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Psychometric Properties of the 10-item Connor-Davidson Resilience Scale Among Finnish Older Adults

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Abstract

Objectives: Resilience, the ability to bounce back after adverse events may be an important factor in active aging. The 10-item version of the Connor–Davidson Resilience Scale (CD-RISC10) seems suitable for aging research owing to its low participant burden; however, its psychometric properties have not been comprehensively reported for older people. For example, no estimate exists of the test-retest reliability of the scale when used with older adults. Hence, this study evaluated the psychometric properties of the CD-RISC10 in a large population-based sample of community-dwelling older people.

Method: The scale's internal consistency, factor structure, construct validity, test-retest reliability, and user experience were analyzed among 1 018 Finnish older adults (57% women) aged 75 (45%), 80 (33%) and 85 years (22%).

Results: The internal consistency of the CD-RISC10 was good (Cronbach's $\alpha = 0.85$), test-retest reliability moderate (ICC = 0.61), and the scale was unidimensional. However, a two-factor solution was found among the 75-year-olds, where the ability to deal positively with change (e.g., using humor) explained an additional part of resilience. While no differences by gender, age, or education were observed in total scores, very good perceived financial situation was associated with higher resilience. The scale showed good construct validity, and user feedback indicated that administering the scale in research is quick and easy.

Conclusion: In general, the CD-RISC10 is a valid method to study older adults' psychological resilience. However, the present test-retest reliability values suggest caution in using the scale as an outcome measure in intervention studies.

Keywords: CD-RISC, resilience, aging, psychometric properties, validation study

Introduction

Individuals differ in their response to adversity. In part, this is due not only to their personal attributes but also to social and environmental factors (Masten & Garmezy, 1985). During recent decades, research interest has shifted away from studying vulnerability towards studying resilience, the ability to adapt positively to adversity (Rutter, 2012). A common definition of resilience entails two central conditions: exposure to a significant threat or adversity and the attainment of positive adjustment (Luthar, Cicchetti, & Becker, 2000). However, some researchers have treated resilience as a coping style. For example, Rutter (2006) has suggested that resilience originates from physiological or psychological coping processes.

Whereas early work on resilience focused on the personal qualities of at-risk children, resilience is currently often described as a dynamic process, in which genetic, biological, psychological, social and cultural factors interact to determine reactions to a threat (Luthar, 2007; Southwick, Bonanno, Masten, Panter-Brick, & Yehuda, 2014). Among older people, resilience has been associated with successful aging (Montross et al., 2006), including better wellbeing, positive attitude, social engagement and fewer cognitive complaints in later life (Lamond et al., 2008). Moreover, older people seem to equal, or even surpass younger people in resilience (Nygren et al. 2005; Gooding, Hurst, Johnson, & Tarrier, 2012). Despite an increasing number of chronic diseases, disability and the loss of loved ones, many older people continue to be satisfied with their lives and exhibit good mental health (Strawbridge, Wallhagen, & Cohen, 2002).

One way to measure resilience is to use self-report questionnaires. In a review of nineteen different resilience measurement scales, the Connor-Davidson Resilience Scale (CD-RISC, Connor & Davidson, 2003), the Resilience Scale for Adults (Friborg, Barlaug, Martinussen, Rosenvinge, & Hjemdal, 2005) and the Brief Resilience Scale (Smith et al., 2008) received the best psychometric ratings (Windle, Bennett, & Noyes, 2011). However,

thus far, the target population in designing resilience measurement scales has been adults or young adults, prompting the question of how well these measures work in the case of older people. It is possible that psychological processes underlying resilience differ between young and older adults, and if so, that different measurement scales could favor certain age groups. For example, older adults may utilize social support more effectively than younger adults, especially in relation to impaired health (Gooding et al., 2012).

This study aimed to evaluate the psychometric properties of the 10-item version of the Conner-Davidson Resilience Scale (CD-RISC10; Campbell-Sills & Stein, 2007) among Finnish older adults. Although the original longer scale has good psychometric properties, a shorter measure was needed to decrease respondent burden during a long research protocol, and hence for this study the shorter version of the CD-RISC was chosen. Both the CD-RISC10 and the Brief Resilience Scale (Smith et al., 2008) have ten or fewer items; in the present study of older people, however, we favored the former as it does not include reverse-scored items. Reverse wording can sometimes have a marked effect on questionnaire results, and the face validity of reverse-scored items can be weak (Henselmans et al., 2011).

The Connor-Davidson Resilience Scale

The original CD-RISC was developed in the United States for clinical practice as a measure of stress coping ability (Connor & Davidson, 2003). The scale has 25 items and, according to the authors, a five-factor structure comprising “personal competence, high standards, and tenacity”, “trust in one’s instincts, tolerance of negative affect, and strengthening effects of stress”, “positive acceptance of change and secure relationships”, “control’, and “spiritual influences” (Connor & Davidson, 2003, p. 80).

The five-factor structure has not always been replicated in later studies. In different populations, researchers have also found one, two, three or four-factor solutions (Yu & Zhang, 2007; Jorgensen & Seedat, 2008; Khoshouei, 2009; Burns & Anstey, 2010; Karaırmak, 2010). Hence, Campbell-Sills and Stein (2007) modified the CD-RISC to enable each factor to be measured reliably and validly to ensure a stable factor structure. The resulting new, shorter CD-RISC10 seems to have good psychometric properties and a unidimensional factor structure among young adults (Notario-Pacheco et al., 2011), middle-aged adults (Blanco, Guisande, Sánchez, Otero, & Vázquez, 2019) and adults aged 20 to 63 years (Wang, Shi, Zhang, & Zhang, 2010). The authors of the shortened scale report a correlation of r = .92 with the original 25-item CD-RISC (Campbell-Sills & Stein, 2007).

However, the reliability and validity of the CD-RISC and CD-RISC10 have rarely been studied among older adults. The CD-RISC has sometimes been applied among people over 60 years old (e.g., Lamond et al., 2008; Serrano-Parra et al., 2013; Zhong et al., 2016), but we found only one study in which the psychometric properties of the CD-RISC10 were assessed with older people (although this study also included persons under age 65). Goins, Gregg and Fiske (2013) studied 160 older American Indians from a single tribe (mean age 68 ± 10 years, 69% female), and reported that the scale showed good internal consistency (Cronbach's α = .88) and convergent validity (r = -.51 for depressive symptoms, r = .45 for self-efficacy, r = .31 for self-mastery, and r = .21 for social support). The one-factor solution showed good fit to the data, and based on various comparisons between the abbreviated and the longer scale, the authors concluded that the shorter scale was a better option for use among older American Indians. Nevertheless, it has hitherto remained unclear how the measure works even among older people. To narrow this research gap, we investigated the psychometric properties of the CD-RISC10 among 75, 80, and 85-year old persons. Typically, many changes in health and function take place around the age of 80 (Ferrucci et

al. 2016), and studying resilience before and after this turning point may help us better understand its role in different critical stages of older age.

In addition to its clear, unidimensional structure, the shorter CD-RISC10 seems a feasible choice as it saves time and places less of a burden on research participants. However, the need remains for a more careful assessment of the scale's psychometric properties. For example, no estimates of the test-retest reliability or floor/ceiling effects of the CD-RISC10 among older people have been published. Hence, the primary aim of the present study was to analyze the psychometric properties, i.e., internal consistency, factor structure, construct validity and test-retest reliability, of the CD-RISC10 among a community-dwelling older population aged 75, 80 and 85 years. The second aim was to examine how easily the CD-RISC10 can be executed among older people by gathering information on user experiences, a practical aspect that is often neglected in evaluations of measurement scales.

Methods

Participants

The present data was from a population-based cohort study titled 'Active ageing – Resilience and external support as modifiers of the disablement outcome (AGNES)'. The protocol of the AGNES study has been described elsewhere (Rantanen et al., 2018). Briefly, participants were community-dwelling people aged 75 (45%), 80 (33%) and 85 years (22%) residing in the city of Jyväskylä in Central Finland. The current population-based sample was formed by drawing the contact details from the national population register. All participants who met the criteria for age and place of residence, and who were willing to participate and able to communicate were included in the study. The aim of the multidisciplinary AGNES study is to identify predictors and consequences of active aging by applying a vast array of measures to

capture such themes as wellbeing, physical activity, resilience, fatigability, environmental support and social engagement, physical and sensory functioning, cognitive capacity, physical health, and mobility.

The overall participation rate of the AGNES study was 36.6%, resulting in 1018 participants. Of those who declined to participate, 865 persons provided data for non-respondent analyses and it was found that they reported poorer health and mobility compared to the participants. In addition, a greater proportion of those who declined were women and lived alone (Portegijs et al. *submitted*). Participants were interviewed in their homes using a Computer Assisted Personal Interviewing technique, along with tests of cognitive and physical functioning. On average, the participants included in the current study had good cognitive function (MMSE mean 27.2, standard deviation 2.4)."

10-item version of the Connor-Davidson Resilience Scale (CD-RISC10)

A member of the research group translated the CD-RISC10 (Campbell-Sills & Stein, 2007) from English into Finnish, after which the translation was carefully discussed in a research group meeting until a consensus was reached. The researchers involved in this process were experts in the fields of psychology, gerontology, education, and sport and health sciences and familiar with the concept of psychological resilience. They all were native Finnish-speakers and fluent in English with some having been employed in academia in English speaking countries and having had academic training in English.

The CD-RISC10 comprises ten items covering different aspects of resilience, such as 'I am able to adapt when changes occur' and 'I tend to bounce back after illness, injury or other hardships'. Trained interviewers read the items aloud and then recorded the answers on a laptop. Participants were provided with a memory aid card, which listed the five

response options, running from 0 (‘Not true at all’) to 4 (‘True nearly all the time’). Response options 1 to 3 were not worded. The total score for the CD-RISC10 is the sum score for all the items (range 0-40). Total scores (no missing items allowed) could be calculated for 958 participants. Of all participants, 6% had missing data.

Construct Validity

Convergent validity

Convergent validity of the CD-RISC10 were studied based on earlier research findings on the mental, social and physical characteristics of resilience in older adults (MacLeod, et al. 2016). In this study, we expected that CD-RISC10 will correlate positively with mental well-being, quality of life, social support, voluntary work, subjective physical health and activity, and physical and cognitive performance. Mental wellbeing was measured with the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985; included in a postal questionnaire answered by the participants before the actual interview), and the Center for Epidemiological Studies Depression scale (CES-D, Radloff, 1977). Quality of life was assessed using the 13-item Older People’s Quality of Life (Bowling, Hankins, Windle, Bilotta, & Grant, 2013) measure. Social support was evaluated with the question ‘My family, friends or neighbors would help me if needed’, answered on a 5-point Likert scale from ‘completely disagree’ to ‘completely agree’. Participants were asked about voluntary work with the question ‘How often do you do voluntary work in an organization, such as voluntary work of associations, the city, your local congregation etc.?’, measured on a 6-point Likert scale from ‘not at all’ to ‘daily’.

Subjective physical health was self-reported in answer to the question ‘How would you rate your current health?’ (5-point Likert scale from ‘very good’ to ‘very bad’). Physical activity was assessed with the modified Finnish version of the Saltin-Grimby

Physical Activity Level Scale (Rantanen, Era, & Heikkinen, 1997; Grimby, 1986). Physical performance was measured with the Short Physical Performance Battery (SPPB, Guralnik et al., 1994) and maximal isometric handgrip strength with a hand-held dynamometer (Rantanen et al. 2003). Cognitive performance was studied with the Mini-Mental State Examination (MMSE, Folstein, Folstein, & McHugh, 1975).

In all analyses, sum scores of the scales were used. We expected resilience to show the strongest association with psychological wellbeing (satisfaction with life, lack of depression) and smaller associations with physical wellbeing (health, physical performance, physical activity).

Structural validity

The structural validity of the CD-RISC was studied with exploratory factor analysis (see Statistical Methods).

Test-Retest Reliability

In order to analyze the test-retest reliability of the scale, the CD-RISC10 was re-administered in the research laboratory to 41 participants (15 men and 26 women). The re-test sample comprised 25 85-year-olds, 15 80-year-olds and one 75-year-old participant. The mean test-retest interval was 11 days (*SD* = 7.07, range 4-42), which is a reasonable time frame to minimize recollection bias and unwanted clinical change (Marx et al. 2003).

User Experience

Six interviewers were asked to complete a structured email questionnaire on their experience of using the CD-RISC-10. They were asked the following ten questions:

- What was learning to use the CD-RISC10 like? Did you practice administering the questionnaire beforehand?

- In general, how did it feel when you were administering the CD-RISC10 (as a part of a longer interview)? Did answering the questions proceed swiftly or slowly? How much time did it usually take with one participant?
- Did the participants understand the items on the scale? Did you have to repeat or elaborate on the items?
- Was it easy for the participants to understand the response options? How much time did the participants spend on pondering the items? In your opinion, was there any item that seemed hard to answer?
- What do you think about the method of administering the questionnaire, i.e., reading the items aloud to the participants and their having the response options on a piece of paper?
- In what situations did you find it impossible to do the questionnaire?
- Do you remember not getting an answer to a specific item? If so, why?
- Did any of the participants comment the questionnaire or individual items?
- How would you assess the reliability of the CD-RISC10 in this age group? Did you notice any differences in how the items were answered between the different age cohorts (75-, 80-, and 85-year-olds)?
- Is there anything else you would like to say about the CD-RISC10?

The responses were categorized into data-driven themes.

Statistical Methods

The distribution of the CD-RISC10 total scores was studied using the Kolmogorov-Smirnov normality test. The associations of gender, age (three cohorts), level of education and financial status on the CD-RISC10 total scores were analyzed with t-tests and ANOVA (Bonferroni post hoc tests). Internal consistency was studied with Cronbach's alpha, Spearman's rhos, mean inter-item correlation, and corrected item-total correlations (ITC).

Exploratory factor analyses were performed using Principal Axis Factoring extraction, Eigenvalues > 1, and Promax rotation, as all the items were correlated. According to the scree plots, the use of smaller Eigenvalues would not have improved the solution. In addition, to verify that our data is suitable for factor analysis, we conducted Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's test of sphericity tests. Factor analyses were performed for the whole sample as well as for stratified samples based on gender and age cohort. Since no differences were found in the gender-based factor analyses, only the factor structures for the different age groups are presented in the results section.

The construct validity of the CD-RISC10 was studied with Pearson correlations and Spearman's Rho (Likert items). As recommended by Koo and Li (2016), the test-retest reliability of total scores was studied with intraclass correlation coefficients (ICC) using two-way mixed-effects, single measure, and consistency. The test-retest reliability of the individual items were studied with weighted Cohen's Kappa, which is especially useful in the case of ordered data (e.g., Ben-David, 2008). All the statistical analyses were conducted using IBM SPSS Statistics 24.

Results

Descriptives

Table 1 shows descriptive statistics of the CD-RISC10 items in the sample of Finnish community-dwelling older adults. The participants used the full range of the scale (0-4) in answering all items except item 2, 'I can deal with whatever comes my way', in which the range was 1-4. The item mean was close to 3, meaning that on the 0-4 scale, participants preferred options 3, 4 and 2. According to the Kolmogorov-Smirnov normality test, the CD-RISC10 total scores were not normally distributed ($p < .001$).

No statistically significant differences by gender, age, or level of education were observed in the CD-RISC10 total scores (range 0-40). The mean total score of the CD-RISC10 was 30.90 for women (*SD* = 5.39) and 31.41 for men (*SD* = 4.90), and 31.43 for the 75-year-olds (*SD* = 5.02), 30.90 for the 80-year-olds (*SD* = 5.15) and 30.73 for the 85-year-olds (S*D* = 5.60). Regarding educational levels, the mean CD-RISC10 total score was 31.3 for those at low level (primary school or less, *SD* = 5.1), 31.2 for those at intermediate level (middle school, folk high school, vocational school or secondary school, *SD* = 5.4), and 30.8 for those at high level (high school diploma or university degree, *SD* = 4.9). However, participants who reported that their financial situation was 'very good' (10%) had a higher resilience score than those who reported their situation as 'good' (49%), 'satisfactory' (37%) or 'poor' (2%) ($F(3) = 7.81$, $p < .001$, all Bonferroni post hoc tests $p < .05$). There were no observable floor or ceiling effects, since none of the participants had the lowest total score (7 was the minimum) and only 4.3% of the participants had the highest total score of 40.

Internal consistency

The internal consistency of the scale was good (Cronbach's $\alpha = 0.85$; acceptable alpha values usually range from 0.70 to 0.95, e.g., Tavakol, & Dennick, 2011). All ten items inter-correlated, indicating that they measure the same construct (Spearman's rho from 0.28 to 0.53, $p < .01$) but are not repetitive (mean inter-item correlation was 0.36, which is within the optimal range of 0.20-0.40; Briggs & Cheek, 1986; Piedmont & Hyland, 1993). The corrected ITC's were moderate to high (range from .461 in item 1 to .611 in item 6) and omitting any item would have not increased the Cronbach's alphas (range .831 to .844) compared to the total Cronbach's alpha. This indicated that all ten items were reasonable to obtain and contribute to the internal consistency of the scale.

Convergent Validity

Correlations between the CD-RISC10 total score and key measures of resilience in old age are shown in Table 2. As expected, higher resilience was associated with higher subjective quality of life and better mental wellbeing (satisfaction with life and lack of depression), suggesting good convergent validity for the scale. Smaller, but significant positive associations of resilience with perceived social support and self-rated health were observed. Weak correlations ($r < .13$) were also observed between the CD-RISC10 total score and voluntary work, physical activity, and physical performance (SPPB). Although the very small correlation between resilience and hand grip strength became statistically significant in our large sample, we consider this association to be irrelevant in practice (the amount of shared variance was 0.86%). Surprisingly, we found no associations between the CD-RISC10 total score and cognitive performance (MMSE).

Structural Validity

The current data as a whole and as stratified by age group were shown to be appropriate for factor analysis (KMO = .909, $p <.001$ for all; KMO = .888, $p <.001$ for 75-year-olds; KMO = .900, $p <.001$ for 80-year-olds; and KMO = .885, $p <.001$ for 85-year-olds). Exploratory factor analysis of the CD-RISC10 items yielded a one-factor solution, which explained 42.96% of the total variance (Table 3). The one-factor solution remained when men and women were tested separately, but not when the different age groups were analyzed. A two-factor solution was found for the 75-year olds, in which the first factor explained 42.72% and the second factor 10.18% of the variance (52.91% cumulative). The correlation between these two factors was $r = .70$. It seems that for the 75-year-olds, the ability to deal with change, use humor, and become stronger from dealing with stress explained an additional component of

resilience. The factor loading of item 7, thinking clearly under pressure, was high on both factors (>.30).

Test-Retest Reliability

ICC of the total scores was 0.615, indicating moderate test-retest reliability (Koo & Li, 2016). According to the weighted Kappas, agreement on individual items was generally fair (0.20-0.40), with the exception of items 1 (‘I am able to deal with change’) and 9 (‘I think of myself as a strong person when dealing with life's challenges and difficulties’), in which agreement was poor and not statistically significant ($p > .05$) (Table 1).

User Experience

All six interviewers said that administering the CD-RISC10 was easy, and that the questionnaire proceeded swiftly, taking only a few minutes. The interviewers reported that the participants understood the items and the response options well and had no need to repeat items. Some interviewers even felt that the participants answered too hastily, as many people preferred the second highest response option. From the interviewer’s viewpoint, reading the items aloud worked well in administering short questionnaire of this type, and the card printed with the response options made answering easier for the participants. However, the interviewers also commented that these participants could most likely have completed the CD-RISC10 independently, for example in the form of a mailed hard copy.

According to the interviewers, items 3 (‘I try to see the funny side of things when I am faced with problems‘) and 6 (‘I believe I can achieve what I want, even when there are problems’) sometimes elicited comments from the participants, or the participants pondered these items more than the others. For example, people had said that while they usually try to see the funny side of things, major negative events during the last few years has

made this impossible. Items 4 (‘Dealing with stress can make me stronger’) and 7 (‘Under pressure, I still think clearly’) were mentioned as difficult to answer for people who had little experience of stress in their lives. On the other hand, one participant refused to answer item 4 because it came too close to his/her life situation, causing discomfort. Finally, some interviewers commented that some participants wanted to avoid boasting, or thought about their answer more carefully because they connected it with bragging or conceit.

Non-completion of the CD-RISC10 was rare. One interviewer remembered skipping the questionnaire because the participant had exhibited difficulty answering previous questions, a lot of time had elapsed in the interview, and the participant seemed tired.

Discussion

The aim of the study was to analyze the reliability and validity of the 10-item version of the Connor-Davidson Resilience Scale among older Finnish adults, aged 75, 80, and 85 years. In general, the scale showed good psychometric properties in this population. Internal consistency was good (Cronbach’s $\alpha = 0.85$), and with the exception of the youngest cohort, the scale was unidimensional, measuring the same single construct of resilience. We found no differences in the CD-RISC10 total scores by gender, age group, or level of education. The test-retest reliability of the scale, which has not previously been estimated among older people, proved to be moderate (ICC = 0.62). The scale showed convergent validity in relation to well-established correlates of resilience in old age, such as quality of life and mental wellbeing (MacLeod et al., 2016), whereas correlations with physical function were also significant but somewhat weaker, as has been found previously as well (MacLeod et al. 2016). Surprisingly, cognitive performance did not correlate with resilience and hence

convergent validity was not shown in respect of cognition. User experience was positive, suggesting that the scale can be implemented quickly and easily in research, and that older people generally understand the items and response options well.

The most worrying aspect of the CD-RISC10 was its test-retest reliability. The authors of the original 25-item scale report a good level of agreement over time (ICC = 0.87; Connor & Davidson, 2003), whereas only moderate agreement has been found for the 10-item version among young people (ICC = 0.71; Notario-Pacheco et al., 2011). In our study of older adults, the test-retest reliability of the CD-RISC10 was even lower than in the aforementioned studies, although still moderate (ICC = 0.62). Hence, we advise caution in interpreting the CD-RISC10 total score as a measure of intervention effectiveness with older people, as the total score for the same participant varied after an interval of only one week. We recommend assessing minimal important change (MIC) in the CD-RISC10 in interventions, since using statistical significance alone in change scores is not always clinically relevant (Windle et al., 2011). It should be noted that our retest sample contained only 41 participants, who were mainly from the older 80- and 85-year-old cohorts. This group was also likely to have been somewhat healthier than the baseline group, since they were able to participate in the laboratory assessments.

Perhaps the most surprising result was the different factor structure of the CD-RISC10 among the 75-year olds, when compared to the 80- and 85-year-olds. In the youngest cohort, a second factor emerged to explain an additional component of resilience: the ability to deal with change in a positive way, such as becoming stronger from dealing with stress and using humor when faced with problems. In Finnish, the meaning of two of the items belonging to this factor could also be back-translated as ‘I *adapt* to changes’ and ‘*Managing/mastering/controlling* stress makes me stronger’. Thus, for the 75-year-olds, coping strategies such as adaptation, use of positive affect, and ‘steeling’ oneself against

adversity, might be important elements of resilience. According to the review by MacLeod et al. (2016), adaptive coping styles are crucial for older adults' recovery from stressful events. However, younger adults typically utilize a greater number of coping strategies than older adults to control worry (Hunt, Wisocki, & Yanko, 2003), and older adults with chronic illnesses are less likely to use active coping strategies (Felton & Revenson, 1987).

Previous findings have been inconsistent on whether women and men have different levels of resilience in old age. Some studies have reported higher resilience scores for women (MacLeod et al., 2016), and others for men (Hardy, Concato, & Gill, 2004) while yet others have found no gender differences (Wells, 2009). We found no effects of socio-demographic factors such as gender, age or education on the CD-RISC10 total score. Nevertheless, we found that participants whose financial situation was very good (10%) portrayed higher levels of resilience than the others. Previously, low income has been associated with resilience because of the higher prevalence of health risk factors, whereas a higher income usually results in a more comfortable and secure life (Wagnild, 2003). These results highlight how resilience cannot be understood solely as an individual trait, but rather as a process involving different resources that can aid a person to overcome adversity (Luthar, 2007; Southwick et al., 2014). Future research should assess whether these resources of resilience differ between younger and older adults.

Strengths of the study

Our study has several notable strengths. First, the population-based sample of 1 018 community-dwelling older adults is larger and more representative than in previous research, which thus far has only studied the psychometric properties of the CD-RISC10 among older people in a sample of 106 American Indians from the same tribe (Goins et al., 2013). It should also be noted that our sample focused specifically on older people and did not include

participants who could be considered middle-aged (as in Lamond et al., 2008; Serrano-Parra et al., 2013, Zhong et al., 2016). Second, as far as we know, our study is the first to assess the test-retest reliability and floor/ceiling effects of the scale among older people. Third, we performed an extensive analysis of the convergent validity of the CD-RISC10 based on several key correlates of resilience in old age (MacLeod et al., 2016), including physical and cognitive tests in addition to validated questionnaires. Finally, we also included a qualitative analysis of user experience in this study to aid future research.

Limitations

The cohort structure of the data is both a strength and a limitation of the study. The data collection was partially harmonized to accommodate future cohort comparisons with data gathered in the 1990s, when 75- and 80-year-old people were studied. The dataset does not represent participants from the full range of 75- to 85-year-olds, but only the three specific ages. In addition, this study does not represent those in the oldest old age either, and hence, psychometric properties of the CD-RISC10 among them should be verified in future studies. Other limitations of the study include the health status and nationality of the participants. Community-dwelling older adults are functional enough to live independently, and thus the results might not represent older people with poor health, low cognitive performance, or limited life-space. Furthermore, cultural differences should be recognized in cross-country comparisons; some of the interviewers commented that the Finnish participants seemed to want to avoid boasting. Despite this, it was interesting that all the participants felt they could ‘deal with whatever comes’ at least in some way, since none of the 970 people selected the lowest response alternative in answering item two.

Conclusion

The CD-RISC10 seems to be a fast, valid and reliable method of studying resilience in older adults. However, it is important to bear in mind that, because the scale focuses on the individual, the role of external factors on a person's ability to bounce back from adversity cannot be deduced from the items. For example, although positive relationships have been consistently associated with better resilience in old age (e.g., Fuller-Iglesias, Sellars, & Antonucci, 2008, Ozbay, Fitterling, Charney, & Southwick, 2008), the CD-RISC10 does not contain items related to social support. It is also important to remember that, by definition, resilience only manifests in relation to a significant adversity (Luthar et al., 2000). Thus, studies focusing on resilience should ideally include evaluation of the hardships the person has faced. Future studies should also clarify whether the test-retest reliability of the CD-RISC10 is as modest among older people as our results indicate and whether unique factors, possibly to do with the use of coping strategies, explain the resilience of 75-year-olds when compared to 80- and 85-year-olds.

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Table 1. Descriptive statistics of the CD-RISC10

		Test			**Retest**			**Test-retest**	
Item	Description	*N*	*Mean*	*SD*	*N*	*Mean*	*SD*	*Weighted Kappa*	*p*
1	I am able to deal with change	972	3.24	0.79	41	3.22	0.61	.167	.176
2	I can deal with whatever comes my way	970	3.41	0.63	41	3.29	0.56	.272*	.032
3	I try to see the funny side of things when I am faced with problems	973	3.28	0.76	41	3.17	0.67	.284**	.010
4	Dealing with stress can make me stronger	965	2.99	0.90	41	2.95	0.63	.213*	.027
5	I tend to bounce back after being sick, injury, or other hardships	970	3.33	0.72	41	3.12	0.75	.270*	.018
6	I believe I can achieve what I want, even there are problems	966	2.99	0.77	41	2.85	0.79	.346*	.002
7	Under pressure, I still think clearly	967	2.88	0.85	41	2.83	0.80	.244*	.018
8	I do not lose hope from failure	968	3.02	0.85	41	2.85	0.62	.287**	.002
9	I think of myself as a	971	2.96	0.87	41	2.78	0.79	.198	.053

	strong person when dealing with life's challenges and difficulties								
10	I am able to handle unpleasant or painful feelings like sadness, fear and anger	971	3.05	0.80	41	3.07	0.69	.370**	<.001
	Total sum score (0-40) (min = 7, max = 40)	**958**	**31.11**	**5.19**	**41**	**30.12**	**3.82**	**ICC = .615****	**<.001**

Note. ICC = intraclass correlation (two-way mixed-effects, single measure, consistency). * = statistically significant at the 0.05 level. ** = statistically significant at the 0.01 level.

Table 2. Convergent validity of the CD-RISC10.

CONVERGENT VALIDITY	Item type	*N*	*r*
Quality of life			
Older People's Quality of Life (13 items)		946	.531
Mental wellbeing			
Satisfaction with Life Scale		906	.362
Center for Epidemiological Studies Depression scale		955	-.426
Social support			
“My family, friends or neighbors would help me if needed’	5-Likert: completely disagree - completely agree	947	.233
Voluntary work			
“How often do you do voluntary work in an organization, such as voluntary activity in associations the city, your local congregation etc.?’	6-Likert: not at all - daily	921	.127
Subjective physical health and activity			
“How would you rate your current health?’	5-Likert: very good - very bad	958	-.204
Saltin-Grimby Physical Activity Level Scale		950	.122
Physical performance			
Short Physical Performance Battery		953	.129
Hand grip strength		950	.093 (p = .004)
Cognitive performance			
Mini-Mental State Examination		954	-.018 (p = .587)

Note. Pearson correlations were calculated for scale items and Spearman's Rho for ordinal items. Statistical significance of all the correlations in the table was $p < .001$, unless marked otherwise.

Table 3. Factor loadings of the CD-RISC10 in different age groups.

		75-year-olds			**80-year-olds**		**85-year-olds**		**All three cohorts**
		52.91% of variance explained			43.00% of variance explained		43.79% of variance explained		42.96% of variance explained
Item	N	Factor 1 (42.72%)	Factor 2 (10.18%)	N	Factor 1	N	Factor 1	N	Factor 1
1	449		0.778	323	0.539	200	0.487	972	0.502
2	447	0.301		323	0.654	200	0.590	970	0.580
3	449		0.459	323	0.487	201	0.630	973	0.531
4	447		0.544	321	0.588	197	0.637	965	0.606
5	446	0.564		323	0.616	201	0.489	970	0.540
6	445	0.600		323	0.708	198	0.631	966	0.671
7	447	0.397	0.317	323	0.665	197	0.663	967	0.664
8	447	0.812		322	0.567	199	0.657	968	0.647
9	448	0.769		323	0.638	200	0.626	971	0.652
10	448	0.467		323	0.572	200	0.693	971	0.641

Note. The extraction method was Principal Axis Factoring and the rotation method applied to the data on the 75-year-olds was Promax with Kaiser Normalization. Three iterations were required for the 75-year-olds and four for the other three groups. Factor loadings under 0.30 have been omitted from the table.