Geriatric Depression Scale – 30 assessments: face-to-face or telephone interviews for older people – a randomized crossover study

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▌Abstract

Introduction and Objective. The Geriatric Depression Scale – 30 (GDS-30) for detecting depressive disorders provides an objective and reliable outcome measure validated by many studies and scientific articles. The aim of the study was to compare the concordance of measurements using the GDS-30 conducted in face-to-face and telephone interviews.
Materials and method. The study design was approved by the Bioethical Committee of the University of Rzeszów (Resolution No. 2022/075). Study participants were community-dwelling older people in south-eastern Poland, aged 60 years and over, with a normal cognitive status. They were divided into 2 groups, each examined with the Geriatric Depression Scale – 30 questionnaire. The first group (G1) was examined first by means of direct contact (A), and the second group (G2) by telephone (B). After an average period of 2 weeks, the study was repeated, this time swapping the method of contact: in G1 telephone contact (B) was used, in G2 face-to-face contact (A).
Results. The study involved a group of 225 people (128 women and 97 men), mean aged 68.2 years, randomly divided into the 2 groups (G1 and G2). Cohen's kappa coefficient analysis showed good (14 questions) to very good (16 questions) concordance for individual responses to questions. Analysis of Krippendorf's alpha coefficient values showed very good concordance for results on the whole questionnaire. Good concordance of the means of measurement was also confirmed by the Bland and Altman method, where more than 95% of the sample was within the 95% concordance limits.
Discussion and Conclusions. Findings of the study showed that the GDS-30 questionnaire had a high compliance in both face-to-face and telephone surveys.

▌Key words
depression, Geriatric Depression Scale, aged, telehealth, telemedicine, face-to-face interview

INTRODUCTION

Depression is a serious public health problem which is very common in the elderly population. In a meta-analysis, Zenebe et al. found that the mean expected prevalence of depression among the elderly was 31.74%, with a higher prevalence in among the developing countries (40.78%) than in developed countries (17.05%) [1].

Depression is prevalent among older people living in different demographic regions, with some sources indicating a higher risk of depression in older people living in rural areas [2]. Factors that increase the risk of depression in rural areas include less frequent contact with friends or family members than in urban areas [3]. Higher prevalence of depression is also associated with limited access to primary health care for older people living in rural areas due to difficult access to public transport, scattered settlements, low income, lower education, long distances to medical facilities and skilled medical staff [4].

Depression in old age is a risk factor for later dementia [5, 6] and frailty syndrome [7]. The presence and persistence of depressive symptoms in older people increases the incidence of chronic diseases, the risk of disability and frailty syndrome, leading to reduced quality of life and higher mortality [8–10].

Health care costs are estimated to be significantly higher for older people with depression [11–14]. Since the treatment

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of depressive disorders in older age is effective, it is important to detect depressive disorders early and initiate appropriate therapy, especially for the elderly [15].

An important problem associated with depression in older age is its low detection rate. This is due to several reasons, including older people's fear of being labelled as 'mentally ill', the increase in somatic illnesses making the diagnosis of depressive disorders difficult, the occurrence of so-called 'masked depression', which is difficult to diagnose, and confusion of depression with dementia, etc. It 9is probable that about 40% of cases remain undiagnosed [16].

Improved detection and treatment protocols may help reduce the burden that depressive disorders place on the healthcare system, and screening assessment for the presence of depressive symptoms should be an essential component of holistic geriatric assessment in older people. The Geriatric Depression Scale 30-item (GDS-30) is a simple, valid and reliable screening tool for assessing the severity of depressive symptoms in the elderly [17]. Albański et al. assessed the psychometric properties and usefulness of various language versions of the GDS, and concluded that due to its very good parameters, this scale should be employed as a useful screening tool, identifying who should undergo a more detailed clinical diagnosis [18].

The results of measurements obtained with the GDS-30 have been standardised and transferred to the scale of the International Classification of Functioning, Disability and Health (ICF) b152 category (Emotional functions) in order to deal with information more effectively in healthcare systems, and make it possible to compare their findings at national or international levels [19].

The COVID-19 pandemic [20] has had an impact on the increase in psychological problems such as stress, anxiety, and depression [21]. It has also had a significant impact on the development of telemedicine, both in Poland and worldwide, providing broader and faster access to medical services, increasing patient safety, and reducing the risk of infection for both the patient and medical staff [22]. Remote teleconsultation is a telemedicine tool that allows the remote diagnosis and treatment of a patient, and when conducted correctly contributes to faster access to medical information, improves the quality of healthcare, and increases trust in medical staff. Questionnaires in telemedicine are the preferred assessment method [23], and according to research, the number of telephone consultations has increased more than six-fold since 2020 [24].

The pandemic has also had a significant impact on the development of many areas within telemedicine and telerehabilitation [25], including the growth of medical telephone consultations. This raises the need to assess the reliability of measurements with the interview tools used during teleconsultation.

The creation of programmes targeting older people, especially those living in rural areas, aimed at the early detection of depression, early implementation of treatment, prevention of dementia and frailty syndrome are important measures that the health care system must encourage [2]. This is particularly important in Poland, which is projected to have the worst demographic burden rate among EU countries by 2100 [26].

The aim of the study was to compare the concordance of measurements using the GDS-30 carried out in a face-to-face and telephone interviews.

MATERIALS AND METHOD

Study design. The study was randomized, open-label and crossover, with 2 study periods (sequences AB/BA) and 4 assessment points.

Participants and setting. The study was carried out among community-dwelling older people in south-eastern Poland, using the Geriatric Depression Scale – 30 points (GDS-30), conducted using a diagnostic survey method. Respondents were recruited using the snowball samplin*g method. Inclusion criteria were: age 60 years and over, normal cognitive status (Abbreviated Mental Test Score – AMTS > 6 points), and informed consent to participate in the study. Exclusion criteria were: age less than 60 years, cognitive decline (AMTS ≤ 6 points), or no consent to participate in the study. The study was performed between 15 June 2022 – 15 November 2022. Recruited subjects were randomly allocated to groups G1 and G2. In the first group (G1), respondents answered face-to-face (A) first, and than responded by telephone (B) in the second survey. In the second group (G2), respondents answered first by telephone (B) and then face-to-face (A). Survey 2 took place after an average of 2 weeks had elapsed since the first survey.

Data collection. An abbreviated version of the AMTS questionnaire was used to assess cognitive status, one of the inclusion or exclusion criteria of the study [16]. The tool assessed in the study was the Geriatric Depression Scale – 30 points (GDS-30), which assessed the prevalence of depression in older people, and consists of 30 short, closed questions (yes/no) assessing mood, motivation, the presence of somatic symptoms and self-perception. The standard key used in the analysis of responses determines the presence of major depression with a score of 21 – 30 points: 11 – 20 points indicate mild depression, a score of up to 10 points allows the exclusion of depression [27]. In addition, the survey was supplemented by an interview questionnaire containing a metric and questions on health and self-assessment of quality of life.

In the first survey, information was collected on socio-economic variables: age, gender, place of residence, marital status, number of people in the household, and basic health information (presence of chronic diseases diagnosed by a doctor, number of medications per day). In surveys one and two, information was also collected on pain levels using the Visual Analog Scale (VAS) and self-assessment of quality of life (QOL) by asking the questions: How do you assess your quality of life?' Possible answers: 'very good', 'good', 'neither good nor bad', 'bad', or 'very bad'.

In the second survey, questions were also asked about the occurrence of adverse events in respondents personal lives in the period since the first survey, such as the death of a loved one, or significant changes in health status, such as an accident with injury, diagnosis of a serious illness, etc., which would clearly have altered the respondent's mental state. Individuals with the described events were excluded from further analysis.

Sample Size. Calculated using Statistica 13 software (TIBCO Software Inc., Palo Alto, CA, USA). Statistica, version 13 (http://statistica.io). A sample size of 203 participants required having 95% of samples within Bland-Altman

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limits of agreement, with an acceptable error of 3%. With an expected loss in follow-up or percentage of missing values of at most 20%, the sample size was estimated to be 254 subjects.

Statistical analysis. A flow chart depicting the recruitment of the study group was developed (Fig. 1). For the socio-demographic variables characterizing the subjects, the number and percentage (%) for categorical variables or the mean ± standard deviation (SD) for numeric variables were given. The Chi-square test was used to assess the significance of differences between the results describing the socio-demographic variables characterizing the subjects in each group for categorical variables. The Mann-Whitney U test was used for measurable variables. The normality of the distribution of the measurable variables was tested using the Shapiro-Wilk test. In the main analysis, the degree of agreement between the 2 methods of measurement for each question was measured by the percentage of participants who gave the same answer for both methods of measurement. Statistical significance of the differences in the results obtained by the different methods was examined using the McNemar test. For the combined GDS-30 score, the statistical significance of the difference in the results obtained in the 2 surveys was verified using the Wilcoxon test. Cohen's kappa coefficient was used to assess the concordance of the results obtained for the individual questions, and Krippendorf's alpha coefficient was used for the combined score. The level of concordance was interpreted as: ≤0.20 – poor concordance of methods, 0.21–0.40 – fair concordance of methods, 0.41–0.60 – moderate concordance of methods, 0.61–0.80 – good concordance of methods, ≥ 0.81 – very good concordance of methods [28]. A significance level of $p < 0.05$ was adopted.

To assess the concordance between the measurements obtained by the 2 methods of summed results, the Bland-Altman method was used [29]. For the results obtained, the mean difference between the total results, together with the standard deviation, the smallest and largest difference and the 95% concordance range were determined. A good concordance of the methods was considered to be one for which the percentage outside the concordance range did not exceed 5% [30]. The impact of individual socio-demographic variables on a 2-dimensional variable (the fact of obtaining good agreement between the 2 versions of the questionnaire) was examined using univariate logistic regression models. Results were presented as OR parameter values with 95% confidence intervals. Analyses were performed using Statistica 13 software (TIBCO Software Inc. (2017). Statistica, version 13 (http://statistica.io).

Ethics approval. The study design was approved by the Bioethical Committee of the University of Rzeszów (Resolution No. 2022/075) and undertaken in accordance with the Helsinki Declaration. The participants were provided with information about the purpose and course of the study, gave written consent to participate, and were informed about the possibility of withdrawing from the study at any stage.

RESULTS

A total of 257 participants were selected and randomized for the study (Fig. 1). Based on the assessment by the AMTS test, 249 subjects with a total score of at least 7 were eligible
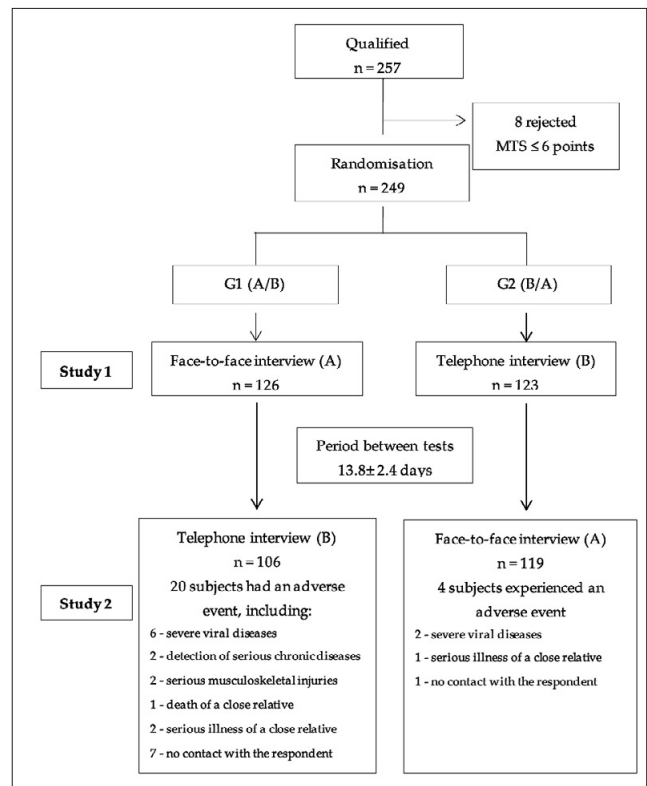
Figure 1. Flow diagram of the study population

for the first study. The results from 225 people (90.36% of participants in the first study) were qualified for the second study. The study participants (N=225) were 128 women and 97 men with the mean age of 68.2 years. These individuals were randomized by allocation to G1 and G2. The differences in the number of subjects qualified for the second study are due to the elimination of those subjects who had an adverse event between the studies that significantly affected assessment of their emotional state, or lack of contact with the subject.

The proportion of subjects whose results were not analysed was higher in group 1 (n = 20/126, 15.87%) than in group 2 (n = 4/123, 3.25%). The interval between the 2 surveys was 13.8 ± 2.4 days (14.1 ± 2.9 in group 1 and 13.4 ± 2.1 in group 2). The mean age in the study population was 68.2 ± 5.5 years, with 67.8 ± 5.2 years in group one and 68.6 ± 5.8 years in group 2. The study group was characterised by a higher proportion of women (128; 56.89%) compared to men (97; 43.11%). The study population was dominated by those in a relationship (144; 64.00%) and living in rural areas (118; 52.44%). The average number of illnesses in the study population was 4.85 ± 3.06, and the average subjectively perceived level of pain as measured by the VAS scale was 3.94 ± 2.05 points. The study group was dominated by those taking 2 or more medications (144; 64.00%) and those assessing their quality of life as at least 'good' (148; 65.78%). The AMTS score in the study population was 9.65 ± 0.76 points. The groups analysed were not statistically significantly different in terms of the socio-demographic characteristics considered, except for marital status and number of persons in the household (Tab. 1).

For the 30 questions in the GDS-30 questionnaire, the percentage of concordant responses given by the subjects during the first and second surveys ranged from 87.56% (Question 2) to 96.00% (Question 1 and Question 15). There

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Table 1. Socio-demographic characteristics of the study group

Socio-demographic characteristics (N = 225)	Total	G 1 (n = 106)	G 2 (n = 119)	p-value
1. Age (mean, SD)	68.2 (5.5)	67.8 (5.2)	68.6 (5.8)	0.410 [a]
2. Gender n (%)				
Women	128 (56.89)	61 (57.55)	67 (56.30)	0.851 [b]
Men	97 (43.11)	45 (42.45)	52 (43.70)	
3. Marital status n (%)				
Free	81 (36.00)	30 (28.30)	51 (42.86)	0.023 [b]
In view of	144 (64.00)	76 (71.70)	68 (57.14)	
4. Place of residence n (%)				
City	107 (47.56)	49 (46.23)	58 (48.74)	0.706 [b]
Village	118 (52.44)	57 (53.77)	61 (51.26)	
5. Number of persons in the household (mean, SD)	2.92 (1.55)	3.15 (1.59)	2.72 (1.50)	0.042 [a]
6. Number of diseases (mean, SD)	4.85 (3.06)	5.10 (3.00)	4.63 (3.12)	0.184 [a]
7. Number of drugs per day n (%)				
0–1	81 (36.00)	36 (33.96)	45 (37.82)	0.548 [b]
2 and over	144 (64.00)	70 (66.04)	74 (62.18)	
8. VAS pain level (mean, SD)	3.94 (2.05)	4.22 (1.98)	3.70 (2.09)	0.051 [a]
9. Self-assessment of QOL n (%)				
At most, neither good nor bad	77 (34.22)	37 (34.91)	40 (33.61)	0.838 [b]
At least good	148 (65.78)	69 (65.09)	79 (66.39)	

(a) Mann-Whitney U test; (b) Chi-square test

were no statistically significant differences between the responses in both the face-to-face and telephone survey in terms of individual questions or the total score derived from them. Cohen's kappa coefficient values ranged from 0.70 (Question 19) to 0.95 (Question 3). The results indicated a good level of agreement between the answers obtained for 14 questions and a very good one for 16 questions. The value of Krippendorf's alpha coefficient determined by the combined result was 0.95, indicating a very good agreement between the combined results obtained from the face-to-face and telephone interviews (Tab. 2).
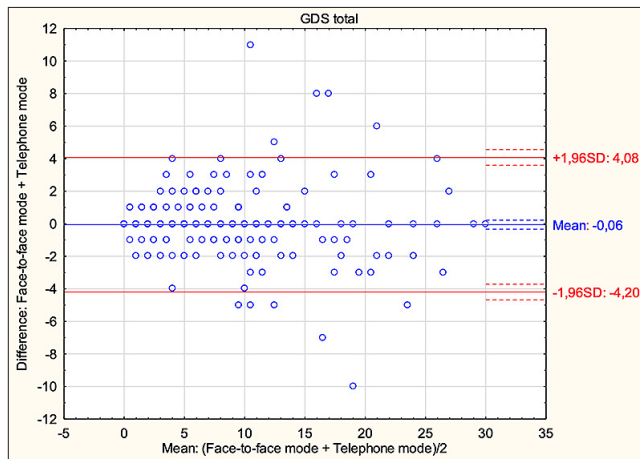
The mean difference between the combined GDS-30 scores received directly and by telephone, determined by the Bland and Altman method, was -0.06, with a standard deviation of 2.11. The smallest absolute difference between the scores obtained in the 2 surveys was 0, while the largest – 11 points. The scores of 95.11% of the 225 respondents were within the 95% agreement range of -4.20 – 4.08 points. The values obtained indicate good agreement between the measurement methods obtained for both test modalities (Fig. 2).

It was investigated whether the study characteristics such as age, gender, marital status, place of residence, number of people in the household, number of chronic diseases, number of medications per day, VAS pain level and quality of life, influenced the chances of fitting within the 95% limits of the Bland and Altman agreement. One-factor logistic regression models showed that none of the characteristics analysed was a significant independent predictor of the chance of good concordance of results (Tab. 3).

Table 2. Evaluation of compatibility of the 2 ways of completing the GDS-30 questionnaire

GDS-30 - questions	Answers in accordance n (%)	p-value	Concordance level
Question 1 *Are you basically satisfied with your life?*	216 (96.00)	1.000 [a]	0.77 [c]
Question 2. *Have you dropped many of your activities and interests?*	197 (87.56)	0.850 [a]	0.74 [c]
Question 3: *Do you feel that your life is empty?*	221 (98.22)	0.617 [a]	0.95 [c]
Question 4: *Do you often feel bored?*	211 (93.78)	0.789 [a]	0.87 [c]
Question 5: *Are you hopeful about the future?*	212 (94.22)	1.000 [a]	0.84 [c]
Question 6: *Are you bothered by thoughts you can't get out of your head?*	206 (91.56)	0.359 [a]	0.81 [c]
Question 7: *Are you in a good spirit most of the time?*	202 (89.78)	0.095 [a]	0.85 [c]
Question 8: *Are you afraid that something bad is going to happen to you?*	209 (92.89)	0.803 [a]	0.86 [c]
Question 9: *Do you feel happy most of the time?*	210 (93.33)	1.000 [a]	0.78 [c]
Question 10: *Do you often feel helpless?*	211 (93.78)	0.423 [a]	0.86 [c]
Question 11: *Do you often get restless and fidgety?*	199 (88.44)	0.845 [a]	0.75 [c]
Question 12: *Do you prefer to stay at home rather than go out and do things?*	208 (92.44)	0.628 [a]	0.84 [c]
Question 13: *Do you frequently worry about the future?*	206 (91.56)	0.359 [a]	0.83 [c]
Question 14: *Do you feel that you have more problems with memory than most?*	208 (92.44)	0.628 [a]	0.81 [c]
Question 15: *Do you think it is wonderful to be alive now?*	216 (96.00)	1.000 [a]	0.77 [c]
Question 16: *Do you often feel downhearted and blue?*	212 (94.22)	0.579 [a]	0.80 [c]
Question 17: *Do you feel pretty worthless the way you are now?*	213 (94.67)	0.387 [a]	0.71 [c]
Question 18: *Do you worry a lot about the past?*	212 (94.22)	1.000 [a]	0.87 [c]
Question 19: *Do you find life very exciting?*	211 (93.78)	0.061 [a]	0.70 [c]
Question 20: *Is it hard for you to get started on new projects?*	203 (90.22)	0.522 [a]	0.80 [c]
Question 21: *Do you feel full of energy?*	206 (91.56)	1.000 [a]	0.83 [c]
Question 22: *Do you think that your situation is hopeless?*	215 (95.56)	0.114 [a]	0.78 [c]
Question 23: *Do you think that most people are better off than you are?*	214 (95.11)	1.000 [a]	0.75 [c]
Question 24: *Do you frequently get upset over little things?*	211 (93.78)	0.182 [a]	0.86 [c]
Question 25: *Do you frequently feel like crying?*	212 (94.22)	0.267 [a]	0.72 [c]
Question 26 *Do you have trouble concentrating?*	214 (95.11)	1.000 [a]	0.90 [c]
Question 27: *Do you enjoy getting up in the morning?*	210 (93.33)	0.606 [a]	0.79 [c]
Question 28: *Do you prefer to avoid social gatherings?*	213 (94.67)	0.773 [a]	0.86 [c]
Question 29: *Is it easy for you to make decisions?*	201 (89.33)	0.307 [a]	0.78 [c]
Question 30: *Is your mind as clear as it used to be?*	210 (93.33)	0.302 [a]	0.87 [c]
GDS-30 - total	-	0.435 [b]	0.95 [d]

(a) McNemar test; (b) Wilcoxon test (a test comparing a telephone interview with a face-to-face interview); (c) Cohen's kappa; (d) Krippendorf's alpha

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Figure 2. Bland-Altman plot comparing the results of the GDS-30 – study 1, and GDS-30 – study 2

Table 3. Relationship between characteristics of the surveyed and the odds to be included in the 95% limits of the Bland and Altman agreement.

Trait		OR	95%CI		p-value
Age	[years]	1.043	0.868	1.253	0.656
Gender	Women	1.000	ref.		0.910
	Men	1.112	0.178	6.948	
Marital status	Free	1.000	ref.		0.111
	In view of	5.396	0.678	42.964	
Place of residence	Village	1.000	ref.		0.775
	City	1.306	0.209	8.150	
No. of persons in the household		2.413	0.901	6.462	0.080
No. of diseases		0.888	0.673	1.173	0.405
No. of drugs per day	0-1	1.000	ref.		0.529
	2 and more	0.511	0.063	4.124	
VAS pain level	[points]	0.725	0.456	1.154	0.175
Self-assessment of Qol	At most, neither good nor bad	1.000	ref.		0.329
	At least good	1.985	0.501	7.865	

OR – odds ratio ; CI – confidence interval

DISCUSSION

In this randomized crossover study, depression screening performed in a face-to-face interview was compared with a telephone-based survey. To the best of the authors' knowledge, this is the first study to assess the concordance between face-to-face and telephone interview measures using the GDS-30. It was found that both surveys provided a comparable measure of the emotional state of older people when there were no adverse events significantly affecting the scores between measurements. Comparing the total score of the GDS-30 with both survey modalities, analysis of Cohen's kappa coefficients showed agreement ranging from 'good' (14 questions) to 'very good' (16 questions) for responses to individual questions. Analysis of Kripendorf's alpha coefficient values showed very good concordance for results on the entire questionnaire. Good concordance of measured values was also confirmed by the Bland and Altman method, where more than 95% of the sample ranged

within 95% of concordance limits. The present study has extended the findings of previous studies which compared telephone and face-to-face interviews with the assessment of functional status or cognitive impairment in older people on different scales. The obtained results showed that the telephone interview provided an appropriate method of data collection [31–34]. Some studies have included small sample sizes and often used correlation to compare different survey modalities instead of assessing the degree of concordance which, following Dauphinot et al., is a more appropriate methodology to achieve the objective [35].

Bednorz et al. indicated that the results of assessing the occurrence of depression during videoconferencing are comparable for diagnoses made in an office setting [36]. Although telemedicine diagnosis is not intended to completely replace the gold standard of face-to-face assessment, if used appropriately, it can expand the scope of practice, especially when barriers to standard clinical assessment arise [37], such as impaired access to medical care for older people living in rural areas. There is undoubtedly a future in telemedicine. It may not replace the basic face-to-face examination, but it will certainly be perfect for screening diagnoses to reach a wider group of patients in need of help. It is very important to use standardised tools in screening diagnoses with which reliable telephone contact testing can be carried out. The collected results, structured by information systems, will allow for rapid assistance and, where necessary, range extension of the diagnosis. The aggregation of data will also allow for the development of more effective systemic health care solutions and programmes.

Strengths and limitations. To the best knowledge of the authors, this is the first study to compare the personal administration of the GDS-30 by telephone. The randomized crossover study design allowed the demonstration that the order of the study (AB/BA) did not affect the magnitude of compliance. This study was supplemented by a set of adverse events that could occur between assessments. The study was conducted among 87.5% of the selected participants, and participant loss occurred before each assessment. As this loss had been anticipated, the sample size was adjusted a priori. Despite the random selection into the G1 and G2 groups, differences in marital status and number of people in the household were found between the groups. Since these characteristics were not related to the difference between the GDS-30 measurements, it is believed that this did not affect the results.

CONCLUSIONS

Taken together, the findings of this randomized crossover study provide evidence that measurements taken with the GDS-30 over the telephone can be considered as consistent with those taken during a face-to-face interview. Therefore, a telephone survey using the GDS-30 could be implemented in clinical practice to assess the emotional state of older people. The GDS-30 should be used as a useful screening tool identifying who should undergo a detailed clinical diagnosis. Due to the high incidence of depression among older people in Poland, screening for depression is recommended. The relatively low cost of the test carried out by telephone interviews and its high effectiveness in detecting psycho-

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emotional problems are important, both in the treatment of depression itself, as well as the effectiveness of clinical interventions conducted due to the occurrence of other health problems in older people. The introduction of screening for depression using a telephone interview could translate into improved health of the elderly population in Poland.

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