JADARA

Volume 55 | Number 3 Article 2

9-2023

Addressing the Need for Depression Inventories in American Sign Language

Josephine F. Wilson
Wright State University Boonshoft School of Medicine

Michelle Niehaus
Kentucky Cabinet for Health and Family Services

Jared A. Embree
Wright State University Boonshoft School of Medicine

Deb S. Guthmann
Wright State University Boonshoft School of Medicine

Steven R. Sligar
East Carolina University

See next page for additional authors

Addressing the Need for Depression Inventories in American Sign Language

Cover Page Footnote

We have no known conflicts of interest to disclose. The development and field-testing of these inventories was funded by a National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR) Disability and Rehabilitation Research Projects (DRRP) grant # 90DP0067.

Authors

Josephine F. Wilson, Michelle Niehaus, Jared A. Embree, Deb S. Guthmann, Steven R. Sligar, Janet C. Titus, Annie Welch, and Kathy Taylor

Addressing the Need for Depression Inventories in American Sign Language

Josephine F. Wilson[1]
Michelle Niehaus[2]
Jared A. Embree[3]
Debra Guthmann[4]
Steven R. Sligar[5]
Janet C. Titus[6]
Annie Welch[7]
Kathryn C. Taylor[8] [1]

[1] Author notes: 1Josephine F. Wilson, D.D.S., Ph.D., Professor, Department of Population & Public Health Sciences, Boonshoft School of Medicine, Wright State University (WSU), Dayton, OH. Email address: josephine.wilson@wright.edu 2Michelle Niehaus, Program Administrator, Deaf and Hard of Hearing Services, Division of Behavioral Health, Kentucky Cabinet for Health and Family Services, Lexington, KY. Email address: Michelle.Niehaus@ky.gov 3Jared Embree, M.A., Project Manager, Substance Abuse Resources and Disability Issues (SARDI) Program, Department of Population & Public Health Sciences, Boonshoft School of Medicine, WSU, Dayton, OH. Email address: jared.embree@wright.edu 4Deb Guthmann, Ed.D., NIC, Lead Project Consultant, SARDI Program, Department of Population & Public Health Sciences, Boonshoft School of Medicine, WSU, Dayton, OH. Email address: dguthmann@aol.com 5Steven R. Sligar, Ed.D., CVE, Professor Emeritus, Department of Addictions and Rehabilitation Studies, College of Allied Health Sciences, East Carolina University, Greenville, NC. Email address: sligars@ecu.edu 6Janet C. Titus, Ph.D., Research Consultant: Psychometrics, Deafness, and Linguistic Adaptation, SARDI Program, Department of Population & Public Health Sciences, Boonshoft School of Medicine, WSU, Dayton, OH. Email address: philo1998@hotmail.com 7Annie Welch, M.A., Department of Human Services, Wright State University (WSU), Dayton, OH. Email address: annie.welch@wright.edu 8Kathryn Copley Taylor, AAS, BA, NAD III, Project Coordinator, SARDI Program, Department of Population & Public Health Sciences, Boonshoft School of Medicine, WSU, Dayton, OH. Email address: kathryn.taylor@wright.edu

Addressing the Need for Depression Inventories in American Sign Language

Abstract

Using state-of-the-art techniques, the authors interpreted two commonly used depression inventories, the revised Beck Depression Inventory (BDI-II) and Patient Health Questionnaire–9 (PHQ-9), into American Sign Language (ASL): BDI-II-ASL and PHQ-9-ASL, respectively. A national sample of 361 deaf individuals who preferentially use ASL completed the BDI-II-ASL and PHQ-9-ASL online. BDI-II-ASL and PHQ-9-ASL scores were significantly and positively correlated. The results showed no significant differences in scores due to gender, Deaf cultural identification, race, ethnicity, or employment status. However, the results did show that less education was significantly associated with higher depression scores. The BDI-II-ASL and PHQ-9-ASL require norming in a comparative study of a confirmed diagnostic group and healthy control group.

Keywords

depression, Beck Depression Inventory (BDI-II), Patient Health Questionnaire (PHQ-9), deaf

Disclosure Statement

The authors report no conflict of interest.

Acknowledgement

The development and field-testing of these inventories was funded by a National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR) Disability and Rehabilitation Research Projects (DRRP) grant—# 90DP0067.

Author contact information: Josephine F. Wilson, D.D.S., Ph.D., Professor, Department of Population & Public Health Sciences, Boonshoft School of Medicine, Wright State University, 2555 University Blvd, Room 239W, Fairborn, OH 45324. Email address: josephine.wilson@wright.edu.

Authors

Josephine F. Wilson, D.D.S., Ph.D., Boonshoft School of Medicine, Wright State University
Michelle Niehaus, MSW, Kentucky Cabinet for Health and Family Services

Jared A. Embree, MA, Boonshoft School of Medicine, Wright State University
Debra Guthmann, Ed.D.,NIC, Boonshoft School of Medicine, Wright State University
Steven R. Sligar, Ed.D., CVE, East Carolina University
Janet C. Titus,Ph.D., Boonshoft School of Medicine, Wright State University
Annie Welch, MA, Boonshoft School of Medicine, Wright State University
Kathryn C. Taylor, AAS, BA, NAD III, Boonshoft School of Medicine, Wright State University

Addressing the Need for Depression Inventories in American Sign Language

Individuals who exhibit or complain of signs or symptoms of depression should be routinely screened for depression. The most commonly used depression inventories are normed for hearing individuals and are subject to interpreters or clinicians inappropriately or inadequately communicating assessment items (Connolly et al., 2006; Dreyzehner & Goldberg, 2019; Estrada, 2012; Leigh et al, 1989; Rostami et al., 2014; Zazove et al., 2006). Investigators from North America, Europe, Africa, and Asia have reported higher rates of depression in deaf[2] individuals compared to hearing individuals (Adigun, 2017; Dreyzehner & Goldberg, 2019; Estrada, 2012; Fellinger et al., 2012; Kim et al., 2017; Kvam et al., 2007; Leigh et al., 1989; Li & Hoffman, 2014; Rostami et al., 2014; Theunissen et al, 2011; Turner et al., 2007; Zazove et al., 2006). Many of these investigators have suggested that higher rates of depression may be due to the use of audiocentric diagnostic instruments (Connolly et al., 2006; Dreyzehner & Goldberg, 2019; Estrada, 2012; Leigh et al, 1989; Rostami et al., 2014; Zazove et al., 2006).

Two of the most commonly used depression inventories are the Beck Depression Inventory (BDI; Beck et al., 1961) and the Patient Health Questionnaire–9 (PHQ-9; Spitzer et al., 1999; Maurer, 2012; Urtasun et al., 2019). The BDI was revised and reintroduced in 1996 as the BDI-II, a self-administered, 21-item depression inventory (Beck et al., 1996). Until the development of the PHQ-9, the BDI-II was the most widely used depression inventory worldwide (Kerr & Kerr, 2001). The BDI-II has been reported to demonstrate satisfactory sensitivity and specificity for depression in patients with cardiovascular disorders, chronic

[2]We have elected to use *deaf* with a lowercase "d" in an all-encompassing manner to reflect the diversity within the deaf population. We follow the examples set by the National Association for the Deaf (https://www.nad.org/), a deaf consumer organization, and the National Deaf Center on Postsecondary Outcomes (https://www.nationaldeafcenter.org/). In this paper, "deaf" refers to individuals who self-identify as deaf or hard of hearing. The use of *Deaf* with an uppercase "d" refers to persons who self-identify as culturally Deaf; that is, people who identify as Deaf community members, go to all-deaf events, have used ASL since they were young, and have a strong deaf identity.

kidney disease, chronic respiratory disorders, cancer, neurological disorders, eating disorders and obesity, and for general psychiatric and nonpsychiatric populations (Bautovich et al., 2018; Beck et al., 1988; Homaifar et al. 2009; Moullec et al., 2015; Phan et al., 2016; Plourde et al., 2016; Shean & Baldwin, 2008; Strik et al., 2001; Udo et al., 2015). The PHQ-9 is a nine-item depression inventory that takes less than 5 minutes to complete and demonstrates 61 percent sensitivity and 94 percent specificity for depression in adults (Kroenke et al., 2001; Spitzer et al., 1999).

There is no evidence that the BDI-II is more valid or reliable than other depression inventories, including the PHQ-9 (Zimmerman, 2011). The BDI-II and PHQ-9 have demonstrated similar psychometric properties, and both measure responsiveness to change for patients who are in treatment for depression (Titov et al., 2011). For individuals being treated for depression in outpatient and inpatient settings, the BDI-II and PHQ-9 are highly correlated and interchangeable (Kung et al., 2013). Likewise, BDI-II and PHQ-9 scores have been reported to be highly correlated for those with substance misuse or substance use disorders, patients in general practice, patients with stroke or cancer, obese patients, adolescents, and patients with eating disorders (Cameron et al., 2011; Dum et al., 2008; Lambert et al, 2015; Roseman et al., 2016; Schutt et al., 2016; Scott et al., 2011; Turner et al., 2012).

To provide measures that are linguistically and culturally appropriate for deaf individuals, a number of investigators have offered a variety of alternatives for deaf clients (Estrada, 2012; Leigh et al., 1988; Traxler, 2000; Wilson et al., 2020; Zazove et al., 2006). Leigh et al. (1988) attempted to simplify items on the BDI-II by rewriting items to a fourth- or fifth-grade reading level. Since English is a second language for many deaf individuals and there is no written form of ASL, English-based assessments still create a barrier (Traxler, 2000). Estrada (2012)

translated the BDI-II into Mexican Sign Language (MSL) for deaf Mexican citizens. Zazove et al. (2006) suggested that a potential solution may be video-based instruments, but then rejected them as too impractical for the typical medical office. More recently, however, Wilson et al. (2020) demonstrated that video-based inventories in ASL can be made available online and are easily accessed by health professionals in their offices.

This paper describes our development and field testing of the BDI-II and PHQ-9 in American Sign Language (BDI-II-ASL and PHQ-9-ASL, respectively). To provide the professional health field with an appropriate depression measure for use by deaf individuals who use primarily ASL, we interpreted the BDI-II and PHQ-9 into ASL using state-of-the-art techniques. Our goal was to do an interpretation rather than a translation—we were looking for conceptual equivalence rather than word-for-word translation. At times, we included an exact word, using fingerspelling, which might be considered more of a literal translation, but we always included an ASL conceptual option as well. We examined linguistic context and kept the meaning of the inventory items intact.

To consider the unique linguistic needs and cultural perspectives of Deaf individuals, an expert panel of eight individuals representing the Deaf community, professionals in ASL interpretation, and mental health services provided guidance and feedback throughout the interpretation process. Our goals in developing the BDI-II-ASL and PHQ-9-ASL were to produce instruments in ASL that (a) were linguistically appropriate for deaf individuals who use ASL primarily, (b) could be administered without the use of interpreters, (c) did not require the use of written English, and (d) were accessible online to deaf consumers, regardless of their location. The online BDI-II-ASL and PHQ-9-ASL also included captioning in English and voicing. Understanding the wide range of language preferences and abilities within the Deaf

community, our team worked to find a middle ground for those who may use one or multiple modes of communication. We report the results of field-testing of the online BDI-II-ASL and PHQ-9-ASL with a large, nationally representative sample of individuals who self-identified as deaf and primarily used ASL.

Methods

Participants

Individuals who self-identified as deaf (i.e., deaf or hard-of-hearing) and used ASL preferentially were recruited to participate in a field test of the BDI-II-ASL and PHQ-9-ASL through various avenues, including LISTSERVs, social media outlets and national networks of leaders and members of the Deaf community. Three hundred and sixty-one deaf individuals from 44 states and the District of Columbia participated in this field test. They completed the BDI-II-ASL and PHQ-9-ASL in an online field test.

Preference for ASL was determined by asking prospective participants, “What language do you understand the best?” A total of 450 individuals responded to the question. Those individuals who reported that they understood ASL best were included in the sample of participants (N = 361); those who answered that they understood English better were excluded. All participants were treated in accordance with the ethical standards of the American Psychological Association, and this research project received approval from the Institutional Review Board (IRB) of Wright State University. Everyone who completed the field test received an electronic gift card of $25.

Development of the BDI-II-ASL and PHQ-9-ASL

The BDI-II-ASL and PHQ-9-ASL were developed using the most effective and appropriate scientific methods employed in developing, translating, and linguistically validating

assessment instruments (Sousa & Rojjanasrirat, 2011; Tsang et al., 2017). The interpretation and validation procedures for the BDI-II-ASL and PHQ-9-ASL were modeled after five-step translation and validation protocol used for the Substance Abuse Screener in ASL (SAS-ASL), the ASL version of the Global Appraisal of Individual Needs–Short Screener (GAIN-SS; Guthmann et al., 2012; Guthmann & Moore, 2007; Titus & Guthmann, 2010), and the Adult Quality of Life-DHH and the Youth Quality of Life-DHH instruments (Patrick et al., 2011). The five steps of the modeled translation and validation protocol are forward translation, back translation, reconciliation between the original and back translated instruments, cognitive debriefing, and field-testing (Guthmann et al., 2007, 2012, 2017; Titus & Guthmann, 2010).

Forward Translation. The forward translation, from English to ASL, of the BDI-II and PHQ-9 was conducted by a forward translation team consisting of five bilingual native and nonnative ASL signers from the eastern, midwestern, and western regions of the United States. Members of the forward translation team have worked with deaf individuals for 20 to 40 or more years in clinical and postsecondary settings; two of the members (one Deaf and one hearing) currently teach college-level courses in ASL. The forward translation team addressed language structures, idioms, technical terms, time frames, and other features that had to be clarified as they interpreted each inventory item, response options, and directions. The team transcribed the translation in ASL gloss.[3] After the forward translation team reached consensus on a translated inventory, it was videotaped with a Deaf individual signing the instrument in ASL. Members of the forward translation team provided input during the filming of the ASL version of the instrument to assure fidelity of the Deaf individual's signing. The BDI-II-ASL and PHQ-9-ASL were posted on a dedicated website to make it available for back translation.

[3] Gloss is a written or typed approximation of one language using another language. ASL gloss is a written or typed approximation of ASL using English words as "labels" for each sign along with various grammatical notes.

Back Translation. The back translation, from ASL to English, of the BDI-II-ASL and PHQ-9-ASL was conducted by 30 bilingual native ASL users who had no prior exposure to the English-language versions of the BDI-II and PHQ-9. The 30 native bilingual ASL users were either deaf or children of deaf adults from across the United States. They viewed the BDI-II-ASL and PHQ-9-ASL on our website and wrote their understanding of the items and response choices in English.

Reconciliation. The reconciliation of the original English of the BDI-II and PHQ-9 and the back- translated English of the BDI-II-ASL and PHQ-9-ASL was conducted by two bilingual, nonnative ASL users who were mental health specialists and members of the forward translation team. The reconciliation process required a careful comparison between the meanings of the original English and back-translated English, as the goal was consistency in meaning; the two versions did not need to be literally identical. After careful comparison, items that had varied meanings between the two versions were flagged, compiled into a summary report, and further reviewed by the forward translation team. Flagged items typically identified places in the translation where there was a misunderstanding, mis translation, omission, or other irregularity.

The forward translation team met to review the results from the reconciliation, view the flagged BDI-II-ASL and PHQ-9-ASL items, and make revisions. The translation team updated the ASL gloss for revised items prior to rerecording them. Each revised item went through the back translation and reconciliation steps again. This iterative process continued until no items were flagged. At which point, the BDI-II-ASL and PHQ-9-ASL were ready to for use in the cognitive debriefing step.

Cognitive Debriefing. The cognitive debriefing was conducted by a cognitive debriefing team consisting of two members (one Deaf and one hearing) who currently teach college-level

courses in ASL. Twenty Deaf community members with no prior experience with the BDI-II or PHQ-9 were recruited to complete the online BDI-II-ASL and PHQ-9-ASL and then were interviewed in ASL by the cognitive debriefing team, using a structured protocol. The cognitive interviews were designed to elicit feedback on the understandability of individual BDI-II-ASL and PHQ-9-ASL items and the ease with which the BDI-II-ASL and PHQ-9-ASL could be navigated. The interview prompts were "Are there any signs you are not sure of? (If so, which ones?) Was the signing clear? What does the item mean? Do you understand what the item means? How would you change the item to make it better/clearer/easier to understand?"

The 20 participants viewed the ASL videos for each BDI-II-ASL and PHQ-9-ASL item, wrote down their understanding of the items in English, and then provided feedback in ASL via the interviews regarding the clarity of the signing and the participant's understanding of each item's meaning. Feedback from the interviews was summarized for the reconciliation team. The reconciliation team reviewed the summaries and compiled suggested revisions for the forward translation team. The forward translation team reviewed the suggestions, made revisions as appropriate, updated the ASL gloss for revised items, and rerecording the revised items. Each revised item went through the back translation, reconciliation, and cognitive debriefing steps again. This iterative process resulted in the final versions of the BDI-II-ASL and PHQ-9-ASL that were used in the field test.

Field-Testing. The BDI-II-ASL and PHQ-9-ASL were field-tested using two samples of deaf persons: those who were currently vocational rehabilitation (VR) consumers and those who were not VR consumers. Because this project was funded by an employment grant from the National Institute on Disability, Independent Living, and Rehabilitation Research, we were interested in investigating whether VR consumers and non-VR consumers performed differently

on these instruments. All 361 participants completed both instruments; though, a 300-participant sample was deemed to be an adequate sample size for the field test, based on the number of questions on the inventories administered (Costello & Osborne, 2005; Tabachnik & Fidell, 2001; Wolf et al., 2013).

Procedure

Field-testing of the BDI-II-ASL and PHQ-9-ASL was conducted online using Lime Survey software, which participants could access on all browsers and mobile devices. Responses were scored automatically, and the results were stored securely on a HIPAA-compliant server. Participants with low vision were able to scale the online inventory to a larger size, and all text was screen-reader compatible, in keeping with web content accessibility guidelines recommended by the United Nations Convention on the Rights of Persons with Disabilities.

The BDI-II-ASL and PHQ-9-ASL were administered along with two other instruments also being field-tested in ASL, the Alcohol Use Disorders Identification Test (AUDIT-10) and the Generalized Anxiety Disorder (GAD-7) scale. Participants were required to give online consent via an informed consent document presented in ASL before completing the inventories. Demographic information—gender, race, ethnicity, age, educational level, preferred language, cultural identification (culturally Deaf or not), and employment status (including whether the participant was currently a VR consumer)—was collected before the field-testing began. The BDI-II-ASL and PHQ-9-ASL inventories were presented in ASL with English text below the video. No information that identified the participants was stored with the field-test data.

Results

The 361 participants ranged in age from 19 to 75, with 58.4 percent falling between 25 and 34, 16.9 percent below 25, and 24.7 percent over 34. Of this sample, 48.2 percent were male

and 51.5 percent were female. In terms of racial background, 85.3 percent of the participants reported being White/Caucasian and 8.0 percent reported being Black/African American. In terms of ethnicity, 11.9 percent identified as Latinx. Education levels varied widely with 9.2 percent not completing high school, 31.9 percent earning a high school diploma only, 26.3 percent completing some college, and 32.6 percent having a college degree or higher. Over 69 percent of the participants were employed, 57.6 percent of which were employed full-time; 14.1 percent were students; and 35.2 percent reported being current VR consumers.

Results of BDI-II-ASL Field-Testing

For all participants, the mean BDI-II-ASL score was 20.03 (SD = 10.71). BDI-II-ASL scores did not differ significantly for men (M = 20.42) and women (M = 19.76), $t(335) = 0.58$, n.s. No significant differences were found between BDI-II-ASL scores for White (M = 20.87) and Black (M = 18.21) participants, $t(335) = 1.32$, n.s. Likewise, no significant differences were found between BDI-II-ASL scores for Latinx (M = 19.26) and non-Latinx (M = 20.13) participants, $t(335) = -0.50$, n.s.

There was a significant main effect for education level, $F(5,355) = 17.75$, $p < .001$ (Figure 1). Participants who had a graduate degree (M = 8.48) and participants who had completed some graduate school after college (M = 12.00) had significantly lower BDI-II-ASL scores than those who completed college only (M = 16.86), those who finished some college (M = 22.22), and those who finished high school only (M = 22.23), according to a Student-Newman-Keuls post-hoc test at $p < .05$. Participants who had not completed high school (M = 26.91) had significantly higher BDI-II-ASL scores than the other participants, according to the same post-hoc test.

In addition, no significant differences were observed among employment groups. Individuals who were unemployed had a mean BDI-ASL score of 20.59, which was not significantly different from BDI-ASL scores for participants who were employed part-time (M = 19.94) or full-time (M = 18.98), $F(2,358) = 0.36$, n.s. Likewise, there were no significant differences between participants who were students (M = 18.27) and those who were not students (M = 20.32), $t(359) = -1.26$, n.s.

Psychometric analyses for the BDI-II-ASL. Cronbach's alpha for the BDI-II-ASL is .943, which indicates excellent internal consistency. A principal components analysis (PCA) of the 21 BDI-II-ASL questions identified two factors: one with an eigenvalue of 9.89, which accounted for 47.11 percent of the variance, and one with an eigenvalue of 1.05, which accounted for 5.01 percent of the variance. For the first factor, all 21 items contributed significantly. Somatic components (loss of energy, tiredness) contributed to the second factor. Table 1 on the next page shows the component matrix for this factor analysis.

Results of PHQ-9 Field-Testing

For all participants, the mean PHQ-9-ASL score was 8.17 (SD = 4.27). PHQ-9-ASL scores differed for men and women with men (M = 8.66) having higher scores than women (M = 7.74), $t(358) = -0.50$, $p = .04$. However, in this study, multiple analyses were conducted on the same dependent variable, PHQ-9-ASL score, including analyses that examined differences due to gender, race, ethnicity, educational level, student status, and employment status. Thus, a Bonferroni correction was required, which reduced the alpha level from .05 to .008 (i.e., .05 divided by 6, the number of analyses conducted). With an alpha level of .008, the gender difference obtained for PHQ-9-ASL scores in the present study would not be statistically significant.

Table 1. Component Matrix Resulting from Factor Analysis of 21 BDI-II-ASL Items

BDI Items	Component	Component
	1	2
Sadness	.750	
Pessimism	.692	
Past failure	.732	
Loss of pleasure	.699	
Guilty feelings	.698	
Punishment feelings	.766	
Self-Dislike	.718	
Self-Criticalness	.708	
Suicidal thoughts or wishes	.581	
Crying	.626	
Agitation	.691	
Loss of interest	.688	
indecisiveness	.691	
Worthlessness	.752	
Loss of energy	.599	.553
Changes in sleeping pattern	.636	
Irritability	.762	
Changes in appetite	.669	
Concentration difficulty	.672	
Tiredness or fatigue	.629	.442
Loss of interest in sex	.610	

No significant differences were found between PHQ-9-ASL scores for White (M = 8.38) and Black (M = 8.34) participants, $t(335) = 0.05$, n.s. Similarly, no significant differences were found between PHQ-9-ASL scores for Latinx (M = 8.63) and non-Latinx (M = 8.11) participants, $t(335) = 0.74$, n.s.

There was a significant main effect for education level, $F(5,355) = 12.66$, $p < .001$ (Figure 2). Participants who had a graduate degree (M = 3.91) had significantly lower PHQ-9-ASL scores than participants who had completed some graduate school after college (M = 6.50), those who completed college only (M = 7.36), those who finished some college (M = 8.68), and those who finished high school only (M = 8.86), according to a Student-Newman-Keuls post-hoc test at $p < .05$. Participants who had not completed high school (M = 10.88) had significantly higher PHQ-9-ASL scores than the other participants, according to the same post-hoc test.

In addition, no significant differences were observed among employment groups. Individuals who were unemployed had a mean PHQ-9-ASL score of 8.33, which was not significantly different from PHQ-9-ASL scores for participants who were employed part-time (M = 8.69) or full-time (M = 7.99), $F(2,358) = 0.58$, n.s. Likewise, there were no significant differences in PHQ-9-ASL scores between participants who were students (M = 7.76) and those who were not students (M = 8.24), $t(359) = -0.74$, n.s.

Psychometric analyses for the PHQ-9-ASL. Cronbach's alpha for the PHQ-9-ASL is .845, which indicates good internal consistency. A PCA of the nine PHQ-9-ASL questions identified two factors: one with an eigenvalue of 4.05, which accounted for 45.02 percent of the variance, and one with an eigenvalue of 1.11, which accounted for 12.28 percent of the variance. For the first factor, all nine items contributed significantly. Somatic components (loss of energy, tiredness, moving slowly), together with thoughts of killing or hurting oneself, contributed to the second factor. Table 2 shows the component matrix for this factor analysis.

Table 2. Component Matrix Resulting from Factor Analysis of PHQ-9-ASL Items

PHQ Items	Component	Component
	1	2
Little interest or pleasure in doing things	.623	
Feeling down, depressed, or hopeless	.802	
Trouble falling or staying asleep, or sleeping too much	.702	
Feeling tired or having little energy	.557	.365
Poor appetite or overeating	.738	
Feeling bad about yourself or that you are a failure	.748	
Trouble concentrating on things	.638	
Moving or speaking so slowly that other people could have noticed	.628	.472
Thoughts that you would be better off dead or of hurting yourself in some way	.558	.623

Correlational Analysis

Because all participants completed both the BDI-II-ASL and PHQ-9-ASL, it was possible to compare scores on these instruments. A Pearson correlational analysis revealed a significant positive correlation between the two depression screeners, BDI-II-ASL and PHQ-9-ASL, $r(N$ =

361) = .817, $p < .001$. Thus, this correlational analysis provided evidence of criterion validity for these measures in ASL.

Discussion

The BDI-II-ASL and PHQ-9-ASL were developed to permit mental health clinicians, physicians, and other healthcare professionals to screen deaf patients who communicate in ASL and who present with symptoms of depression with linguistically appropriate depression screeners. In the present study, BDI-II-ASL and PHQ-9-ASL scores for deaf individuals who use ASL preferentially were significantly and positively correlated. Significant correlations for BDI-II and PHQ-9 have also been reported for the English-language versions for individuals with and without depression in general practice and specialty medical inpatient and outpatient treatment settings (Cameron et al., 2011; Dum et al., 2008; Kung et al., 2013; Schutt et al., 2016; Scott et al., 2011; Titov et al., 2011; Weobong et al., 2018). Similarly, significant Pearson correlations between the BDI-II and the PHQ-9 have been found for the Spanish-language and Korean-language versions (Lee et al., 2017; Urtasun et al., 2019). Thus, the BDI-II-ASL and PHQ-9-ASL appear to have strong convergent validity.

In the present study, the mean BDI-II-ASL score for 361 deaf participants was 20.03, with no significant difference between scores for men and women. This mean score exceeds the cutoff score of ≥20 for moderate depression recommended by the instrument's publisher, although it is well below Cameron et al.'s (2011) suggested cutoff of ≥28. Over half of the participants in the present study (50.2 percent of the men, 56.2 percent of the women) scored above 20 on the BDI-II-ASL and, based on their BDI-II-ASL scores, they would be classified as moderately depressed, according to the BDI-II publisher's manual. Numerous investigators have expressed concerns that deaf individuals are often misdiagnosed with depression based on scores

on audiocentric depression inventories (Connolly et al., 2006; Dreyzehner & Goldberg, 2019; Estrada, 2012; Leigh et al, 1989; O'Rourke & Grewer, 2005; Rostami et al., 2014; Zazove et al., 2006). Glickman (2019) and others (Crump & Hamerdinger, 2017; Fellinger et al., 2012; Pollard & Rendon, 1998) have written that high reported rates of psychopathology in deaf individuals may be because behaviors of deaf people are often misunderstood and misdiagnosed.

For all deaf participants in the present study, the mean PHQ-9-ASL score was 8.17. PHQ-9-ASL scores for men and women did not differ significantly, which is congruent with other published reports. Kvam et al. (2007) found no gender differences in depression in their survey of 431 deaf persons. However, investigators studying hearing populations have universally reported higher depression scores for women (Hunt et al., 2003; Veerman et al., 2009). Research by Hunt and colleagues (2003) suggests that hearing men minimize their depressive symptoms more than women do. It may be that deaf men, responding to a survey in ASL, may not minimize their symptoms and, thus, will generate PHQ-9-ASL or BDI-II-ASL scores that are similar to women's scores.

Behavioral health services for consumers who are deaf and hard of hearing are compromised by an absence of assessment instruments that are normed for that population and that are linguistically and culturally appropriate (Hauser et al., 2007; Sligar et al., 2013). Research has demonstrated that appropriate assessment is associated with earlier referral for needed services, reduced costs, and better employment outcomes for deaf VR consumers (Heinemann & Moore, 2013). Certainly, instruments like the BDI-II-ASL and PHQ-9-ASL, which have been methodically developed, are needed to improve screening and assessment of deaf individuals who use ASL to communicate.

Limitations of the Present Study

The field study described in this paper was conducted with a general deaf population that used ASL preferentially. The next required step is to collect BDI-II-ASL and PHQ-9-ASL data from a confirmed diagnostic group (i.e., persons who have been diagnosed with or are in treatment for depression) and a comparison healthy control group. At this point, convergent and discriminant validity for the BDI-II-ASL and PHQ-9-ASL have not been obtained. Once the BDI-II-ASL and PHQ-9-ASL have been appropriately normed for deaf individuals with and without depression, investigators will be able to estimate the prevalence of depression in deaf subpopulations with accuracy.

References

Adigun, O. T. (2017). Depression and Individuals with Hearing Loss: A Systematic Review. *Journal of Psychology & Psychotherapy, 7*, 323. htpps://doi.org/10.4172/2161-0487.1000323

Bautovich, A., Katz, I., Loo, C. K., & Harvey, S. B. (2018). Beck Depression Inventory as a screening tool for depression in chronic haemodialysis patients. *Australasian Psychiatry, 26*(3), 281-284. htpps://doi.org/10.1177/1039856218758582

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *BDI-II: Beck Depression Inventory Manual*. Harcourt Brace.

Beck, A. T., Steer, R. A., & Garbin, M. G. (1988). Psychometric properties of the Beck Depression Inventory: Twenty-five years later. *Clinical Psychology Review, 8*, 77-100. https:// https://doi.org/10.1016/0272-7358(88)90050-5

Beck, A. T., Ward, C. H., Mendelson, M., Mock, J., & Erbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry, 4*(6), 561-571. htpps://doi.org/10.1001/archpsyc.1961.01710120031004

Cameron, I. M., Cardy, A., Crawford, J. R., du Toit, S. W., Hay, S., Lawton, K., Mitchell, K., Sharma, S., Shivaprasad, S., Winning, S., & Reid, I. C. (2011). Measuring depression severity in general practice: discriminatory performance of the PHQ-9, HADS-D, and BDI-II. *British Journal of General Practice, 61*(588), e419-e426. htpps://doi.org/10.3399/bjgp11X583209

Connolly, C. M., Rose, J., & Austen, S. (2006). Identifying and assessing depression in prelingually deaf people: A literature review. *American Annals of the Deaf, 151*(1), 49-60. htpps://doi.org/10.1353/aad.2006.0013

Costello, A., & Osborne, J. (2005). Exploratory Factor Analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research, and Evaluation, 10*(7), 1-9. https://doi.org/10.7275/jyj1-4868

Crump, C. J., & Hamerdinger, S. H. (2017). Understanding etiology of hearing loss as a contributor to language dysfluency and its impact on assessment and treatment of people who are deaf in mental health settings. *Community Mental Health Journal, 53*(8), 922-928. htpps://doi.org/10.1007/s10597-017-0120-0

Dreyzehner J., & Goldberg, K. A. (2019). Depression in deaf and hard of hearing youth. *Child and Adolescent Psychiatric Clinics, 28*(3), 411–419. https://doi.org/10.1016/j.chc.2019.02.011

Dum, M., Pickren, J., Sobell, L. C., & Sobell, M. B. (2008). Comparing the BDI-II and the PHQ-9 with outpatient substance abusers. *Addictive Behaviors, 33*(2), 381-387. https://doi.org/10.1016/j.addbeh.2007.09.017

Estrada, B. (2012). Beck Depression Inventory-II in Mexican Sign Language. Reliability and factorial data. *International Journal on Mental Health and Deafness, 2*, 4–12.

Fellinger, J., & Holzinger, D., & Pollard, R. (2012). Mental health of deaf people. *Lancet, 379*, 1037–1044. https://doi.org/10.1016/S0140-6736(11)61143-4

Glickman, N. S. (2019). Language disfluency and diagnosis in the deaf inpatient population. *Journal of the American Deafness & Rehabilitation Association (JADARA), 38*(1), 1-29. https://repository.wcsu.edu/jadara/vol38/iss3/3

Guthmann, D., Lazowski, L. E., Moore, D., Heinemann, A. W., & Embree, J. (2012). Validation of the substance abuse screener in American Sign Language (SAS--ASL). *Rehabilitation Psychology, 57*, 140-148. https://doi.org/10.1037/a0028605

Guthmann, D., & Moore, D. (2007). The Substance Abuse in Vocational Rehabilitation-Screener in American Sign Language (SAVR-S-ASL) for persons who are deaf. *Journal of American Deafness and Rehabilitation Association (JADARA), 41*(1), 9-16. http://repository.wcsu.edu/jadara/vol41/iss1/4

Guthmann, D., Titus, J., Embree, J., & Wilson, J. F. (2017). Translation and Validation of an Online Suite of Assessments in American Sign Language. *Journal of American Deafness and Rehabilitation Association (JADARA), 51*(1), 12-20. http://repository.wcsu.edu/jadara/vol51/iss1/5

Hauser, P. C., Cohen, J., Dye, M. W. G., & Bavelier, D. (2007). Visual constructive and visual motor skills in deaf native signers *Journal of Deaf Studies and Deaf Education, 12*(2), 148-157. https://doi.org/10.1093/deafed/enl030

Homaifar, B. Y., Brenner, L. A., Gutierrez, P. M., Harwood, J. F., Thompson, C., Filley, C. M., Kelly, J. P., & Adler, L. E. (2009). Sensitivity and specificity of the Beck Depression Inventory-II in persons with traumatic brain injury. *Archives of Physical Medicine and Rehabilitation, 90*(4), 652-656. https://doi.org/10.1016/j.apmr.2008.10.028

Hunt, M., Auriemma, J., & Cashaw, A. C. (2003). Self-report bias and underreporting of depression on the BDI-II. *Journal of Personality Assessment, 80*(1), 26-30. https://doi.org/10.1207/S15327752JPA8001_10

Kerr, L. K., & Kerr, L. D., Jr. (2001). Screening tools for depression in primary care: the effects of culture, gender, and somatic symptoms on the detection of depression. *Western Journal of Medicine, 175*(5), 349–352. https://doi.org/10.1136/ewjm.175.5.349

Kim, S. Y., Kim, H.-J., Park, E.-K., Joe, J., Sim, S., & Choi, H. G. (2017). Severe hearing impairment and risk of depression: A national cohort study. *PlosOne*, June 22, 2017, https://doi.org/10.1371/journal.pone.0179973

Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine, 16*(9), 606-613. https://doi.org/10.1046/j.1525-1497.2001.016009606.x

Kung, S., Alarcon, R. D., Williams, M. D., Poppe, K. A., Moore, J. M., & Frye, M. A. (2013). Comparing the Beck Depression Inventory-II (BDI-II) and Patient Health Questionnaire (PHQ-9) depression measures in an integrated mood disorders practice. *Journal of Affective Disorders, 145*(3), 341-343. http://doi.org/10.1016/j.jad.2012.08.017

Kvam, M., Loeb, M., & Tambs, K. (2007). Mental health in deaf adults: symptoms of anxiety and depression among hearing and deaf individuals. *Journal of Deaf Studies and Deaf Education, 12*, 1-7. http://doi.org/10.1093/deafed/enl015

Lambert, S. D., Clover, K., Pallant, J. F., Britton, B., King, M. T., Mitchell, A. J., & Carter, G. (2015). Making sense of variations in prevalence estimates of depression in cancer: A co-calibration of commonly used depression scales using Rasch analysis. *Journal of the National Comprehensive Cancer Network, 13*(10), 1203-1211. http://doi.org/10.6004/jnccn.2015.0149

Lee, E.-H., Lee, S.-J., Hwang, S.-T., Hong, S.-H., & Kim, J.-H. (2017). Reliability and validity of the Beck Depression Inventory-II among Korean adolescents. *Psychiatry Investigation, 14*(1), 30-36. https://doi.org/10.4306/pi.2017.14.1.30

Leigh, I. W., Robins, C. J., & Welkowitz, J. (1988). Modification of the Beck Depression Inventory for use with a deaf population. *Journal of Clinical Psychology, 44*, 728-732. https://doi.org/10.1002/1097-4679(198809)44:5%3C728::aid-jclp2270440510%3E3.0.co;2-a

Leigh, I. W., Robins, C. J., Welkowitz, J., & Bond, R. N. (1989). Toward greater understanding of depression in deaf individuals. *American Annals of the Deaf, 134*, 249-254. https://doi.org/10.1353/aad.2012.0662

Li, C.-M., & Hoffman, H. J. (2014). Untangling the link between hearing loss and depression. *The Hearing Journal, 67*(7), 6. http://journals.lww.com/thehearingjournal/

Maurer, D. M. (2012). Screening for depression. *American Family Physician, 85*(2), 139-144. http://www.usafp.org/wp-content/uploads/2013/12/Screening-for-Depression.pdf

Moullec, G., Plourde, A., Lavoie, K. L., Suarthana, E., & Bacon, S. L. (2015). Beck Depression Inventory II: Determination and comparison of its diagnostic accuracy in cardiac outpatients. *European Journal of Preventive Cardiology*, *22*(5), 665–672. https://doi.org/10.1177/2047487314527851

O'Rourke, S., & Grewer, G. (2005). Assessment of Deaf people in forensic mental health settings: A risky business! *Journal of Forensic Psychiatry & Psychology, 16*(4), 671-684. https://doi.org/10.1080/14789940500279877

Patrick, D. L., Edwards, T. E., Skalicky, A. M., Leng, M., Topolski, T. D., Schick, B., Kushalnagar, P., & Sie, K. (2011). Validation of a quality of life instrument for deaf or hard of hearing youth**.** *Archives of Otolaryngology-Head & Neck Surgery, 145*, 137-145. https://doi.org/10.1177/0194599810397604

Phan, T., Carter, O., Adams, C., Waterer, G., Chung, L. P., Hawkins, M., Rudd, C., Ziman, M., & Strobel, N. (2016). Discriminant validity of the Hospital Anxiety and Depression Scale, Beck Depression Inventory (II) and Beck Anxiety Inventory to confirmed clinical diagnosis of depression and anxiety in patients with chronic obstructive pulmonary disease. *Chronic Respiratory Disease*, *13*(3), 220–228. https://doi.org/10.1177/1479972316634604

Plourde, A., Moullec, G., Bacon, S. L., Suarthana, E., & Lavoie, K. L. (2016). Optimizing screening for depression among adults with asthma. *Journal of Asthma, 53*(7), 736-743. https://doi.org/10.3109/02770903.2016.1145692

Pollard, R., & Rendon, M. (1999). Mixed deaf-hearing families: maximizing benefits and minimizing risks. *Journal of Deaf Studies and Deaf Education, 4*(2), 156-157. https://doi.org/10.1093/deafed/4.2.156

Roseman, M., Kloda, L. A., Saadat, N., Riehm, K.E., Ickowicz, A., Baltzer, F., Katz, L. Y., Patten, S. B., Rousseau, C., & Thombs, B. D. (2016). Accuracy of depression screening tools to detect major depression in children and adolescents: A systematic review. *The Canadian Journal of Psychiatry, 61*(12), 746-757. https://doi.org/10.1177/0706743716651833

Rostami, M., Bahmani, B., Bakhtyari, V., & Movallali, G. (2014). Depression and deaf adolescents: A review. *Iranian Rehabilitation Journal, 12*, 43-53. http://irj.uswr.ac.ir/files/site1/user_files_055690/seligman-A-10-321-2-647e764.pdf

Schutt, P. E., Kung, S., Clark, M. M, Koball, A. M., & Grothe, K. B. (2016). Comparing the Beck Depression Inventory-II (BDI-II) and Patient Health Questionnaire (PHQ-9) depression measures in an outpatient bariatric clinic. *Obesity Surgery*, *26*, 1274-1278. https://doi.org/10.1007/s11695-015-1877-2

Scott, J. D., Wang, C. C., Coppel, E., Lau, A., Veitengruber, J., & Roy-Byrne, P. (2011). Diagnosis of depression in former injection drug users with chronic hepatitis C. *Journal of Clinical Gastroenterology, 45*(5), 462-467. https://doi.org/10.1097/MCG.0b013e3182008ee1

Shean, G., & Baldwin, G. (2008). Sensitivity and specificity of depression questionnaires in a college-age sample. *The Journal of Genetic Psychology, 169*(3), 281-292. https://doi.org/10.3200/GNTP.169.3.281-292

Sligar, S. R., Cawthon, S., Morere, D., & Moxley, A. (2013). Equity in assessment for individuals who are Deaf or Hard of Hearing. *Journal of the American Deafness & Rehabilitation Association (JADARA), 47*(1), 110-127. http://repository.wcsu.edu/jadara/vol47/iss1/12

Spitzer, R. L., Kroenke, K., & Williams, J. B. (1999). Validation and utility of a self-report version of PRIME-MD: the PHQ primary care study. *Journal of the American Medical Association, 282*, 1737-1744. https://doi.org/10.1001/jama.282.18.1737

Strik, J. M. H., Honig, A., Lousberg, R., & Denollet, L. (2001). Sensitivity and specificity of observer and self-report questionnaires in major and minor depression following myocardial infarction. *Psychosomatics, 42*(5), 423-428. https://doi.org/10.1176/appi.psy.42.5.423

Sousa, V. D., & Rojjanasrirat, W. (2011). Translation, adaptation and validation of instruments or scales for use in cross-cultural health care research: a clear and user-friendly guideline. *Journal of evaluation in clinical practice, 17*(2), 268–274. https://doi.org/10.1111/j.1365-2753.2010.01434.x

Tabachnick, B. G., & Fidell, L. S. (2001). *Using Multivariate Statistics, Fourth Edition*. Needham Heights, MA: Allyn & Bacon.

Theunissen, S. C. P. M., Rieffe, C., Kouwenberg, M., Soede, W., & Briaire, J. J. (2011). Depression in hearing-impaired children. *International Journal of Pediatric Otorhinolaryngology, 75*(10), 1313-1317. https://doi.org/10.1016/j.ijporl.2011.07.023

Titov, N., Dear, B. F., McMillan, D., Anderson, T., Zou, J., & Sunderland, M. (2011). Psychometric comparison of the PHQ-9 and BDI-II for measuring response during treatment of depression. *Cognitive Behaviour Therapy, 40*(2), 126-136. https://doi.org/10.1080/16506073.2010.550059

Titus, J., & Guthmann, D. (2010). Addressing the black hole in substance abuse treatment for the deaf and hard of hearing individuals: technology to the rescue. *Journal of American Deafness and Rehabilitation Association (JADARA), 43*(2), 92-100. http://repository.wcsu.edu/jadara/vol43/iss2/4

Traxler, C. B. (2000). The Stanford Achievement Test, 9th edition: National norming and performance standards for deaf and hard-of-hearing students. *Journal of Deaf Studies and Deaf Education, 5*(4), 337-348. https://doi.org/10.1093/deafed/5.4.337

Tsang, S., Royse, C. F., & Terkawi, A. S. (2017). Guidelines for developing, translating, and validating a questionnaire in perioperative and pain medicine. *Saudi journal of anaesthesia, 11*(Suppl 1), S80–S89. https://doi.org/10.4103/sja.SJA_203_17

Turner, A., Hambridge, J., White, J., Carter, G., Clover, K., Nelson, L., & Hackett, M. (2012). Depression Screening in Stroke: A comparison of alternative measures with the structured diagnostic interview for the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (Major Depressive Episode) as criterion standard. *Stroke, 43*, 1000-1005. https://doi.org/10.1161/STROKEAHA.111.643296

Turner, O., Windfuhr, K., & Kapur, N. (2007). Suicide in deaf populations: A literature review. *Annals of General Psychiatry, 6*, 26-34. https://doi.org/ 10.1186/1744-859X-6-26

Udo, T., McKee, S. A., & Grilo, C. M. (2015). Factor structure and clinical utility of the Beck depression inventory in patients with binge eating disorder and obesity. *General Hospital Psychiatry, 37*(2), 120-125. https://doi.org/10.1016/j.genhosppsych.2014.11.011

Urtasun, M., Daray, F. M., Teti, G. L., Coppolillo, F., Herlax, G., Saba, G., Rubinstein, A., Araya, R., & Irazola, V. (2019). Validation and calibration of the patient health questionnaire (PHQ-9) in Argentina. *BMC Psychiatry, 19***,** 291. https://doi.org/10.1186/s12888-019-2262-9

Veerman, J. L., Dowrick, C., Ayuso-Mateos, J. L., Dunn, G., & Barendregt, J. J. (2009). Population prevalence of depression and mean Beck Depression Inventory score. *The British Journal of Psychiatry, 195*, 516–519. https://doi.org/10.1192/bjp.bp.109.066191

Weobong, B., Weiss, H. A., Cameron, I. M., Kung, S., Patel, V., & Hollon, S. D. (2018). Measuring depression severity in global mental health: Comparing the PHQ-9 and the BDI-II. *Wellcome Open Research, 3*, 165. https://doi.org/10.12688/wellcomeopenres.14978.1

Wilson, J. F., Embree, J. A., Guthmann, D., Sligar, S. R., Titus, J. C., & Taylor, K. C. (2020). Satisfaction With Life Scale in American Sign Language: Validation and normative data. *JADARA, 53*(3), 1-10. https://repository.wcsu.edu/jadara/vol53/iss3/1

Wolf, E., Harrington, K., Clark, S., & Miller, M. (2013). Sample size requirements for structural equation models: An evaluation of power, bias, and solution propriety. *Educational and Psychological Measurement, 76*(6), 913–934. https://doi.org/10.1177/0013164413495237

Zazove, P., Meador, H. E., Aikens, J. E., Nease, D. E., & Gorenflo, D. W. (2006). Assessment of depressive symptoms in deaf persons. *Journal of the American Board of Family Medicine, 19*, 141–147. https://doi.org/10.3122/jabfm.19.2.141

Zimmerman, M. (2011). Using scales to monitor symptoms and treatment of depression (measurement based care). In *UpToDate*, Rose, BD (Ed). Waltham, MA: UpToDate.