998), *GFI* and *AGFI* ≥ .90 (Hoyle & Panter, 1995), *NFI* ≥ 0.95 (Bentler, 1990) and *PNFI* ≥ .90 (James, Mulaik, & Brett, 1982).

Table 3 shows the fitting indices of the models tested. The indicators of absolute fit showed that the unidimensional model fitted suitably, since *GFI* and *AGFI* and *RMR* had optimum values. Additionally, the relative fit index, *NFI*, and the parsimonious fit index, *PNFI* showed that this model was better than an alternative independence model such that its fit could be considered good and that it approached the marginal level of a parsimonious model. Regarding the oblique model, some indices showed a slightly better fitting than the unidimensional model. The relationship between

the social and emotional factors proved to be fairly high (r = .87). When examining the orthogonal model we found a very poor fitting that led us to reject this factor solution as a plausible alternative to the other models.

Finally, although the oblique model showed a better goodness of fit than the unidimensional model, and considering, among others, the principle of parsimony, the results did not provide sufficient evidence to be able to reject the hypothesis of unidimensionality.

Table 3. Results of the three models tested in the confirmatory factor analyses.

Model	*RMR*	*GFI*	*AGFI*	NFI	*PNFI*
Unidimensional	.088	.975	.963	.966	.773
Two factors correlated	.082	.978	.967	.971	.759
Two factors uncorrelated	.333	.643	.464	.513	.410

In order to obtain more evidences about the factor structure, and following the recommendations of Ferrando & Angiano-Carrasco (2010), we explored the underlying structure by imposing a minimum degree of constraint on the data. The factor loadings of the rotated models (see Table 4) suggested the existence of a second factor formed by two or four items, depending on the type of rotation (orthogonal or oblique) that accounted for only 11% of the variance, as compared with approximately 56% of the first factor. The correlation between both factors was low (r = .27). In these bifactorial solutions, the size of the residuals was higher and their distributions were more asymmetric than in the unidimensional solution. Moreover, the consideration of factors composed by so few items causes inconsistent results (Costello & Osborne, 2005). Neither did we find substantial reasons for considering the existence of a second factor, since these few items did not suggest the existence of a specific common content. Also, the factor structures observed after the rotations were not very clear either, since we found several item cross-loadings.

Table 4. Standardized factor loadings of the residuals in the exploratory factor analyses.

Factor/items	Unidimensional model	Oblique model		Orthogonal model	
	F 1	F 1	F 2	F 1	F 2
Social loneliness					
Item 1	**.72**	**.62**	.23	.38	**.62**
Item 4	**.70**	**.49**	.39	**.50**	.49
Item 7	**.63**	.36	**.48**	**.56**	.37
Item 8	**.55**	-.01	**.89**	**.99**	.04
Item 11	**.77**	**.57**	.38	.51	**.57**
Emotional loneliness					
Item 2	**.75**	**.70**	.16	.32	**.69**
Item 3	**.73**	**.67**	.18	.33	**.66**
Item 5	**.65**	**.64**	.09	.24	**.63**
Item 6	**.60**	**.40**	.36	**.45**	.41
Item 9	**.72**	**.81**	-.02	.16	**.79**
Item 10	**.75**	**.75**	.10	.27	**.74**
Reliability	.91	.87	.89	.86	.89

Note: In bold, factor loadings > .40.

Finally, regarding divergent validity we found a significant correlation, as expected, between loneliness and satisfaction with life r = -.39 (p < .001). As in previous studies, our results suggest that loneliness in elderly adults is negatively related to their satisfaction with life insofar that this seems to take into account the quantitative and qualitative aspects of interpersonal relations with different members of the social network (Pavot & Diener, 2008; Suh et al., 2012).

Discussion

The aim of the present study was to examine the internal structure of the Spanish adaptation of the DJGLS by means of confirmatory and exploratory factor analyses. With the former we tested the goodness of fit of the three models most frequently reported in previous studies. With the latter we attempted to better understand the internal structure of the scale when no restrictions were applied to data.

A priori, the confirmatory analyses revealed that oblique model showed a better fit than did a model hypothesizing a unidimensional structure. Nevertheless, considering our cut-off values, only some fit indices were better than those of a more parsimonious model with a good model fit. This relative superiority of the oblique model with respect to the unidimensional one is normal, since the increase in the number of factors tends to produce improvements in fitting and may even lead to overfactoring if there are no substantive criteria (Abad et al., 2011). Additionally, when the constraints imposed on the data were minimum (*EFA*) the residuals were higher and more poorly distributed than those of the unidimensional model. Also, examination of the factor loadings of the standardized residuals in this stage revealed that the second factor was formed by a very low number of items.

Unlike previous studies (e.g., de Jong Gierveld & van Tilburg, 1992; van Tilburg, 1988; Zammuner, 2008), our exploratory analyses did not reveal the recurrent bifactorial oblique structure formed by the items formulated positively, on one hand, and those formulated negatively, on the other, which should correspond to social and emotional loneliness respectively. Different authors (e.g., Moorer & Suurmeijer, 1993; van Baarsen et al., 2001) have already alerted to the difficulties seen for some items to be considered pure markers of social or emotional loneliness (e.g., "Is there always someone around who you can talk to about your daily problems?"). Similarly, van Tilburg et al., (2004) recognized the possibility that negative items might measure social and emotional loneliness and that positive ones would only measure social loneliness. Grygiel et al. (2012) also found the best fit for a bifactor model, which indicated that all items were related to a general feeling of loneliness. The correlation between the social and emotional factors was .77. The authors concluded that the 11-item DJGLS measured, primarily and overall, general loneliness. Here it is important to recall that the scale was not created to assess types of loneliness but to measure a latent continuum of social deprivation whose highest level reflects extreme loneliness.

At this point of convergence between our findings and those of Pawel et al. (2012) we cannot justify the use of the scale as a bidimensional instrument. It is even less plausible to consider that the scale is unidimensional and bidimensional at the same time. Undoubtedly, the fact that the items of emotional loneliness coincide with the positive items (reverse worded items) and those of social loneliness with the negative ones (non-reverse worded items) represents an added problem in elucidating the structure of the scale. The use of positive and negative items to prevent *acquiescence* involves problems of internal consistency, of factor structure, and of differential item functioning (DIF) associated with the skills or characteristics of the participants (Brown, 2003, van Baarsen et al., 2001). In our opinion, the use of non-reverse-worded items (or only reverse-worded items), even though implying a response bias due to acquiescence, would pose fewer difficulties and doubts about the internal structure of the scale. Another potential problems is that some items contain adjectives and adverbs (e.g., always, too much, sufficient, etc), whose suitability for measuring the construct is questionable. For example, the response *No* to the item "Are there *many* people you can trust completely?" does not necessarily indicate loneliness; having two intimate friends may suffice to avoid feelings of loneliness and it is clear that two are not the same as *many*. Like Moorer and Suurmeijer (1993), we believe that the response system of the scale (i.e., *Yes*, *More or Less, No)* is not suitable, above when the results are to be dichotomized later, because *more or less* is considered a positive response to loneliness, for both negative and positive items. The reason is that dichotomization leads to a loss of information about the construct (Shaw, Huffamn & Haviland, 1987) and might not represent the responses of the participant to all items in the same way as if these had originally been dichotomous. Undoubtedly, further studies are necessary from the perspectives of the item response theory (IRT) and factor techniques to explore the differential functioning of the items (DFI) and the effect of the method-bias associated with the formulation of the items in order to gain further evidence concerning the construct validity of this instrument.

At conceptual level, the distinction between social and emotional loneliness is important because it provides a better knowledge of the role of personality and of social and cultural factors in the onset and persistence of this type of negative experience. Such knowledge should facilitate the design of efficient intervention strategies fitted to the situation of each individual. Undoubtedly, having a bidimensional scale that differentiates between both types of loneliness will allow us to lend greater support to the multidimensional nature of loneliness as formulated by Weiss (1973). Nevertheless, owing to the lack of evidence in our study we believe that the DJGLS, as constructed, does not allow us to differentiate social loneliness from emotional loneliness in elderly Spanish adults. Perhaps, as stated by Cacioppo, Hughes, Waite, Hawkley, & Thisted (2006, p. 140):

> although loneliness is a multifaceted construct dating back to Weiss (1973) the evidence suggests that there is sufficient overlap in these factors that individual differences in the experience of loneliness appear to be adequately gauged by a unidimensional measurement instrument.

The negative relationship observed by us between loneliness and satisfaction with life provides further support to previous evidence that shows that the social components are important in the overall assessment that people make of their lives. For example, the quality of the support relations between older parents and adult children or among friends is one of the best predictors of satisfaction with life (Merz, Schuengel, & Schulze, 2009). In the same sense, it has also been reported that the loss of loved ones has negative effects on subjective well-being (Suh et al., 2012).

From the cultural perspective our results, at item-level analysis, suggest that the feelings of loneliness perceived by elderly Spanish adults seems to be based mainly on the emotions experienced due to the lack of emotionally close people (i.e., partners, children or best friends). Spain is a collectivist culture in which expectations concerning family support are very high (IMSERSO, 2008), such that the perception of the lack of care or of the availability of loved ones has more negative effects on loneliness than in more individualist cultures (Sánchez et al., 2012). In the latter case, the experience of loneliness is mainly based on the absence of a broad and diversified social network (de Jong Gierveld et al., 2006). Our data are consistent with national findings (IMSERSO, 2008) and those of other collectivist countries such as Russia, Bulgaria and Georgia (de Jong Gierveld & van Tilburg, 2010) showing that the feelings of abandonment and the absence of close friends represent a core element in the feelings of loneliness.

We feel that our results should be taken with a certain degree of caution. First of all, the sample addressed is not probabilistic. Moreover, although we attempted to interview elderly adults with different levels of social integration it is not possible to say categorically whether those involved in the second phase were really a *different* group from those included in the first phase. Nevertheless, some indicators suggest that it would be possible to rely on the quality of the data. Firstly, the sociodemographic profile of the sample was very similar to that of the reference population (IMSERSO, 2008). Secondly, the asymmetry in some items and the pattern of the levels of loneliness were comparable to those obtained in cross-cultural and validation studies (e.g., de Jong Gierveld & van Tilburg, 2010; van Baarsen et al., 2001). It should be noted that the face-to-face format for gathering data might have caused a decrease in the loneliness scores. Only a few studies have compared the self-administered format with that of interviews (e.g., van Tilburg & de Leeuw, 1991). Their findings have pointed out that the mean loneliness scores are equal to or slightly higher in the self-administered format, but that there are no changes in the reliability and validity of the scale (de Jong Gierveld & van Til-

burg, 2011). Our partial disagreement with respect to previous findings regarding factor structure reveals the need to continue exploring the psychometric properties of psychological instruments, especially when they are applied to cultures other than those for which they were intended. For example, as far as we know, all the translations of the scale have been done from the English version into the target language. Ours is the first to have been translated directly from the Dutch in an attempt to maximize the guarantees concerning the validity of the instrument. The evidence accumulated with recent research addressing the psychometric properties of this scale should help to obtain a better development of theories about loneliness and a better knowledge of the factors associated with it.

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