VALIDATION OF THE 6-ITEM DE JONG GIERVELD LONELINESS SCALE IN FRENCH AND IN ENGLISH

By

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Abstract

The 6-item De Jong Gierveld Loneliness Scale (DJGLS-6) has been previously validated in various languages, including Spanish and formal Chinese. However, some translations, although actively used, have yet to be validated. Although widely used, the English and French versions of this scale have not yet been validated. To validate this scale in both languages, samples were collected from French (N = 640) and English speaking (N = 767) multinational and independent samples in France, Canada, and the United States. The psychometric properties of the French (multinational) (α = .66, Item total Correlation (ITC) = .40, Inter Item Correlation (IIC) = .24, rs = .64) and English (multinational) (α = .72, ITC = .45, IIC = .28, rs = .72) translations of the DJGLS-6 were found to be acceptable at both the multinational and independent national levels. However, at the subscale level, the psychometrics of the emotional loneliness subscale were suboptimal in both languages compared to those of the social loneliness subscale. The confirmatory factor analysis (CFA) revealed a good fit according to the standardized root mean squared residual (SRMR) (=.02) and comparative fit index (CFI) (=.95) at the French multinational level. Similar results were obtained for the English multinational sample. Overall, these results indicate that the French and English translations of the DJGLS-6 are reliable and valid measures and may be used confidently, although the emotional loneliness subscale should be used with caution when considered independently.

Résumé

L'échelle *De Jong Gierveld Loneliness Scale (DJGLS-6)*, composée de 6 items, a été validé précédemment dans diverses langues, notamment l'espagnol et le chinois. Cependant, certaines traductions, bien qu'activement utilisées, doivent encore être validées. Bien que largement utilisées, les versions anglaise et française de cette échelle n'ont pas encore été validées.
Pour valider cette échelle dans les deux langues, des échantillons ont été recueillis auprès de populations francophones (N = 640) *et* anglophones (N = 767) multinationales et indépendantes en France, au Canada et aux Etats-Unis. Les propriétés psychométriques des traductions française (α = .66, ITC = 0.40, IIC = .24, rs = .64) et anglaise (α = .72, ITC = 0.45, IIC = .28, rs = .72) de l'échelle DJGLS-6 ont été jugées satisfaisantes dans l'échantillon multinational et dans les échantillons nationaux. Cependant, les résultats de la sous-échelle de solitude émotionnelle étaient non-satisfaisants dans les deux langues comparativement à la sous-échelle de solitude sociale. L'AFC a révélé un bon ajustement selon le SRMR (=.02) et le CFI (=.95) au niveau de l'échantillon multinational français et des résultats similaires ont été obtenus pour l'échantillon multinational anglais. Ces résultats indiquent que les traductions française et anglaise de la DJGLS-6 sont fiables et valides et peuvent être utilisée avec confiance, mis à part la sous-échelle de solitude émotionnelle doive être utilisée avec prudence lorsqu'elle est analysée indépendamment.

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Contribution of Authors

This thesis was written in the context of a larger CIHR-funded study designed by Drs. Alain Brunet, Manuela Ferrari, and Ph.D. student Marjolaine Rivest-Beauregard examining the psychosocial impacts of the COVID-19 pandemic. The present thesis sought to examine the psychometric properties of the French and English translations of the 6-item De Jong Gierveld Loneliness Scale to establish validity and reliability, in addition to expanding language accessibility in standardized measures. I contributed to this thesis by conducting the literature review, performing the statistical analyses, interpreting the results, and writing the thesis under the guidance of Dr. Brunet. Dr. Daniel Saumier and Marjolaine Rivest-Beauregard offered support and provided practical feedback on earlier versions of this thesis. My thesis committee approved the scope and feasibility of this project and provided practical guidance.

Introduction

Loneliness is a global experience, marked by feelings of physical aloneness, emotional despair, and social misunderstanding. A concept that has been studied since the early to mid-20th century, research has expressed that the cumulation of these sentiments of loneliness over time may lead to detriments in overall mental health and wellbeing (Caplan, 2007; Cole, 2016; Hards et al., 2022; Van Ours, 2021). But, while loneliness has historically affected many people, it was not until the onset of the COVID-19 pandemic in early 2020 and the implementation of quarantine measures (i.e., self-isolation, maintaining few necessary close contacts) that loneliness became a forefront in many current research domains.

To appropriately quantify the experience of loneliness, regardless of context, it is necessary to have psychological measures which demonstrate reliability and validity within the desired language. Although work has been done to make popular measures of loneliness such as the 6-item De Jong Gierveld Loneliness Scale (De Jong Gierveld, 1989; De Jong Gierveld & Kamphuis 1985; De Jong Gierveld & Van Tilburg 1999a) available in numerous languages, not all translations have been officially validated. Take into consideration French, a language spoken in approximately 29 countries worldwide. Though the 6-item De Jong Gierveld Loneliness Scale has been translated to both French and English, these translations have not yet been officially validated; thus, this represents a clear barrier to language accessibility in standardized measures of loneliness. This work seeks to improve language accessibility within one standardized measure of loneliness by examining the validity of the French and English translation of the 6-item De Jong Gierveld Loneliness Scale.

Loneliness

Loneliness is a historically developing concept (Bound Alberti, 2018; Snell, 2015). Bound Alberti explains that the term "loneliness" was solemnly used before the 1800s, at which time the word held meaning like "oneness", representing more so a physical state of being rather than the psycho-emotional state we have come to understand modern loneliness to be. To be "lonely" simply meant to be physically alone, without company. However, through the 20th century, a shift occurs that marks the concept of "loneliness" as more than simply being alone. According to Smith (2006), this shift represents a movement towards recognizing that humans possess an innate need for companionship, in addition to forming the basis for the recognition of social and emotional isolation as detrimental to mental health.

Theories of Loneliness

Scholars of the mid-1900's such as John Bowlby regarded loneliness to be a key indicator of psychological adaptation beginning from early bonding patterns in infancy (Hecht & Baum, 1984). It was theorized that children who exhibited secure attachment to parents and caregivers in early childhood would then present with less loneliness in adolescence and adulthood, due to the developmental nature of loneliness and socialization (Hecht & Baum, 1984; Bowlby, 1977). To be more precise, attachment theory as presented by Bowlby (1969, 1973, 1980) was founded on the idea that humans hold an intrinsic need for connection to others, thereby suggesting that the experience of loneliness is a byproduct of unfulfilled human necessities (Helm et al., 2020).

Though loneliness could be explained in some part as a consequence of intrinsic human nature, loneliness as a human experience went largely misunderstood for a large portion of the 1900's. Early psychodynamic approaches to loneliness regarded the sentiment to be normal and representative of a transient state of mind (Zilboorg, 1938); perhaps even a reflection of human

traits such as narcissism or hostility (Zilboorg, 1938). The phenomenological approach such as that adopted by Carl Rogers (1961) relied heavily on the "self-theory" of personality to describe loneliness, suggesting that loneliness thrives due to societal pressures which force the individual to act in socially approved ways, fostering a divide between the inner self and the projected self. Loneliness is then most agonizing to those who have lost touch with their inner selves completely (Rogers, 1973). Weiss (1973), who explained loneliness through the interactionist lens, suggested that loneliness was not solely the product of human nature nor situational influences; rather, loneliness is the product of their combined interactions. Other approaches such as the cognitive approach and privacy approach conform to ideas like that of Weiss (1973), suggesting that loneliness is the product of a combination of factors including the impacts social relationships may have on one's experience of loneliness (Peplau & Perlman, 1982).

Looking forward to the present day, Bound Alberti (2018) describes loneliness as a "modern epidemic," fueled by various sources, including the digital revolution (Caplan, 2007), socioeconomic status and deprivation (Scharf, 2005), ethnicity (Allen & Oshagan, 1995), the glorification of independence (Snell, 2015), and urbanization leading to the dissolvement of historical collective living arrangements (Laing, 2016) to name a few. It is evidenced within the literature that scholars recognize social shifts such as the digital and urban revolutions as significant components of the trajectory of loneliness as a human experience (Bound Alberti, 2018; Caplan, 2007; Laing, 2016; Snell, 2015). In this way, loneliness continues to be viewed as the result of a multifaceted genre of interaction, suggesting that the interactionist lens, such as that presented by Weiss (1973), remains dominant to date.

Loneliness as a two-factored concept

Dominant work by Weiss and Bowlby (1973) maintains that loneliness, which is influenced by combinations of external factors (i.e., interactions), can be further understood by encapsulating its experiences into two separate but related categories: social and emotional loneliness. Emotional loneliness, as explained by Weiss (1973) and interpreted by De Jong Gierveld and Van Tilburg (2006), is the absence of an intimate relationship or a close emotional attachment, which could be found in a best friend or romantic partner. On another hand, social loneliness can be described as resulting from the absence of a broad social group or engaging social network (De Jong Gierveld & Van Tilburg, 2006), thus creating feelings of disengagement within oneself and one's friends, colleagues, neighbours, etc. As evidenced in the literature, both factors of social and emotional loneliness encapsulate different yet important aspects of the loneliness phenomenon. It is generally agreed upon within the literature that examining loneliness in this way provides greater insight into the root of one's loneliness. However, work by De Jong Gierveld and Van Tilburg, (2006) suggests that there is added value in examining loneliness as both a unidimensional and multidimensional phenomenon.

Loneliness and Mental Health

The impacts of loneliness are vast, touching both mental and physical well-being in numerous ways (Pitman et al., 2018). More specifically, across all ages, loneliness has the potential to negatively affect one's mental health (Caplan, 2007; Cole, 2016; Hards et al., 2022; Van Ours, 2021). A recently conducted meta-analysis examining mental health in adolescents found that three of seven studies examining the relationship between loneliness and mental health symptom severity presented a positive correlation between loneliness and symptoms of anxiety and depression (Hards et al., 2022). In addition, in one study loneliness acted as a

mediator between anxiety and depression symptoms (Hards et al., 2022). When examining the impacts of loneliness on the mental health of neurodivergent adolescents, the above-mentioned results were maintained, and evidence was found supporting increased social anxiety as a result of loneliness in those with autism spectrum disorder (White & Roberson-Nay, 2009).

Much like for adolescents, the literature supports the prevalence of increased mental health concerns in adult and aging populations experiencing loneliness; suggesting that those above the age of 50 are not exempt from the effects of loneliness on mental health. Factors such as retirement, the loss of a partner, decreased physical independence, and shrinking social circles have been found to be significant determinants of loneliness in the aging population (Van Ours, 2021). Though it is noted that the aging population does tend to experience increased rates of mood and anxiety disorders (Byers et al., 2010), research has shown loneliness and social isolation to play an important mediating role in the development and severity of symptoms including anxiety, depression, cognitive impairment, fragmented sleep, and the development of dementia (Cole., 2016; Santini et al., 2016).

Protective Factors

Not all hope is lost when it comes to loneliness. Research has shown that several protective factors may help reduce the development of comorbid mental health conditions. For example, akin to the ideas of Bowlby and Weiss (1972), children benefit most significantly from good familial adjustment at all stages of childhood; therefore, it is suggested by Sharabi and colleagues (2012) that the family climate is a key influence in loneliness outcomes – an appropriately adapted familial climate results in fewer feelings of loneliness overall. In addition, children who exhibit increased “hope” are less likely to be impacted by long-term effects of loneliness (Sharabi et al., 2012). For older adults, it has been found that loneliness and its

resulting mental health outcomes can be mediated through maintaining a stable social network, developing/maintaining strong intimate connections with a partner, living with others or in a community environment, and increasing the use of social technology (Teater et al., 2021).

Loneliness in the Time of the COVID-19 Pandemic

What started as an unknown form of pneumonia is now known as the SARS-CoV-2 virus (also coronavirus, COVID-19) and has spread like wildfire across the globe (Ciotti et al., 2020). To date, the virus has infected more than 523 million people and ultimately lead to the death of over 6.3 million people (World Health Organization, 2022).

Because of this, the COVID-19 pandemic represents an unprecedented public health crisis and universal human experience. Prior to the COVID-19 pandemic, loneliness had already represented a significant issue to public health due to its widespread nature and association with increased risk for morbidity and mortality (Luchetti et al., 2020). But, following the onset of the COVID-19 pandemic, public health measures such as social distancing, self-isolation, and quarantining were implemented to aid in slowing the spread of the SARS-CoV-2 virus (Luchetti et al., 2020). It was no question that the implementation of these measures would impact an already statistically "lonely" society; however, the nature of this impact was yet to be seen (Bonsaksen et al., 2021; Luchetti et al., 2020).

In the context of the COVID-19 pandemic, some population groups such as the elderly and those with underlying chronic health conditions were deemed most likely to bear the brunt of COVID-19 restrictions, many feeling the need to isolate more strictly than others due to the nature of their pre-existing health and the increased chance of contracting COVID-19 (Bonsaksen et al., 2021). However, it has also been found that those experiencing adjustment related distress (job loss, financial disruptions, transitioning to remote work and learning), stress

of a post-traumatic nature (death of a loved one, life-threatening illness, or working in a hospital), and the public in general report an increased sense of loneliness and feelings of social alienation (Bonsaksen et al., 2021; Groarke et al., 2020; Luchetti et al., 2020).

Though two years have now passed, and the nature of the pandemic remains an ongoing experience, scholars have agreed that it is pertinent that loneliness within this context be regarded as a continuously transforming phenomenon, much like the pandemic itself (Bonsaksen et al., 2021; Groarke et al., 2020; Luchetti et al., 2020) for the sake of understanding and developing appropriate interventions for loneliness and its residual impacts on mental health (Parlapani et al., 2020). Overall, the COVID-19 pandemic and its unprecedented nature continue to shape research surrounding loneliness; therefore, it is essential that the measures and scales that accompany this research be both widely accessible, valid, and reliable.

Measuring Loneliness

Loneliness presents itself to be an onerous experience for some, in many contexts leading to reduced quality of life (Dahill et al., 2020; VanderWeele, 2012), and comorbid mental health conditions (Caplan, 2007; Cole, 2016; Van Ours, 2021). The understanding of loneliness as a component of mental health has led to the development of measures used to quantify loneliness, including popular self-report scales such as the UCLA Loneliness scale (Allen & Oshagan, 1995) which has been translated to and validated in French (De Grace et al., 1993), the De Jong Gierveld Loneliness Scale (DJGLS; De Jong Gierveld & Kamphuis, 1985), and its 6-item short form (DJGLS-6; De Jong Gierveld & Van Tilburg, 2006). Though similar in nature, the UCLA scale conceptualizes loneliness as affective, whereas the DJGLS views loneliness to be cognitive (Penning et al., 2014). Though slightly different, both scales are important for the monitoring of loneliness and mental health amongst the public. Now, loneliness scales are being utilized to

examine the impacts of the COVID-19 pandemic on a global scale. Ultimately, these scales carry substantial weight in fostering vital and timely research in psychosocial domains; thus, validating the French DJGLS-6 is necessary to broaden accessibility in the measurement of loneliness.

The De Jong Gierveld Loneliness Scale (DJGLS)

Originally developed in Dutch, the De Jong Gierveld Loneliness Scale is an 11-item self-reported questionnaire that was developed in the 1980s by De Jong Gierveld and colleagues (De Jong Gierveld, 1989; De Jong Gierveld & Kamphuis 1985; De Jong Gierveld & Van Tilburg 1999a), designed to measure loneliness with the understanding that one's perceived loneliness is a primary indicator of one's social well-being. This scale draws from the work of Weiss (1973), who presents loneliness as a two-faceted phenomenon, with consideration given to both social and emotional loneliness. Thus, the DJGLS is a unidimensional loneliness scale containing two subscales that measure social and emotional loneliness as both unique and intertwined phenomena. The original DJGLS was measured on a scale of 0 to 11 with a higher score indicating increased loneliness overall. Its psychometric properties indicated strong internal consistency on the full ($\alpha = .84$) and subscale levels (emotional loneliness: $\alpha = .88$; social loneliness: $\alpha = .88$) (Gierveld & Tilburg, 2006; Pinquart & Sorensen, 2001).

The 6-item De Jong Gierveld Loneliness Scale (DJGLS-6; Gierveld & Tilburg, 2006) was developed as a shortened version of its 11-item counterpart. Scale developers Gierveld and Tilburg (2006) were confident that the reduction in questions presented on the DJGLS would benefit research, especially in the development of large surveys; thus, the development of a short form DJGLS ensued. To maintain consistency with the original DJGLS, the 6 items included in this scale are divided evenly to address both social and emotional loneliness, with three questions addressing each factor. To maintain reliability, it was proposed that the shortened version of the

DJGLS scale meet three criteria, including (1) optimum correlation between either of its factors' indicators, (2) optimal blanketing coverage of the scale's broad range of difficulties, and lastly (3) optimal phrasing and wording for each of the six items (Gierveld & Tilburg, 2006). The initial psychometric properties of the Dutch DJGLS-6 were consistent with these desired outcomes, with α coefficients for the 6-item scale varying between .70 and .76 at the total scale, with the emotional loneliness and social loneliness subscales demonstrating α coefficients ranging from .67 to .74 and .70 to .73 respectively (Gierveld & Tilburg, 2006).

Towards Language Accessibility in Mental Health Research – Validating the DJGLS-6

To maintain language accessibility in research, it is essential that validated translations of scales such as the DJGLS-6 are widely available. To date, the Dutch (Gierveld & Tilburg, 2006), Norwegian (Bonsaksen et al., 2019), Spanish (Rodríguez-Blázquez et al., 2021), formal Chinese (Leung et al., 2008), and Bahasa Malaysia (Jaafar et al., 2020) translations of the DJGLS-6 have been validated.

Generally, the psychometric properties across all validated translations of the DJGLS-6 are sound, ranging from adequate to optimal. The Norwegian, Dutch, Bahasa Malaysia, and Chinese translations demonstrate good internal consistency on its total factor scale (α = .70-.76; Bonsaksen et al., 2019; Gierveld & Tilburg, 2006; Jaafar et al., 2020; Leung et al., 2008), while the Spanish translation yielded Kuder-Richardson 20 (KR-20) coefficients of .65-.71, indicating acceptable reliability according to this formula (Rodríguez-Blázquez et al., 2021). Internal consistency for the emotional loneliness subscale was reported for both the Norwegian and Dutch translations, ranging from α = .67-.86, while internal consistency for the social loneliness subscale ranged from α = .63-.73 (Bonsaksen et al., 2019; Gierveld & Tilburg, 2006). Test-retest reliability for the Bahasa Malaysia DJGLS is good (r = .93, p < .05) (Jaafar et al., 2020); the

Chinese DJGLS demonstrates strong inter-rater reliability with intraclass coefficients (ICC; Shrout & Fleiss, 1979) ranging between 0.98-1.00. Convergent and/or divergent validity has also been established in the Bahasa Malaysia, Dutch, and Chinese translations of this scale (Bonsaksen et al., 2019; Gierveld & Tilburg, 2006; Jaafar et al., 2020). De Jong Gierveld & Van Tilburg (2010) note that the DJGLS-6 has been validated for use in seven countries, including France, Germany, the Netherlands, Russia, Bulgaria, Georgia, and Japan; however, this article does not explicitly state which languages were used, nor does it present validation data.

Though the DJGLS-6 has been translated to French, to our knowledge a proper validation in that language has not yet been conducted. The objective of this work is to address this gap through the statistical validation (Chronbach's alpha, test-retest, convergent and divergent validity, and factorial structure) of a French translation of the DJGLS. In addition, this work seeks to examine and compare in parallel the psychometric properties of the English translation of the DJGLS-6 to in the context of a single study examining the impact of the COVID-19 on loneliness. It is first hypothesized that, like in other validated languages, the French DJGLS-6 will present sound psychometric properties; similarly, it is expected that the English DJGLS-6 will present with psychometric properties consistent with those presented in earlier works on other languages. If these results are congruent with those reported in previous language validations, confidence can be maintained that the French and English versions of the measure present psychometric soundness.

Methods

Participants

As part of a broader Internet-based longitudinal study on the social impacts of the early COVID-19 pandemic involving participants from Canada, the US, France, Italy and China (for

more details see Brunet et al. 2022), a sample of 5941 participants was initially examined; 1434 participants, mainly from China and Italy, were excluded due to the nature of the language study, leaving a total of 4507 Francophone and Anglophone participant responses for analysis. Of this sub-total, 1407 participants hailing from France, Canada, or the United States had completed all items included on the 6-item De Jong Loneliness Scale in either French or English, providing the final combined language sample for this study. This attrition can be accounted for by considering the application of a zero-tolerance rule for missing data, in addition to natural attrition found in longitudinal work.

A sample composed of 640 French-speaking individuals (from France and Canada) was analyzed to complete the French language validation of the 6-item De Jong Gierveld Loneliness Scale. In addition, a sample of Anglophone individuals (from Canada and the USA) was collected to further complete an English validation of the De Jong Gierveld Loneliness Scale. This sample was composed of 767 English-speaking individuals. Eligibility criteria included being 18 years of age or older and demonstrating self-attested proficiency in one of the study languages. Participants demonstrated language proficiency through their use of said language in the completion of this study. This is consistent with previous validation work completed on the DJGLS-6, where language proficiency was demonstrated through participation in one's native language.

Due to the context and nature of this study, all participants in both samples represent persons impacted in varying degrees by the first wave (2020) of the COVID-19 pandemic. Ethics approval for the parent project was obtained by the Research Ethics Board of the Douglas Mental Health University Institute (No. IUSMD-20-13). No monetary compensation was offered for participation in this study.

Procedure

Participants were recruited using online advertisements on platforms such as Google AdWords and social media sites, in addition to invitations sent via secure email to various social and professional networks using the snowball technique. Those meeting the inclusion criteria who remained interested in participating were required to read and click on 'I accept' the informed consent form prior to commencing the survey. Surveys were distributed using the widely used and secure Survey Monkey website (www.surveymonkey.com). Data collected using Survey Monkey is securely stored in their servers. Collected data is entirely owned by the survey creators and data is purged from the Survey Monkey server within 14-90 days post-contract termination. Due to the longitudinal nature of this study, three surveys were administered at three separate time points, with a 14-day interval passing between each survey. To enhance participant retention at time points two and three, follow-up emails containing an invitation for participation were sent at two-day intervals, up to three times, as reminders. Those who did not respond were considered uninterested in further participation and were thanked and no longer contacted.

At each time (T) point (i.e., T1, T2, T3), the participants completed a short battery of self-reported questionnaires further described in Brunet et al. (2021). The T1 battery included information regarding sociodemographic variables, exposure to the COVID-19 pandemic, social support, and social media use. At timepoints two and three (T2, T3), this battery included the 6-item version of the De Jong Gierveld Loneliness Scale, the Peritraumatic Distress Inventory (Brunet et al., 2001) and the 6-item version of the Impact of Events Scale (Thoresen et al., 2009). At timepoint three (T3), the questionnaire also included the Generalized Self-Efficacy Scale (GSES; Schwarzer & Jerusalem, 1995). For this study, the French and English responses gathered during T2 and T3 survey timepoints are subject to further analysis.

Measures

The Dutch *De Jong Gierveld Loneliness Scale 6 Item Version* (DJGLS-6; Gierveld & Tilburg, 2006) is a two-faceted measure of loneliness, focusing on both social and emotional loneliness. The six items in this scale are each rated on a three-point Likert scale with responses including “no”, “more or less”, and “yes”. The total score for loneliness is calculated on a scale from 0-6, with 0 representing least lonely to 6 representing most lonely. This scale has been translated to French (Gierveld & Tilburg, 2010), Chinese (Leung et al., 2008), and Bahasa Malaysia (Jaafar et al., 2020). The Dutch translation of the DJGLS-6 exhibited good internal consistency (α = .70-.76) (Gierveld & Tilburg, 2006). When compared to the Dutch DJGLS-11 item version, the 6-item version presents with high convergent validity (r = .93-.95). In the context of this study, the DJGLS-6 was distributed in both English and French. However, for the purpose of this study, the preexisting French translation was applied.

The *Peritraumatic Distress Inventory* (PDI; Brunet et al., 2001) is a 13-item self-report measure that aims to quantify the levels of perceived life threat, fear, helplessness, and horror one may have experienced during a traumatic event. Each item included on this scale is rated on a 5-point Likert scale ranging from 0 (not at all) to 4 (extremely true). The resulting summation of all items produces a total score ranging between 0-52, with higher scores being representative of higher peritraumatic distress. In addition to its total score, the PDI hosts two internal subscales, one of which focuses directly on negative emotions while the other examines perceived life threat and physical bodily arousal (Brunet et al., 2001; Bunnell et al., 2018). The PDI, though originally developed and validated in English (Brunet et al., 2001; Bunnell et al., 2018), has been translated to and validated in languages including French (Jehel et al., 2005). Initial psychometric properties of the English PDI were indicative of scale stability. A

confirmatory factor analysis replicated the initial factor solution and found that the major goodness-of-fit indices produced results in the adequate to good range (Brunet et al., 2001).

The *Impact of Event Scale – 6 Item Version* (IES-6; Thoresen et al., 2009) is a condensed version of the original 22-item Impact of Event Scale-Revised (IES-R; Weiss & Marmar, 1997) which includes six items measuring the severity of response to a stressor experienced over the previous week. Using a 5-point Likert-type scale, participants rank the severity of a list of symptoms ranging from 0 (not at all) to 4 (extremely). Final severity scores are then obtained through the summation of all responses. In addition to English, the IES-R is available in numerous languages including French (Brunet et al., 2003).

Statistical Analyses

All statistical analyses assessing the validity and reliability of the DJGLS-6 were performed using IBM SPSS (version 28). Responses containing missing data were excluded entirely from the analyses. Latent factor analyses were conducted using SPSS Amos (version 21). Cronbach's alpha was calculated at the total, subscale, item-total (ITC) and inter-item (IIC) levels to assess the internal consistency of both the French and English versions of the DJGLS-6. Results producing Cronbach's alpha greater than 0.6 is deemed acceptable, with higher scores indicating more excellent internal consistency. To examine test-retest reliability at timepoints 2 and 3 within both language samples, Spearman's rank order correlations were applied instead of Pearson's due to data-non normality. Divergent validity between the DJGLS-6 total scores, sociodemographic constructs of age, gender, and the "Bodily Harm and Life Threat" subscale of the PDI were assessed using Spearman's correlation. Spearman's rank order correlation was applied to analyze convergent validity between the DJGLS-6 total scores, sociodemographic constructs of marriage, number of children, and distress as indicated by the IES-6 total scores.

Sociodemographic factors for both the test-retest sample and the remaining sample were compared. Variables including sex, country, age groupings, and marital status were analyzed using chi-square tests with Yates continuity correction, when needed. All tests used an alpha level of .05 in two-sided tests. No correction for multiple testing was applied here due to the exploratory nature of the work.

Latent factor structure analyses following a similar confirmatory factor analysis (CFA) approach as De Jong Gierveld and Van Tilburg (2006, 2010) were conducted on both English and French samples separately. Data for both language samples were found to violate univariate and multivariate normality assumptions; therefore, Bollen-Stine bootstrap $\chi 2$ (Bollen & Stine, 1992), was used to estimate the overall model fit of each model. The procedure and evaluation criteria for model fit were adopted from that recommended by Hu and Bentler (1998, 1999), including Standardized Root Mean Square Residual (SRMR; Bentler, 1990) and Comparative Fit Index (CFI). Additionally, the Tucker-Lewis Index (TLI) and root mean square error of approximation (RMSEA) goodness of fit indexes were also applied to evaluate the model fit (Kline, 2015).

Results

Samples

Sociodemographic characteristics from each sample can be viewed in Table 1. The French language sample was composed of 640 participants primarily from Canada (n = 325, 50.7%) and France (n = 290, 45.3%). At the time of survey distribution, the majority of participants identified as female (n = 544, 85%) between the ages of 18-64 (n = 572, 89.4%). Participants also reported being employed (n = 503, 78.6%), with many having completed undergraduate or graduate-level education (n = 590, 90.6%). Most were living in married or common-law relationships (n = 369, 57.9%).

A total of 767 English-speaking participants primarily from the United States of America (USA; *n* = 414, 54.0%) and Canada (*n* = 294, 38.3%) composed this other sample. Like in the French sample, participants identified mainly as female (*n* = 594, 77.4%) between the ages of 18 and 64 (*n* = 652, 85.0%), who held employment (*n* = 626, 81.6%). Similarly, the sample was well educated, with the vast majority holding an education at the undergraduate or graduate level (*n* = 731, 95.3%). Much of this sample also identified as being married or living under common law (*n* = 462, 60.2%).

Internal Consistency

Internal consistency examining the DJGLS-6's conceptual consistency with loneliness was calculated using Cronbach's alpha coefficients at both the full and subscale levels. For both languages, the DJGLS-6 scores presented with acceptable to good internal consistency at the full and subscale levels (see Tables 2, 3, and 4). Scores were further examined according to country of origin within each language, i.e., French-Canada vs. France and English-Canada vs. the US. All item total correlations (ITC) and inter-item correlations (IIC) can be found in Tables 5 and 6.

Multinational French Sample

The combined multinational scores derived from the French translation of the DJGLS-6 revealed a Cronbach's alpha coefficient of $\alpha = .66$, indicating acceptable internal consistency at the total scale level. Item-total correlations (ITC) were calculated to examine for discrimination between individual items for participants who report loneliness versus those who do not. A mean ITC value of 0.4 or higher indicates very good discrimination. ITC analyses at the total scale level provided scores ranging between .07-.54, with a mean ITC of 0.40, suggesting very good overall discrimination. Inter-item correlations (IIC) were assessed at the total level (see Table 6). IIC scores ranging between .15-.50 are deemed appropriate (Clark & Watson, 1995). Of all 6

items, 5 fell into the appropriate range for IIC, with an inter-item correlation mean of .24. Item 2 on the total scale (emotional loneliness 2: "I miss having people around me") produced low to moderate IIC values ranging from .01-.26. The low levels of IIC for this item may be explained in part by restraint in variability due to disproportionate responses by those who endorsed this item (72%, $n = 461$), in the context of COVID-19.

The emotional loneliness (EL) subscale produced a Cronbach's alpha of $\alpha = .49$, indicating marginally acceptable validity. ITC scores revealed a mean of .31 for this subscale indicating acceptable discrimination (range: .23-.39). An analysis examining inter-item correlation determined that two out of three of the items in this subscale (EL1 and EL2) hold appropriate scores for IIC, with an overall mean of .24. The IIC for the third item (EL3: "I often feel rejected") was .12, slightly below the acceptable range. This may reflect restraint in variability as the result of unbalanced responses to this item (71.25%, $n = 456$) as most did not endorse this response. Results of analyses performed on the social loneliness (SL) subscale yielded a Cronbach's alpha of $\alpha = .83$ indicating very good internal validity. ITC scores for the SL subscale indicate strong levels of discrimination, reporting a mean of .69 (range: .56-.76). Inter-item correlation results for this subscale surpassed the high end of the appropriate range for all items, yielding a mean of .61, with scores ranging from .52-.77.

France

We divided the multinational French sample into country of origin: France and Canada to examine whether it was okay to lump them together. Scores returned from participants from France produced Cronbach's alpha coefficients apparently similar (although we did not formally test this) to those reported within the multi-national sample. Analyses resulted in an acceptable Cronbach's alpha coefficient of $\alpha = .66$ at the total scale, a marginally acceptable $\alpha = .55$ at the

EL subscale, and a favourable $\alpha = .82$ at the SL subscale level. Also comparable to the multi-national sample, item total correlations at the total scale produced an acceptable mean ITC of .40 (range: .15-.52), with the EL subscale exhibiting a moderately acceptable mean of .36 (range: .31-.43), and the SL subscale presenting the highest acceptable mean of .68 (range: .54-.76).

At all scale levels, the inter-item correlations were evaluated. Like in the multi-national sample, 5 of 6 items on the total scale fell into the appropriate range for IIC, with scores ranging from.08-.72, yielding a mean of .27. Once again, scale item 2 (emotional loneliness 2: "I miss having people around me") produced the lowest IIC values, ranging from -.01-.79, suggesting that less participants may have endorsed this item. IIC values were adequate for all items when assessed at the EL and SL subscales, yielding acceptable means of .29 (range: .19-.35) and .60 (range: .50-.79) respectively.

French Canada

Scores produced by French participants residing in Canada revealed a Cronbach's alpha coefficient of $\alpha = .70$ at the total scale, suggesting good internal consistency at this level. Like in the multinational sample, the EL subscale produced a marginally acceptable Cronbach's alpha of $\alpha = .49$ while the SL subscale yielded a very reliable alpha of $\alpha = .81$. Similar to the aforementioned, item total correlations assessed at the total scale returned a mean ITC of 0.43 (range: .20-.57) indicating very good discrimination, while scores on the EL subscale produced acceptable discrimination ($m = .32$, range: .26-.40), compared to the SL subscale whose scores fashioned fortified levels of discrimination, with a mean ITC of .67 (range: .56-.73).

The inter-item correlations were assessed at all levels. Like in the multi-national sample, 5 out of 6 items fell into the appropriate range for IIC on the total scale, with scores ranging

from .08-.72, yielding a mean of .27. Item 2 on the total scale, as in the two previous samples, (emotional loneliness 2: “I miss having people around me”) produced low to moderate IIC values ranging from .08-.28. When assessed at the EL and SL subscales, IIC values were adequate for all items on both scales, producing acceptable means of .24 (range: .12-.32) and .59 (range: .50-.72) respectively.

Multinational English Sample

Multinational scores on the English translation of the DJGLS-6 exhibited good internal consistency at the total score across its six items with a Cronbach’s alpha coefficient of $\alpha = .72$. ITC analyses for the 6 scale items resulted in values ranging between .40 - .62, with a mean ITC of .45. Like for the French translation, most of the 6 items fell within the appropriate range for IIC, with an inter-item correlation mean of 0.40; however, item 2 (emotional loneliness 2: “I miss having people around me”) produced low to moderate IIC values (range: -.03 - .25). As in the former, variability restraint due to disproportionate participant endorsement (86.57%, $n = 664$) of this item may have influenced these outcomes.

Cronbach’s alpha for the EL subscale was found to indicate acceptable validity ($\alpha = 0.52$). Analyses examining ITC indicate good to very good discrimination for all items in this subscale, with a mean of .34 and all scores ranging between .21 and .46. Inter-item correlation analyses found that two of the three items (EL1 & EL2) in this subscale fall within the appropriate range for IIC (.26-.42). The third item (EL3: “I often feel rejected”) produced a low IIC value of .09 which may be explained in part due to variability restraint caused by disproportionate responses by item non-endorsers (68.71%, $n = 527$). Analyses examining the SL subscale found that Cronbach’s alpha was .82, indicating very good internal consistency. ITC for all subscale items indicated very good discrimination (.66-.71) with an ITC mean of .67. These

analyses also yielded an IIC mean of .67, indicating very strong inter-item correlations (range: .55-.64). The multi-national English sample was divided according to country of origin as a means to determine the appropriateness of having combined the two samples into one.

English Canada

Scores yielded by 295 anglophone Canadians generated Cronbach's alpha coefficients apparently similar to that reported in the multi-national sample, resulting in $\alpha = .73$ at the total level, suggesting good internal consistency. The same can be reported at the SL subscale, where an $\alpha = .83$ is indicative of very good internal consistency. However, the EL subscale failed to yield a high Cronbach's alpha coefficient, producing only a marginally acceptable $\alpha = .50$. Item total correlations were assessed at all levels and produced acceptable mean ITCs at the total scale ($M = .47$ range: .10-.64) and SL subscale levels ($M = .70$, range: .67-.73) indicating good discrimination. However, the EL subscale produced a less-than-acceptable mean ITC of .32 (range: .18-.44) indicating potential issues with an item in this subscale.

Inter-item correlations were evaluated at all scale levels. Consistent with previously presented results, scale item 2 (emotional loneliness 2: "I miss having people around me") produced the lowest IIC values; however, this was the only scale item that did not fall into the appropriate range for IIC. At the total, EL, and SL levels, scores produced acceptable mean IICs of .30 (range: -.001-.66), .23 (range: .07-.41), and .63 (range: .58-.66) respectively.

USA

Cronbach's alpha was assessed at all levels in this sample of 419 anglophones residing in the USA. Consistent with the Canadian sample, the total and SL subscales yielded acceptable Cronbach's alpha coefficients of $\alpha = .72$ and $\alpha = .82$, indicative of good internal consistency. On the other hand, the EL subscale once again produced a lower alpha coefficient indicative of

issues within this subscale (α = .52). Item total correlations were assessed, and results showed strong discrimination at the full scale and SL subscale, with scores producing ITC means of .45 (range: .10-.62) and .67 (range: .64-.71) respectively. Controversially, the EL subscale failed to produce an acceptable ITC value, falling below the cut-off for good discrimination with a mean of .34 (range: .21-.46).

Results of analyses examining inter-item correlations produced acceptable IIC means at all levels, revealing means of .29 (range: -.003-.64), .25 (range: .09-.42), and .60 (range: .55-.64) at the total, EL, and SL levels. Once again, scale item 2 (emotional loneliness 2: "I miss having people around me") produced the lowest IIC values; however, all other items fell into the appropriate range for IIC.

Divergent Validity

Spearman's rank-order correlation was applied to analyze divergent validity between the DJGLS-6 total scores and sociodemographic data at the T3 time point with a sample size of n = 480 for the total French translation, and n = 719 for the total English translation (see Table 7). Analyses of the French sample scores revealed no significant correlation between constructs of loneliness and age (r_s = 0.06, p = .21) or loneliness and gender (r_s = 0.07, p = .11). The same analyses performed on the English sample scores produced similar results, between the constructs of loneliness and gender (r_s = -.04, p = .355). A small positive correlation was observed however between age (r_s = .21, p < .001) and loneliness.

Divergent validity for both language samples was further explored between the DJGLS-6 total scale and the "Bodily Harm and Life Threat" subscale of the PDI. Scores from the French samples produced results inconsistent with the criteria for divergent validity (r_s = .31-.39, p < .001). On the contrary, scores from all three English samples yielded results consistent with

divergent validity, with the multinational sample producing a nonsignificant Spearman's correlation of r_s = .04 (p = .36), while the samples from Canada and the USA produced nonsignificant correlations of r_s = .07 (p = .21) and r_s = .02 (p = .70) respectively.

Convergent Validity

Spearman's rank-order correlation was applied to analyze convergent validity between the DJGLS-6 total scores and sociodemographic data at the T3 time point with a sample size of n = 480 for the total French translation, and n = 719 for the total English translation (see Table 7). Analyses of the French sample found loneliness to be mitigated by both marriage (r_s = -.09, p < .05), and number of children (r_s = -.10 , p < .05), indicative of convergent validity. Similar results were found within the English sample, where significant negative correlations were found between loneliness and marriage (r_s = -.18, p < .001), and number of children (r_s = -.04, p = .355).

To examine the relationship between loneliness and distress, convergent validity was explored between the DJGLS-6 and the IES-6 total scores for all levels of both the English and French samples (see table 11). Scores from the English samples produced correlations indicative of moderate convergent validity (r_s = .26-.33, p < .001), with the Canadian sample producing the highest correlation, and the USA representing the low end of the range. As in its English counterpart, the French sample produced correlations indicative of moderate convergence, ranging between r_s = .30-.45 (p < .001), with Canada representing the high end of the range while France produced the lowest correlation.

Test-Retest Reliability

Multinational French Sample

A total of 481 participants completed the DJGLS-6 in French at both T2 and T3 with approximately five weeks (35 days; $M = 35.63$, $SD = 9.65$) passing between survey responses. Comparisons of sociodemographic data pertaining to this sub-sample and its parent sample have been analyzed and no statistically significant differences were found in this sample (see Table 8). Test-retest reliability between the DJGLS-6 total scores was good ($r_s = .64$, $p < .001$,) indicating acceptable test-retest stability at the DJGLS-6 total score. Analyses examining the emotional loneliness subscale yielded moderate to strong Spearman's correlation ($r_s = .53$, $p < .001$). The social loneliness subscale produced a strong Spearman's correlation of ($r_s = .67$, $p < .001$), indicating good test-retest reliability within this subscale.

France

A total of 204 participants from France were included in the test-retest analysis. On average, 33 days passed between the completion of the T2 and T3 surveys ($M = 33.34$, $SD = 9.97$, range: 13-70 days). DJGLS-6 scores generated only moderate reliability at the total and SL subscale levels, producing Spearman's correlations of $r_s = .63$ ($p < .001$) and $r_s = .64$ ($p < .001$) respectively. The EL subscale produced a Spearman's correlation of $r_s = .50$ ($p < .001$), indicating poor reliability at this level. Due to the extended nature of the range, further analyses were done to examine the potential for time-related impacts; however, no substantial differences were observed (see Table 10).

French Canada

A total of 259 French participants from Canada were included in the test-retest analysis. On average, 38 days passed between the completion of the T2 and T3 surveys ($M = 37.63$, $SD = 9.08$, range: 14-66 days). Like in the sample from France, DJGLS-6 scores generated only moderate reliability at the total and SL subscale levels, producing Spearman's correlations of r_s

= .64 ($p < .001$) and $r_s = .68$ ($p < .001$) respectively. Comparable to the sample from France, the EL subscale for the French-Canadian sample produced a Spearman's correlation of $r_s = .54$ ($p < .001$), indicating poor reliability at this level. Once again, due to the extended nature of the range, further analyses were done to examine the potential for time-related impacts (see Table10).

A group of 29 participants who responded to T3 between 13-28 days after responding to T2 was examined and contrasted visually to a group of 24 participants who responded between 56-70 days post T2. Analyses demonstrated that the scores of those who responded between 56-70 days post T2 produced Spearman's correlations like those presented above, yielding results of $r_s = .69$ ($p < .001$), $r_s = .56$ ($p < .01$), and $r_s = .72$ ($p < .001$) at the total, EL, and SL subscales. However, the scores of those who responded between 13-28 days after T2 submissions yielded critically poor results, producing a non-significant correlation at the total level ($r_s = .30$, $p = .11$), in addition to poor correlations of $r_s = .40$, ($p < .05$) and $r_s = .49$ ($p < .01$) at the EL and SL subscales.

Multinational English Sample

A total of 551 participants completed the scale in English, with approximately six weeks (40 days; $M = 40.94$, $SD = 13.55$) passing between these time points. Comparisons of sociodemographic data pertaining to this sub-sample and its parent sample have been analyzed. Analyses revealed that the English sample held statistically significant differences between the test-retest and parent sample on the marital status, country, and age grouping variables which may represent a grouping bias (see Table 9).

In the multinational English sample, DJGLS-6 total scores generated a moderate to good Spearman's correlation indicating proficient retest stability at the scale total score ($r = .72$, p

< .001,). Like in the multinational French translation, the EL and SL subscales yielded moderate test-retest reliability, producing significant Spearman's correlations of 0.62 and 0.71 respectively ($p < 0.001$).

Canada

A subsample of 207 English-speaking Canadians completed the DJGLS-6 across both eligible timepoints, with an average of 38 days passing between the completion of each questionnaire ($M = 37.79$, $SD = 15.65$, range: 14-77 days). Spearman's correlations of $r_s = .73$ ($p < .001$) and $r_s = .74$ ($p < .001$) at the total and SL subscales is indicative of good reliability. However, the EL subscale failed to produce adequate reliability, yielding a correlation of $r_s = .59$ ($p < .001$).

Due to concern for the impact of time on test-retest reliability, further analyses were conducted (See table 10). A group of 52 participants who responded to T3 between 14-28 days after responding to T2 was examined and compared to a group of 62 participants who responded between 49-77 days post T2. In this case, those who responded between 49-77 days post T2 produced Spearman's correlations of $r_s = .61$ ($p < .001$), $r_s = .47$ ($p < .001$), and $r_s = .66$ ($p < .001$) at the total, EL, and SL subscales in comparison to results of $r_s = .77$ ($p < .001$), $r_s = .57$ ($p < .01$), and $r_s = .80$ ($p < .001$) at the total, EL, and SL subscales for those who responded between 14-28 days post T2. It is possible that results of the test-retest analyses for this group may have been influenced by a confounding variable such as time.

USA

A subsample of 419 participants from the USA completed this loneliness scale across T2 and T3, with approximately 43 days passing between responses ($M = 43.06$, $SD = 11.62$, range: 14-85). A Spearman's correlation of $r_s = .72$ ($p < .001$) at the total level is suggestive of good

reliability. However, in the case of the EL and SL subscales, both yielded lower spearman's correlations of $r_s = .66$ ($p < .001$) and $r_s = .69$ ($p < .001$), indicative of marginally acceptable reliability.

Again, due to concern for the impact of time on test-retest outcomes, further analyses were conducted (See table 10). Test-retest outcomes were compared between 25 participants who responded between 14-28 days post T2, and 15 who responded between 56-85 days later. The first group yielded moderately acceptable Spearman's correlations at the full ($r_s = .66$, $p < .001$), EL ($r_s = .69$, $p < .001$), and SL ($r_s = .61$, $p < .001$) levels, while the second group produced results indicative of good test-retest reliability at all levels including full ($r_s = .76$, $p < .001$), EL ($r_s = .79$, $p < .001$), and SL ($r_s = .72$, $p < .001$) subscales. Notably, those who responded between 56-85 days later produced Spearman's correlations indicative of better test-retest reliability on all levels than those who responded within the first 3 weeks. Thus, like in the Canadian sample, this may represent the presence of a confounding variable influencing one's perception of loneliness.

Confirmatory Factor Analyses

The Bollen-Stine bootstrap $\chi 2$ value ($p < 0.05$) and TLI (< .95) analysis models did not suggest a good fit for data from any language sample as cut-off scores indicated by Kline (2015) went unmet in these analyses, with the exception of English-Canada which met the appropriate cut-off score for TLI. For scores in all subsamples analyzed under the French and English translations, values fell within the limits for the SRMR (< .08), and CFI (> .90) analytic models, indicating a good fit for these data. The RMSEA proved to be a good fit (90%CI > .80), however, this indication applies exclusively to the French- and English-Canadian subsamples (See table 11).

Discussion

This work was oriented towards a much-needed expansion of language accessibility within the psychosocial study of loneliness through the validation of the French and English translations of the DJGLS-6. This work, to represent the globality of the languages at hand, was conducted in multi-national samples of Francophone and Anglophone individuals, then further examined according to country of origin (i.e., France, Canada, USA) to explore the possibility of linguistic-driven differences. As hypothesized, the French DJGLS-6 exhibited adequate internal consistency, in addition to adequate divergent validity with the socioeconomic variables. In addition, as hypothesized, the English DJGLS-6 presented with good to excellent internal consistency and test-retest validity, with divergent validity like that of the French scale; however, only the English sample scores (in all contexts) were found to diverge adequately with concepts presented in the PDI bodily harm and life threat subscale.

Overall, these findings are consistent with other language validations of the DJGLS-6. Where Cronbach's alphas ranged from $\alpha = .70$-$.76$ on the total factor scale across previous language validations (Bonsaksen et al., 2019; Gierveld & Tilburg, 2006; Jaafar et al., 2020; Leung et al., 2008), those presented in this work remain consistent with the existing literature. However, it must be noted that compared to its English counterpart, the French DJGLS-6 scores tended to produce somewhat lower Cronbach's alpha coefficients. These small (untested) differences may be indicative of modest psychometric differences.

Also notable, previous language validations such as that of the Bahasa Malaysia translation found that item total correlations for all items ranged from .36 to .64 (Jaafar et al., 2020), whereas this work found results ranging from .07-.59. However, internal validity analyses for both languages in this work uncovered observed differences between the emotional and social

loneliness subscales, with the emotional loneliness subscale demonstrating much lower reported validity than its counterpart. This is consistent with the original validation work conducted on the Dutch scale, which found that α values for the 3-item emotional loneliness scale were lower than those for the total and social loneliness scales, ranging from .67-.74 (Gierveld & Tilburg, 2006). Having said this, results from our analyses produced α values between .49-.55 on the emotional loneliness subscale, indicating some discrepancy.

Scale item 2 “I miss having people around me” had the biggest impact on the reduction of Cronbach’s alpha scores in both languages. There is a possibility that this item does not reflect entirely on the true question at hand. For example, work by Boyd and colleagues (2021) found that 37% of people living in a particular retirement village still felt lonely, despite the increased availability of social connectedness in this controlled environment. It should be taken into consideration that there may in fact be a difference between social connectedness (i.e., having people around oneself) and internalized sentiments of loneliness that may contribute to the poor statistical performance of this item. However, earlier work on the Dutch DJGLS-6 by De Jong Gierveld and Van Tilburg found results indicating similar Cronbach’s alphas between both subscales. This may be indicative of sample differences (i.e., country of collection, primary language) between this work and previous research. In addition, it should be considered that the timeline of this work in the context of the COVID-19 pandemic may have impacted the endorsement of this item thus leading to these results.

The confirmatory factor analysis based on De Jong Gierveld and Van Tilburg’s work (2006, 2010) following the methods set out by Hu and Bentler (1998, 1999) revealed not to be a good fit for this data as per some but not all indexes, with only the SRMR and CFI values indicating that the emotional and social loneliness subscales are indeed a good fit in the English

sample, with the addition of RMSEA in the French- and English-Canadian samples. TFI was also found to be a good fit but only in the English-Canadian sample. No other analyses indicated a good fit for this data. This, however, does remain consistent with the work of De Jong Gierveld and Van Tilburg (2006) who also found that their data presented good fits only for CFI and SRMR models. But these results in our analyses may be indicative of unresolved questions in scale application. For example, the literature has noted that the context surrounding the application of this scale has the potential to influence its functioning (De Jong Gierveld & Van Tilburg, 2006); thus, it may be possible that contextual factors such as the COVID-19 pandemic have an unknown impact on the overall functioning of the DJGLS-6. In addition, geographical factors such as the country of response have been highlighted as factors influencing correlations across items (De Jong Gierveld, & Van Tilburg, 2010); this is in part due to cultural influences that may impact the factor loadings of each of the scale items.

Where both of our language analyses were conducted on multi-national samples, we wondered if the combination of these factors may have influenced goodness-of-fit outcomes. However, upon further examination, goodness-of-fit outcomes remained consistent across translations regardless of language or country of response, a reassuring finding.

Until now, previous language validations of the DJGLS-6 have concentrated primarily on independent national samples. For example, the Spanish DJGLS-6 validation (Rodríguez-Blázquez et al., 2021) was focused directly on the Chilean population, whereas the Chinese validation (Leung et al., 2008) was based in Hong Kong, and the Bahasa Malaysia validation was conducted solely on Malaysian adults (Jaafar et al., 2020). The integration of multiple nations within the French (i.e., Canada and France) and English (i.e., Canada and USA) language samples of this work represent a unique development in the psychometric literature surrounding

the DJGLS-6 and allows for a broader transnational use of the scale. The idea that this measure remains reliable and valid when used in these multi-national circumstances should lead to unique possibilities for future research using this scale.

Limitations

Attention should be paid to the limitations surrounding this work. First, this data was gathered through a convenience sample in the context of the COVID-19 pandemic, where the DJGLS-6 was applied to examine loneliness as it relates to pandemic-associated factors (not reported here). As such, it is possible that collected DJGLS-6 scores may have been uniquely influenced by pandemic-associated factors such as quarantine or self-isolation measures. In terms of sociodemographic limitations, the majority of the participants in both language samples were female, married, and with higher education; thus, limiting generalizability to this profile of users. A sample that mirrors more closely the realities of the general population (i.e., balanced gender and education distributions) would potentially yield results slightly different than that presented here.

Sociodemographic analyses also suggest that significant differences in sociodemographic characteristics such as marital status, age, and country of response were present between those included and excluded in the test-retest analyses, specifically within the English sample. Consequently, future research on a more representative sample may yield different results. Again, this can be addressed partly within our sample, and we will do so before submitting a for publication manuscript. Lastly, as previously mentioned, future research on multi-national language samples should continue to consider the linguistic differences that may be present amongst different nationalities within the same language as these group differences may potentially impact research outcomes. However, even given these limitations, we remain

confident that this work provides a solid foundation for the validity and reliability of both the French and English DJGLS-6, and that these scales should continue to be implemented in both Anglophone and Francophone populations to expand the current literature on loneliness.

Concluding Remarks and Summary

Loneliness is a global concept that can impact on one's general well-being (Parlapani et al., 2020); therefore, it is vital that reliable and valid scales such as the DJGLS-6 be available across globally prominent languages including French and English. This work has provided a coveted insight into the reliability and validity of the French DJGLS-6, while also re-examining the English DJGLS-6 to ensure its continued psychometric reliability. To execute these validations, multi-national groups of Francophone and Anglophone individuals were sampled. From this, results suggested that the DJGLS-6 is both reliable and valid when used in French and English, confirming our first hypothesis. The psychometric properties exhibited by these two translations are consistent with those reported in other existing translations (Bonsaksen et al., 2019; Gierveld & Tilburg, 2006; Jaafar et al., 2020; Leung et al., 2008; Rodríguez-Blázquez et al., 2021). This work has laid a foundation for the use of multi-national samples to complete these validations and represents a new and exciting advancement in the literature for the DJGLS-6, as the scale demonstrates validity even when faced with potential cultural and linguistic differences across the same language. The ability to measure loneliness across populations on a global requires work in measurement translation and validation to be given a high priority. The validation of the French and English translations of the DJGLS-6 is a vital step in the direction of future research toward improving global language accessibility within standardized measures.

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Table 1
Sociodemographic Characteristics of French and English Language Samples

Characteristics	French (n = 640)			English (n = 767)		
	Mean	Frequency	*SD* or %	Mean	Frequency	*SD* or %
Age	45.98		13.72	43.72		15.72
Missing Data		1	0.16		14	1.8
Gender						
Male		92	14.4		156	20.3
Female		544	85.0		594	77.4
Undisclosed		1	0.2		15	2.0
Missing Data		3	0.5		2	0.3
Country						
Canada		324	50.6		294	38.3
USA		1	0.2		414	54.0
France		287	44.82		3	0.4
Missing Data		28	4.38		42	5.4
Marital Status						
Single		135	21.1		177	23.1
In a Relationship		57	8.9		77	10.0
Married or Common Law		369	57.7		465	60.2
Divorced/Separated/Widowed		76	11.9		50	6.5
Missing Data		3	0.5		1	0.1
Education						
Pre-University		57	8.9		36	4.7
Undergraduate Level		200	31.3		236	30.8
Graduate Level		380	59.4		495	64.5
Missing Data		3	0.5		0	0
Occupation						
Stay at Home Occupation		75	11.7		75	9.8
Essential Worker		322	50.3		400	52.2
Non-Essential Worker		106	16.6		151	19.7
Other		137	21.4		139	18.1
Missing Data		0	0		2	0.3

Table 2
Psychometric Characteristics (r) across the French and English DJGLS-6

Psychometric Characteristic	DJGLS-6 French	DJGLS-6 English
Internal Consistency (Cronbach's α)		
Total Scale	.66	.72
Emotional Loneliness Subscale	.49	.52
Social Loneliness Subscale	.83	.82
Mean Item-Total Correlation		
Total Scale	.40	.45
Emotional Loneliness Subscale	.31	.34
Social Loneliness Subscale	.69	.67
Mean Inter-item Correlation		
Total Scale	.24	.28
Emotional Loneliness Subscale	.24	.25
Social Loneliness Subscale	.61	.60
Divergent Validity(r_s)		
Gender	.07	.04
Age	.06	.21[3]
PDI Bodily Harm and Life Threat Subscale	.35[3]	.05
Convergent Validity (r_s)		
Marital Status	-.09[1]	-.18[3]
Number of Children	-.10[1]	-.18[3]
Test-Retest Reliability		
Total Scale	.64[2]	.72[2]
Emotional Loneliness Subscale	.53[2]	.62[2]
Social Loneliness Subscale	.67[2]	.71[2]

[1] The Spearman Correlation is statistically significant ($p < .05$)
[2] The Spearman Correlation is statistically significant ($p < .01$)
[3] The Spearman Correlation is statistically significant ($p < .001$)

Table 3

Psychometric Characteristics of the DJGLS-6 across the French Multinational, French Canadian, and French (France) Samples

Psychometric Characteristic	French Multinational	France	Canada
Internal Consistency (Cronbach's α)			
Total Scale	.66	.66	.70
Emotional Loneliness Subscale	.49	.55	.49
Social Loneliness Subscale	.83	.82	.81
Item-Total Correlation (*M*)			
Total Scale	.40	.40	.43
Emotional Loneliness Subscale	.31	.36	.32
Social Loneliness Subscale	.69	.68	.67
Inter-item Correlation (*M*)			
Total Scale	.24	.25	.27
Emotional Loneliness Subscale	.24	.29	.24
Social Loneliness Subscale	.61	.60	.59
Divergent Validity (r_s)			
Gender	.07	.07	.18[2]
Age	.06	.04	.05
PDI Bodily Harm and Life Threat Subscale	.35[3]	.31[3]	.39[3]
Convergent Validity (r_s)			
Marital Status	-.09[1]	.04	-.21[3]
Number of Children	-.10[1]	-.03	-.17[2]
Test-Retest Reliability (r_s)			
Total Scale	.64[3]	.63[3]	.64[3]
Emotional Loneliness Subscale	.53[3]	.50[3]	.54[3]
Social Loneliness Subscale	.67[3]	.64[3]	.68[3]

[1] The Spearman Correlation is statistically significant ($p < .05$)

[2] The Spearman Correlation is statistically significant ($p < .01$)

[3] The Spearman Correlation is statistically significant ($p < .001$)

Table 4

Psychometric Characteristics of the DJGLS-6 across the English Multinational, Anglo-Canadian, and Anglo-USA

Psychometric Characteristic	English Multinational	USA	Canada
Internal Consistency (Cronbach's α)			
Total Scale	.72	.72	.73
Emotional Loneliness Subscale	.52	.52	.50
Social Loneliness Subscale	.82	.82	.83
Item-Total Correlation (*M*)			
Total Scale	.45	.45	.47
Emotional Loneliness Subscale	.34	.34	.32
Social Loneliness Subscale	.67	.67	.70
Inter-item Correlation (*M*)			
Total Scale	.28	.29	.30
Emotional Loneliness Subscale	.25	.26	.23
Social Loneliness Subscale	.60	.60	.63
Divergent Validity (r_s)			
Gender	.04	.02	.07
Age	.21[3]	.20[3]	.22[3]
PDI Bodily Harm and Life Threat Subscale	.05	.03	-.02
Convergent Validity (r_s)			
Marital Status	-.18[3]	-.17[3]	-.21[3]
Number of Children	-.18[3]	-.17[3]	-.22[3]
Test-Retest Reliability (r_s)			
Total Scale	.72[3]	.73[3]	.73[3]
Emotional Loneliness Subscale	.62[3]	.66[3]	.59[3]
Social Loneliness Subscale	.71[3]	.69[3]	.74[3]

[1] The Spearman Correlation is statistically significant ($p < .05$)

[2] The Spearman Correlation is statistically significant ($p < .01$)

[3] The Spearman Correlation is statistically significant ($p < .001$)

Table 5
Item-Total Correlations and Cronbach's Alpha Coefficient if item Deleted from French and English DJGLS-6

	French DJGLS-6		English DJGLS-6	
Item	Corrected Item-Total Correlation	Cronbach's α if Item is Deleted	Corrected Item-Total Correlation	Cronbach's α if Item is Deleted
Emotional Loneliness (EL)				
EL1 "I experience a general sense of emptiness"	.35	.64	.40	.70
EL2 "I miss having people around me"	.07	.72	.10	.76
EL3 "I often feel rejected"	.38	.62	.47	.68
Social Loneliness (SL)				
SL1 "There are plenty of people I can rely on when I have problems"	.54	.56	.54	.66
SL2 "There are many people I can trust completely"	.53	.57	.59	.64
SL3 "There are enough people I feel close to"	.53	.57	.62	.63

Table 6

Inter-Item Correlations of the 6 Items Included in the French and English 6-item De Jong Gierveld Loneliness Scales

Language	Item	EL1	EL2	EL3	SL1	SL2	SL3
French	EL1	-					
	EL2	.26	-				
	EL3	.33	.12	-			
	SL1	.15	-.09	.23	-		
	SL2	.14	-.07	.23	.77	-	
	SL3	.24	.01	.27	.54	.52	-
English							
	EL1	-					
	EL2	.25	-				
	EL3	.42	.09	-			
	SL1	.20	-.03	.29	-		
	SL2	.22	-.03	.35	.64	-	
	SL3	.29	.07	.37	.55	.61	-

Table 7

Divergent Validity Between the DJGLS-6, PDI, and Sociodemographic Data Presented across All Language Samples

Language	Sample	Gender	Age	Marital Status	Number of Children	PDI Bodily Harm and Life Threat Subscale
French	Multinational French	.07	.06	-.09[1]	-.10[1]	.35[3]
	Canada	.18[2]	.05	-.21[3]	-.17[2]	.39[3]
	France	.07	.04	.04	-.03	.31[3]
English	Multinational English	.04	.21[3]	-.18[3]	-.18[3]	.05
	Canada	.07	.20[3]	-.21[3]	-.22[3]	.03
	USA	.02	.22[3]	-.17[3]	-.17[3]	-.02

[1] The Spearman Correlation is statistically significant ($p < .05$)

[2] The Spearman Correlation is statistically significant ($p < .01$)

[3] The Spearman Correlation is statistically significant ($p < .001$)

Table 8

Chi-Square Results of Comparing Sociodemographic Variables of Participants Included vs. Not Included in the French Test-Retest Sub-Sample Using Yates Correction for Continuity

Language	Variable		*N* Test-Retest	*N* Not Included	χ^2	*df*	*p*
French	Gender	Male	65	27	5.17	2	.076
		Female	413	129			
	Marital Status	Single	105	30	5.64	9	.775
		In a Relationship	37	19			
		Married/Common Law	258	84			
		Separated/Divorced /Widowed	51	24			
	Country	France	202	84	7.00	6	.320
		Canada	258	65			
		Other	12	4			
	Age	18-39	154	72	10.11	6	.120
		40-64	271	73			
		65-79	54	11			
		80-100	2	0			

Table 9

Chi-Square Results of Comparing Sociodemographic Variables of Participants Included vs. Not Included in the English Test-Retest Sub-Sample Using Yates Correction for Continuity

Language	Variable		*N* Test-Retest	*N* Not Included	χ^2	df	*p*
English	Gender	Male	107	49	2.30	4	0.681
		Female	433	160			
	Marital Status	Single	117	60	25.94	9	0.002*
		In a Relationship	49	28			
		Married/Common Law	343	118			
		Separated/Divorced /Widowed	43	7			
	Country	Canada	207	87	31.77	15	0.007*
		USA	303	110			
		Other	37	16			
ES	Age	18-39	253	107	11.92	4	0.018*
		40-64	208	83			
		65-79	78	19			
		80-100	4	0			

Table 10

Differences in Test-Retest Performance Categorized by Time Passed Between T3 Survey Distribution and Submission

Language	Sample	Total Range (Days)	Weeks 1-3 (Days 1-21)	Weeks 4-6 (Days 22-42)	Weeks 7-9+ (Days 42+)
French	Multinational	1 - 57	n=255 .64***	n=219 .62***	n=7 .53
	Canada	1 - 52	n=109 .63***	n=147 .66***	n=3 .50
	France	1 - 57	n=135 .62***	n=65 .62***	n=4 .64***
English	Multinational	1 - 71	n=192 .76***	n=293 .68***	n=67 .80***
	Canada	1 - 63	n=100 .79***	n=89 .66***	n=18 .57*
	USA	1 - 71	n=81 .72***	n=180 .68***	n=47 .86***

Note: T3 Surveys were distributed 14 days after T2 distribution. The total range represents how many days passed between T3 survey distribution and survey completion.

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 11
Goodness-of-fit indices for the French (N = 640) and English (N=767) Translations of the DJGLS-6

Language	**Sample**	Bollen-Stine bootstrap χ^2	*df*	*p*	CFI	TLI	SRMR	RMSEA (90% CI)
French	Multinational	61.76	8	< .001	.947	.900	.016	.103 (.080-.127)
	Canada	22.65	8	< .01	.968	.940	.053	.075 (.040-.112)
	France	23.99	8	< .01	.966	.936	.065	.083 (.046-.122)
English	Multinational	48.72	8	< .001	.952	.910	.053	.095 (.007-.118)
	Canada	19.36	8	< .05	.976	.956	.043	.069 (.030-.109)
	USA	43.74	8	< .001	.942	.891	.057	.103 (.075-.134)

Note. Bollen-Stine bootstrap χ^2 cut off *p*-values > .05, CFI (Bentler's comparative fit index) goodness-of-fit cut-off ≥ .90; TLI (Tucker Lewis Index) goodness-of-fit cut-off ≥ .95; SRMR (Standardized root mean square residual) goodness-of-fit cut-off <.08; RMSEA (Root mean square error of approximation) goodness-of-fit cut-off <.08.

Table 11
Spearman's Correlations Between French and English DJGLS-6 and IES-6 Total Scores Examining Conceptual Distress

Language	Sample	Spearman's Correlation	*p*
French	Multinational	.39	<.001
	Canada	.45	<.001
	France	.30	<.001
English	Multinational	.31	<.001
	Canada	.33	<.001
	USA	.26	<.001