Telehealth and the Deaf: A Comparison Study

Jaime A. B. Wilson
M. Gawain Wells
Brigham Young University

Within the deaf population, an extreme mental health professional shortage exists that may be alleviated with videoconferencing technology—also known as telehealth. Moreover, much needed mental health education within the deaf population remains largely inaccessible. Researchers have warned that the deaf population may remain underserved if significant changes do not take place with traditional service delivery methods. This article evaluated the efficacy of telehealth in teaching psychoeducational objectives, with special emphasis given to its application to the deaf population. Results indicate that telehealth can be regarded as an efficacious and cost-effective option in delivering health care to the deaf population. Participants also indicated satisfaction with the telehealth technology. The use of printed transcripts for educational purposes is encouraged given the significant findings in this article. The findings also have implications for the literature on single-session interventions.

The 21st century continues to find significant limitations in the provision of appropriate mental health services to the deaf population. It must be recognized, however, that the last few decades have brought progress through legislation on the state and federal levels in providing proper mental health care to this neglected population. Nevertheless, the current research literature (Feldman & Gum, 2007; Turner, Windfuhr, & Kapur, 2007) continues to be synonymous with the early literature (Best, 1943; Myklebust, 1964; Vernon, 1983) in the documentation of such limited health care access. Indeed, the mental health needs of the deaf population have been cited as the most neglected segment within the field of mental health in the United States (Vernon & Leigh, 2007).

In a recent survey study, researchers found that at least 92% of deaf individuals aged 18–85 years felt that there was not enough mental health services for the deaf with at least 94% indicating an interest in more mental health services (Feldman & Gum, 2007, p. 394). These findings parallel past research that cites that mental health care was the most requested but least available service (Pollard, 1994; Warner, 1987; see also Steinberg, 1991). Estimates of the number of deaf Americans who need some form of mental health intervention, such as substance abuse counseling or parenting advice, have ranged from 100,000 to 1 million (Lane, Hoffmeister, & Bahan, 1996). Unfortunately, due to the lack of clinicians who know the client's culture or who can speak the client's language fluently, this population's access to mental health services is severely limited (Munro-Ludders, Simpatico, & Zvetina, 2004; Pollard, 1998). The exact number of psychologists who are themselves deaf and culturally competent to provide clinical services is unknown. One source cited that there were currently approximately 25 deaf psychologists in the entire United States (Brauer, 2008).

One possible solution that may help to at least partially alleviate the extreme health professional shortage found within the deaf population is the use of videoconferencing technology (Austen & McGrath, 2006; Lopez et al., 2004; see also Turner, 2003), also known as telehealth. Nickelson (1998) defines "telehealth" as "the use of telecommunications and information technology to provide access to health assessment, diagnosis, intervention, consultation, supervision, education, and information across distance" (p. 527). Within the general literature, calls for investigations of specific

No conflicts of interest declared. Special thanks to the editor and two anonymous reviewers who provided valuable and insightful comments on an earlier version of the article. The research was partially funded by Sorenson Communications and a Brigham Young University Department of Psychology Graduate Research Funding Award.
Correspondence should be sent to Jaime A. B. Wilson, MCHJ-CP, Madigan Army Medical Center, Telehealth and Technology (T2), Building 9933A, Tacoma, WA 98431 (e-mail: peanutbutterface@gmail.com).

doi:10.1093/deafed/enp008
Advance Access publication on April 27, 2009

populations for which telehealth appears to be efficacious are particularly salient (Glueckauf & Ketterson, 2004; Hyler, Gangure, & Batchelder, 2005; Liss, Glueckauf, & Ecklund-Johnson, 2002), as is further research on the effectiveness of such technology to disseminate psychoeducational objectives at a distance (Baer, Elford, & Cukor, 1997; Hilty, Liu, Marks, & Callahan, 2003). The combination of these two needed research areas appears to be a perfect fit for the deaf population, a truly underserved group.

A recent search of the literature shows only one empirically controlled comparison study examining the usage of telehealth with the deaf population. This lone study did not examine the use of telehealth to deliver health care services but did look at communication dialogue variables compared with a face-to-face condition (Gournaris & Leigh, 2004). In the study, individuals described map directions in American Sign Language (ASL) to participants through face-to-face and high-quality analog video to compare dialogue interaction. Map task deviations made by participants in both conditions were nearly identical, suggesting that instructions were understood and appropriately followed in both conditions. Such findings give preliminary support to the idea of telehealth as being at least a valid communication medium for the deaf population.

Before telehealth can be hailed as a culturally sensitive solution to mental health care access or education across distance, its use must be empirically and appropriately examined within the target population. It was therefore the goal of this article to examine the viability of using telehealth technology to disseminate psychoeducational objectives. The viability of telehealth was examined as a controlled comparison-type study, with the focus on addressing the following three general research questions or aspects of telehealth in its use with the deaf population:

1. Is telehealth an effective medium for providing and receiving health education or services?
2. Do users of telehealth indicate satisfaction with the use of the technology?
3. Is telehealth a cost-effective option compared with traditional methods of health care delivery services?

Given the higher prevalence rates of depression found within the deaf population compared with the general population (Leigh & Anthony-Tolbert, 2001; Leigh, Robins, Welkowitz, & Bond, 1989; Watt & Davis, 1991), the subject of depression was deemed to be an appropriate psychoeducational topic to use in exploring the feasibility and effectiveness of telehealth. For the purposes of this article, the term "telehealth" will follow Nickelson's aforementioned definition with a specific emphasis on the term having reference to the use of such technology for psychological interventions or education at a distance, using synchronous videoconferencing technology. A description of the research design follows.

Method

Participants

Fifty-five deaf and hard-of-hearing participants (26 males [47%] and 29 females [52%]) were recruited from the deaf population residing from around the state of Utah. Deaf individuals were recruited via the posting of advertisements in areas around the state where deaf individuals are known to congregate. A variety of electronic listserves were also used, which included various college/university lists as well as deaf information/news lists. The mean age of participants was 29 (SD = 7.37), ranging from 17 to 52. Demographic characteristics reported ethnic identities of 42 Caucasian (76.4%), 8 Hispanic (14.5%), 2 African American (3.6%), 1 Native American (1.8%), and 2 "other" (3.6%). The sample consisted of 17 individuals who had completed high school or a General Educational Development test as his or her highest level of education (30.9%), whereas 9 had completed an associate's degree (16.4%), 8 a bachelor's degree (14.5%), 4 a master's degree (7.3%), 16 had "some college," (29.1%) and 1 "other" (1.8%).

Criteria for exclusion from the study were minimal. Participants were excluded from the study only (a) if they did not have some form of identifiable hearing loss or (b) if they were not able to communicate in ASL. Exclusion criteria were monitored by having participants indicate on the consent form that he or she had a hearing loss and could communicate in ASL. To provide an extra incentive for participation in the research, participants were compensated 20 dollars on the first day of the study. Participants who returned for the second day of the study—1 week later—were remunerated 10 dollars.

Design and Procedure

A between-subjects pretest–posttest crossover control group design was utilized in this article. The first condition, termed the "telehealth" condition, consisted of deaf participants who viewed a psychoeducational lecture on depression via telehealth. The comparison control group, an "attention placebo" condition, included individuals who received the same information as the telehealth condition, but the lecture was administered in a printed format. Given that disparate reading levels exist within the deaf population (Marschark, 1993), the "placebo" term was deemed as an appropriate metaphor to describe a procedure that participants may accept as an intervention but which has no verifiable benefits. Additionally, the procedures within this condition meet the "attention" aspect of appearing credible and effective to the participants but which also do not have empirically validated therapeutic effects (Kazdin, 2003)—especially within the deaf population with respect to therapeutic or effective change.

Participants who expressed interest in participating in the study were given an assigned time (12 or 6 p.m.) to attend the community center on the day of the experiment. Upon arrival at the community center, participants were registered and sent to their randomly assigned condition groups: the telehealth condition or the attention placebo control condition. Once all consent forms were signed, and all demographic information sheets collected, participants in both groups were administered a depression knowledge test to gather pretest scores, followed by the administration of the Beck Depression Inventory-II (BDI-II) and Beck Hopelessness Scale (BHS).

Following pretest evaluation, the psychoeducational intervention for each group was initiated: a mental health professional (MHP), with an ASL interpreter, conducted the depression psychoeducational lecture from the university campus—40 miles away—for the telehealth group; the attention placebo control group received the same information as the telehealth group, in a printed format. A 5- to 10-min question and answer session followed the psychoeducational lecture within the telehealth condition. Next, both the telehealth and the attention placebo conditions were administered an alternate forms posttest of the depression knowledge test. While the participants were completing the posttest, the MHP and ASL interpreter filled out a Lecture/Interpreting Adherence Scale to determine concordance with the first psychoeducational lecture transcript. All participants completed a satisfaction questionnaire, and those in the telehealth condition group also completed a cost-effectiveness analysis.

Upon completion of these measures, these two groups switched conditions. The original attention placebo control group moved from the attention placebo condition room to the telehealth condition room to receive an interpreted psychoeducational lecture via the telehealth condition. This second psychoeducational lecture elaborated on the topic of depression which was introduced in the first lecture. The original telehealth group moved from the telehealth condition room to the attention placebo control condition room to read the printed lecture which was also based on the same elaborated information on depression that the telehealth group received. Both groups remained in their respective rooms until all participants had completed each of their tasks. For example, if the attention placebo condition participants completed their tasks before the telehealth condition participants, all participants would remain in the room until prompted by the research assistants to switch rooms.

Once participants were seated in their respective rooms for the second part of the study, a second pretest knowledge depression test based on the contents of the second psychoeducational lecture was administered and completed. Following the second psychoeducational lecture, both groups completed a final alternate forms posttest depression knowledge questionnaire and satisfaction questionnaire. The telehealth condition also received a cost-effectiveness measure. All were asked to return 1 week later to complete the second administration of the BDI-II and BHS. Figure 1 summarizes the overall design of the study.

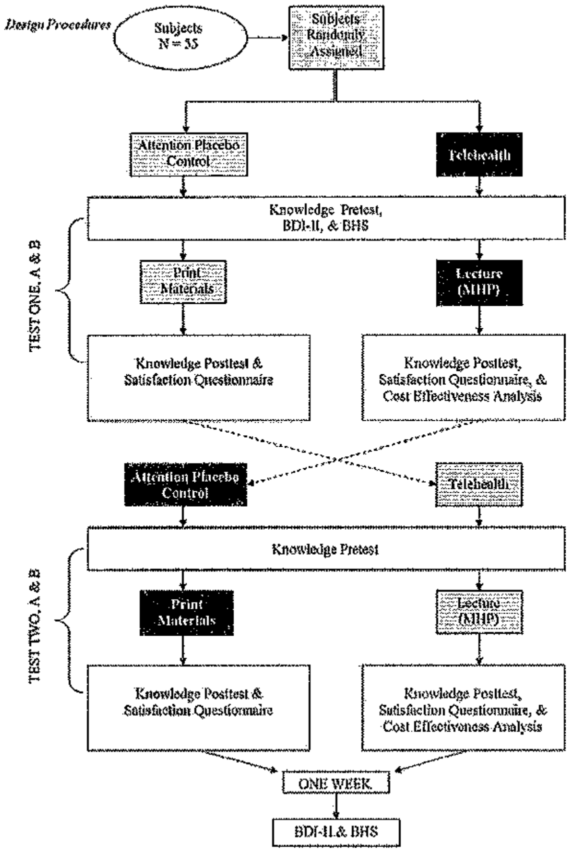

Figure 1 Design procedures.

Dependent Measures

In conducting a study within the deaf population, there are a number of challenges presented. These challenges relate to obtaining valid and reliable outcome data from deaf samples. An exploration of some of the difficulties in obtaining research data within the deaf population will be briefly examined; furthermore, a solution to these difficulties, in order to carry out the purposes of this article, is proposed. Following, a discussion of each of the dependent measures that will be employed in the study and the relevant psychometric properties inherent within these measures will be reviewed. Measures will be discussed in the order in which they were used.

Dependent measures within the deaf population: a caveat. Historically, psychological research within the deaf population has been hampered by the difficulties of attaining objective measures given the linguistic problems many deaf persons have with the English language (Leigh, Robins, & Welkowitz, 1988). Research has traditionally shown that the average student with a hearing loss graduates from high school with median reading comprehension skills at about the fourth grade level (Luckner & Handley, 2008; Marschark & Harris, 1996; Moores, 2001; see also Steinberg, Sullivan, & Loew, 1998). Deaf and hard-of-hearing students have performed consistently lower than hearing students in median reading comprehension skills as demonstrated by the Stanford Achievement Test from ages 8 to 18 years (Holt, 1994; Qi & Mitchell, 2007). It should be recognized, however, that although deaf and hard-of-hearing students perform consistently below their hearing peers in reading comprehension skills, the range of English skills can vary widely (Leigh & Anthony-Tolbert, 2001; Marschark, 1993). Moreover, the primary language of many deaf individuals is ASL, a visual mode of communication which differs grammatically and syntactically from English (Moores, 2001).

To address the difficulties in attaining measurement outcome within the deaf population, this article employed the use of four sign language interpreters. Specifically, two interpreters were available within the telehealth condition and two within the attention placebo control condition. The interpreters were available to sign items on the questionnaires in ASL to aid in the deaf participant's comprehension of measurement items. The interpreter signed only those items in which the deaf participants requested assistance.

Another difficulty in garnering outcome data within the deaf population relates to the dearth of cross-culturally validated measures or to the attainment of psychometric data for newly devised measures that are specific to the population. Given the limited sample size of the deaf population within a given area, it may not be viable to gather evidence of the validity and reliability properties of a newly created test or to cross-validate existing psychological measures. This is especially true if the same test is to be used for a study within the same sample population. For this reason, all measures used within the study were assessed for reliability using the alpha coefficient. Other relevant item analysis procedures were also employed to ensure validity of the measures within the study sample.

Where relevant, a comparison of the psychometric properties between the original and current sample is described for the various measures below.

Beck Depression Inventory-II. In order to assess current levels of depression as well as the possible therapeutic effects of the psychoeducational depression lecture, the BDI-II (Beck, Steer, & Brown, 1996) was administered. In a study examining the use of the BDI-II with the deaf population, Leigh and Anthony-Tolbert (2001) reported a split-half reliability coefficient of .76 for a sample of 63 deaf participants. Cronbach's alpha internal consistency was reported to be .88 for this same sample (p. 196). The BDI-II also attained a strong Cronbach's alpha internal consistency reliability coefficient for the deaf sample within this article ($\alpha = .93$; $n = 49$).

Beck Hopelessness Scale. The BHS (Beck, Weissman, Lester, & Trexler, 1974) was used to corroborate the BDI-II. The BHS has a Kuder–Richardson internal consistency coefficient of .87 for individuals with dysthymic disorder (Beck & Steer, 1988, p. 12). A 1-week test–retest reliability of .66 (Beck & Steer, 1998, p. 12) has also been demonstrated with the BHS. Concurrent validity between the BHS and the BDI-II for individuals with dysthymic disorder indicates a correlation coefficient of .64 (Beck & Steer, 1998, p. 14). Within the study sample, a moderate-level Kuder–Richardson alpha was attained ($\alpha = .32$; $n = 54$). Caution should be used in interpreting the difference between the internal consistency coefficient from the original sample to the current deaf sample due to the clinical nature of the original sample. Criterion-referenced validity coefficients between the BDI-II and BHS in the current deaf sample indicate evidence of convergent validity between the construct of hopelessness and depression ($r = .55$; $n = 48$).

Because psychoeducational lectures, per se, are not considered to be a bona fide therapeutic intervention, it was expected that any remediation in depression or hopelessness based on the BDI-II and BHS retest scores would be minimal at best.

Knowledge of the signs, symptoms, and treatment of depression. One of the primary goals of this article was to evaluate the feasibility and effectiveness of disseminating psychoeducational objectives to the deaf population by means of telehealth. This was assessed via pre- and postintervention knowledge tests on depression. These tests were created using a rational/deductive approach in which items were developed based on the essential features of the psychoeducational lecture and were created as selected response multiple-choice tests. Some items were also adapted from existing quizzes, exams, and test banks of psychology textbooks.

Pre- and postknowledge tests were created for the first and second psychoeducational interventions, for a total of four tests. For the first psychoeducational intervention which introduced the topic of depression, a pretest that included the content of this first lecture was developed. An alternate forms test was then created in which the items from the pretest were randomly shuffled from their original numbered order. This alternate forms test was used to assess postpsychoeducational intervention knowledge. For the second psychoeducational lecture, which elaborates on the topic of depression which was introduced in the first lecture, another knowledge test of depression was created. This second test incorporated the new content of the second lecture. An alternate forms test was then created out of the original pretest. There are 25 items on both the first and the second depression knowledge pretest and posttest with possible scores ranging from 0 to 25 (each item was worth one point).

The depression knowledge questionnaires were administered to a small sample of hearing undergraduate students ($n = 17$) in order to verify the validity of the measure. As predicted by theory, the mean depression knowledge score increased from pretest to posttest following the first ($M_{\text{pretest1}} = 17.5$ [out of a possible 25] to $M_{\text{posttest1}} = 24.1$) and second ($M_{\text{pretest2}} = 19.8$ to $M_{\text{posttest2}} = 23.2$) psychoeducational interventions. The average item difficulty index also increased from pretest to posttest following the first ($d_{\text{pretest1}} = .70$ to $d_{\text{posttest1}} = .96$) and second interventions ($d_{\text{pretest2}} = .79$ to $d_{\text{posttest2}} = .93$), indicating that the items were becoming easier or that a higher proportion of people were passing the items. The psychoeducational interventions in this sample were administered in printed format.

The same pattern of increases in the overall mean depression knowledge score and item difficulty index was found within the current deaf sample from pretest to posttest following the first (M_{pretest1} = 13.6 to $M_{\text{posttest1}}$ = 16.6; d_{pretest1} = .54 to $d_{\text{posttest1}}$ = .66) and second (M_{pretest2} = 13 to $M_{\text{posttest2}}$ = 15.8; d_{pretest2} = .52 to $d_{\text{posttest2}}$ = .64) psychoeducational interventions (reported values are for both the telehealth and the control groups combined). This demonstrated that increase in test scores over time can be considered to be evidence for the construct validity of the depression knowledge questionnaire.

Satisfaction scales. A revised version of the Client Satisfaction Scale (CSS; Tracey & Dundon, 1988) that was implemented in another telehealth study (Schneider, 2000) was used to assess participant satisfaction for the telehealth and the attention placebo control conditions. Each condition was administered their own version of the scale with appropriate wording (e.g., "I would seek help that was delivered through [two-way video/printed material]"). The modified CSS that was used in the Schneider telehealth study was found to have a Cronbach's alpha internal consistency reliability coefficient of .88 (p. 80). Within the current deaf study sample, the measure was found to have a Cronbach's alpha coefficient of .76 for the telehealth condition and .80 for the attention placebo control condition.

The MHP was also asked to complete a revised version of the Therapist Satisfaction Scale (TSS; Tracey & Dundon, 1988). A modified version of the TSS was also used in the Schneider (2000) psychotherapy telehealth study. Schneider's telehealth study found a Cronbach's alpha internal consistency coefficient of .84 for the modified TSS (p. 80). The alpha coefficient is not reported for this article due to the single sample size inherent within the study (only one MHP administered the lecture).

Cost-effectiveness. In analyzing cost-effectiveness, data were garnered based on the recommendations of Frueh et al. (2000) and Hailey (1999) by asking participants and the MHP to estimate travel and time cost savings. Additionally, participants and the MHP were asked to state whether or not they would recommend telehealth as an effective cost saving way to receive or deliver health care at a distance. In an ideal setting, the telehealth equipment will be housed in the individual's home (e.g., Schopp, Demiris, & Glueckauf, 2006). Due to the fact that the telehealth condition of this article takes place in a setting away from the participants' and the MHP's home, participants were asked to base estimates of cost savings as if they were viewing or conducting the lecture from their own home. In essence, participants were asked to estimate cost savings of their travel from home to the community deaf center; the MHP was asked to estimate cost savings from home to the university campus where the telehealth lecture was conducted.

Although cost-effectiveness measures were not completed within the same location—as would be expected in a traditional health care encounter, it should be recognized that because the deaf participants usually traveled to the community deaf center and the MHP usually traveled to the university campus, the cost-effectiveness estimates may still generalize to a traditional health care encounter in which the patient and doctor both travel to the same usual health care facility or office. This is as opposed to the MHP traveling an additional 40 miles "outside of usual travel habits" to the community deaf center. Furthermore, the distance helped to approximate real-world settings in which patient and provider access the telehealth technology from separate locations.

The Frueh et al. (2000) and Hailey (1999) articles also suggest accounting for telehealth expenses from a societal perspective. Societal costs of telehealth include the purchase of videoconferencing equipment and replacement of this equipment every 3 years, and bridging and line charges. To complete the cost analysis, all the above telehealth costs are then juxtaposed with conventional care costs (patient visits the MHP in his or her office).

Adherence to the psychoeducational lecture transcripts. As a basic check on the integrity of the psychoeducational lectures presented by the MHP and ASL interpreter to determine how closely the psychoeducational transcripts were followed, a modified version of the Therapy Adherence Scale that was used in the Schneider (2000) telehealth study was implemented. The results showed that on a scale of 1–10 (1: complete nonadherence to the transcript; 10: complete adherence to the transcript), the MHP who conducted the lecture indicated a 9 across all four lectures. The ASL interpreter, using this same scale format (1: complete nonadherence to the lecture; 10: complete adherence to the lecture), had a mean of 8 (SD = 0.816; range = 7–9) across the four lectures. These results appear to offer some evidence that the lectures conducted via telehealth were administered in a standardized manner and were consistent in its presentation and interpretation.

Apparatuses

Telehealth equipment. The telehealth equipment at the community center consisted of a Polycom ViewStation FX camera and the university campus utilized one Polycom VSX 7000s camera. The videoconference transmission was displayed on 32″ color TVs. The community center had two TVs; one displayed the screen that the receiving end was seeing, whereas the other displayed the MHP lecturer. All TV's were on portable rolling carts. The systems were connected to the Internet via broadband T1 IP lines with transmission speeds of up to 2 Mbps.

Psychoeducational lectures. Two psychoeducational lectures concerning the topic of depression were created. Participants in the attention placebo control condition received printed handout transcripts of this information. The handout transcripts were approxi-

and treatment of depression. Each lecture was designed to last approximately 20 min.

Research Hypotheses

The general research questions or goals that this article sought to answer were outlined at the beginning of this article. For convenience and clarity, the three general research questions are restated below. A total of five operationally defined research hypotheses were formulated from these three general research questions based on the dependent variables described above. The five research hypotheses are described following the appropriate general research question. All research hypotheses were established before initiation of any stage of the study:

Research question #1: Is telehealth an effective medium for providing and receiving health education or services?

1. The telehealth condition will demonstrate posttest depression knowledge scores that are significantly different from the attention placebo control condition.
2. No significant differences will be found on the BDI-II and BHS at 1-week posttest.

Research question #2: Do users of telehealth indicate satisfaction with the use of the technology?

3. There will be a significant difference between the telehealth and attention placebo conditions with participant satisfaction.

Table 1 Two-way repeated measures analysis of variance for test, condition, and condition × test

Source	*df*	*F*	Λ	*p*
Test	1, 54	53.204	0.504	.000***
Condition	1, 54	0.007	1.000	.934
Condition × test	1, 54	0.850	0.984	.361

Note. ***$p < .01$; probability values based on two-tailed tests.

Effectiveness of Telehealth to Disseminate Psychoeducational Objectives

Depression knowledge questionnaires. The first hypothesis evaluated differences in posttest depression knowledge score gains for the telehealth and attention placebo control condition. Results indicated no significant differences on posttest scores between the two conditions. Both conditions were found to be equally efficacious in meeting the goal of psychoeducational dissemination and exhibited significant pretest ($M_{PreTelehealth} = 13.27$ [out of a possible 25], $SD = 4.92$; $M_{PreControl} = 13.07$, $SD = 4.53$) and posttest ($M_{PostTelehealth} = 15.47$, $SD = 5.14$; $M_{PostControl} = 15.76$, $SD = 5.55$) score gains. The results are summarized in Tables 1 and 2.

In addition to the above analyses, paired-samples *t* tests were run for each of the eight experimental conditions across the two different time groups (12 and 6 p.m.). The results are displayed in Table 3. Effect size measures are computed for each condition using eta square (η^2).

An independent-samples *t* test was also conducted to compare pre- and posttest means for each matched condition across the two different time groups. Due to the differing sample sizes across time, equal variances were not assumed. No significant differences were found for any of the 12 p.m. conditions compared with the 6 p.m. conditions with the exception of one group. Significant differences were found between the Posttest 1 Control 12 p.m. ($n = 13$) and 6 p.m. ($n = 23$) groups, $t_{PostControl(1)}(21.15) = 2.98$, $p = .007$***, with the 12 p.m. group scoring higher ($M = 18.62$) than the 6 p.m. group ($M = 13.30$). These results should be interpreted with caution, however, given the large discrepancy in sample size between the two groups.

Table 2 One-way repeated-measures analysis of variance for overall telehealth and control conditions

N	*F*	*p*	η^2
Pre and post telehealth			
55	32.029	.000***	.372
Pre and post control			
55	33.616	.000***	.384

Note. ***$p < .01$; probability values based on two-tailed tests.

BDI-II and BHS 1-week retest analyses. The second research hypothesis examined differences on the BDI-II and BHS at 1-week posttest using one-way repeated measures analysis of variance. The results indicated a partial rejection of the null hypothesis—significant differences were found at 1-week retest for the BDI-II, Wilks' $\Lambda = 0.829$, $F(1, 46) = 9.51$, $p = .003$, $\eta^2 = .171$. However, the same analysis conducted on the BHS yielded a nonsignificant time effect, Wilks' $\Lambda = 0.952$, $F(1, 50) = 2.51$, $p = .120$, multivariate $\eta^2 = .048$.

Using the standard clinical interpretation of these instruments, the mean drop in BDI-II scores for this article was from a descriptive category of mild depression ($M_{FirstAdministration} = 13.70$, $SD = 11.89$) to minimal depression ($M_{OneWeekRetest} = 10.23$, $SD = 11.59$). Although no statistically significant differences were found with the BHS retest scores, it is of interest to note that the mean BHS scores dropped from the descriptive category of mild ($M_{FirstAdministration} = 4.04$, $SD = 3.74$) to normal ($M_{OneWeekRetest} = 3.39$, $SD = 3.34$).

Satisfaction Analyses

The third hypothesis compared participant satisfaction between the telehealth and attention placebo control conditions. The results for the independent-samples *t* test demonstrated no significant difference between the two conditions, $t(100) = 1.453$, $p = .149$. Both conditions had moderate to high levels of mean satisfaction scores ($M_{Telehealth} = 37.98$, $SD = 7.57$; $M_{Control} = 40.04$, $SD = 6.69$ [max score possible = 49]). Satisfaction was also not correlated with whether or not a specific group performed better on the posttest under a specific condition.

The MHP also completed satisfaction measures for all four lectures given within the telehealth condition. The MHP found lecturing through the telehealth medium to be satisfactory ($M_{LecturerSatisfaction} = 45.5$, $SD = 1.92$ [max score possible = 56]).

Table 3 Paired-samples *t* tests for each experimental condition

Condition	*n*	Mean	*SD*	*p*	η^2
Group 1					
Pretest 1 Control 12 p.m.	13	13.85	5.54		
Posttest 1 Control 12 p.m.	13	18.62	5.47	.002***	.571
Pretest 2 Telehealth 12 p.m.	13	13.38	4.79		
Posttest 2 Telehealth 12 p.m.	13	15.54	5.09	.019**	.697
Group 2					
Pretest 1 Telehealth 12 p.m.	11	13.82	5.36		
Posttest 1 Telehealth 12 p.m.	11	15.91	4.85	.070*	.291
Pretest 2 Control 12 p.m.	11	12.73	4.78		
Posttest 2 Control 12 p.m.	11	16.64	6.14	.001***	.697
Group 3					
Pretest 1 Control 6 p.m.	23	12.78	3.84		
Posttest 1 Control 6 p.m.	23	13.30	4.48	.307	.047
Pretest 2 Telehealth 6 p.m.	23	12.78	5.24		
Posttest 2 Telehealth 6 p.m.	23	14.17	5.68	.013**	.247
Group 4					
Pretest 1 Telehealth 6 p.m.	8	13.75	4.33		
Posttest 1 Telehealth 6 p.m.	8	18.50	2.88	.000***	.851
Pretest 2 Control 6 p.m.	8	13.13	5.06		
Posttest 2 Control 6 p.m.	8	17.00	5.66	.001***	.817

Note. Maximum score = 25. $^*p < .10$. $^{**}p < .05$. $^{***}p < .01$; probability values based on two-tailed tests.

Cost-effectiveness of Telehealth

The final research hypothesis considered the cost-effectiveness of delivering health care via telehealth compared with a hypothetical in-person condition. As indicated previously, study participants and the MHP were asked to estimate total travel time and cost savings as if they had accessed the telehealth technology from their own home. This allowed for comparisons to be made with conventional care costs in which the individual transports himself or herself to the healthcare clinic for a face-to-face consultation. The hypothetical face-to-face consultation in this case was the site in which the study participants (community deaf center) and MHP (university campus) had to travel to in order to participate in the study. For example, study participants were asked to indicate or estimate on the cost-effectiveness form the amount of time it took to travel from home to the community deaf center and how much it cost to travel to the site; the MHP estimated the costs in traveling from home to the university campus. Travel to the respective locations was within usual travel habits for both the study participants and the MHP. The distance between study participants and the MHP also helped to approximate real-world settings in which patient and provider access the telehealth technology from separate locations.

The majority of the study participants (89.1%) indicated that they would recommend telehealth as a way to save money in seeking health care; the MHP also responded in the affirmative to the same question. Total travel time saved for the study participants and MHP was calculated for a 1-year period at one session a week. Study participants indicated a mean total of 55 hrs saved for a 1-year period. The MHP indicated a total of 104 hrs of travel time saved over this same time period.

Total cost savings for the study participants and MHP were also calculated for a 1-year period at one session a week. These total cost savings were then compared with societal cost estimates of start-up, bridging and line charges, and replacement of the telehealth equipment every 3 years. Table 4 summarizes the monetary cost savings and expenses of telehealth.

Discussion

The focus of this article was to explore an alternative means of providing mental health services to

Table 4 Monetary cost savings and expenses of telehealth

Type of cost	Mean savings
Transportation savings (participants)	$1,208.81
Transportation savings (MHP)	$676.00
Transportation savings (participants and MHP combined)	$1,884.81
Societal costs	$693.67

Note. Mean transportation savings estimates based off a workload of one consultation per week, for a total of 52 consultations per year. Societal costs examine total mean telehealth-related costs for both a start-up and maintenance year, as well as bridging and line charges. For the purposes of this study, societal costs for purchasing equipment were based on the average costs of a Sorenson Videophone (which is usually given to qualified deaf individuals free of charge) and a Polycom PVX 8.0.1 machine, with technology cost deflation taken into account. This yielded an average cost of $75.00 to purchase the telehealth technology, and costs for replacing this technology every 3 years were estimated at $56.00 (or $18.67 a year). It should be noted that this cost only includes the videoconferencing camera and software; it does not include the TV or computer monitor that would be needed for picture transmission. Bridging and line charges were estimated at $50.00 per month for a total of $600.00 a year.

a significantly underserved group—that of the deaf population. Due to the dearth of culturally competent clinicians abroad who can provide needed mental health services to this population, telehealth may be at least a partial solution to this problem. The deaf population appears to have every reason to benefit from the use of telehealth to receive mental health services, including the following: (a) the principal mode of communication for the deaf population is visual; (b) for the clinician, most diagnostic and treatment information is gathered via the means of visual communication; and (c) the aforementioned need to extend mental health services to the population, whether in rural or sprawling urban populations (Afrin & Critchfield, 1997; Baer et al., 1997; Siwicki, 2000). Indeed, if alternative service delivery methods are not explored, the deaf population stands to remain as a significantly underserved group. Several writers have suggested that research and services in providing mental health access to deaf people are decades behind where they should be (Brauer, Marcus, & Morton, 1999; Devinney & Murphy, 2002; Munro-Ludders et al., 2004; Steinberg et al., 1998). To this end, the purpose of this study was to examine the viability of telehealth to disseminate psychoeducational objectives to a widely underserved group.

The results of this article provide significant support for the efficacy and effectiveness in the use of telehealth to disseminate psychoeducational objectives to the deaf population. Statistically significant pretest to posttest score changes on the depression knowledge tests were found within the telehealth condition across all four groups ($p < .10$). Three of the four groups had significance levels of $p < .05$. This resulted in a moderate effect size for the aggregate telehealth condition ($\eta^2 = .372, p < .001$).

Of significance to note is the fact that such statistically significant findings were attained despite there being technical difficulties with the telehealth equipment during the study period. All four telehealth condition trials experienced these technical difficulties to varying degrees. The transmitted image would repeatedly freeze up during the psychoeducational lectures, creating significant communication gaps. The detrimental effects these technical difficulties had on the study outcomes within the telehealth condition are unknown. However, it can be said that such unfavorable network conditions created a natural experimental environment and might be considered a test of telehealth's effectiveness in such conditions. In light of such conditions, the findings in support of telehealth's effectiveness are made more intriguing.

One of the most surprising results found in this article was the unexpected significant pretest to posttest depression knowledge score gains found within the attention placebo control group. Based on previous research findings concerning the linguistic difficulties and disparate English skills found within the deaf population, it was theorized that administering the psychoeducational intervention in printed format would serve as a valid attention placebo control condition. This theory did not prove to be legitimate in this study, as three of the four groups were found to have statistically significant pretest to posttest score gains ($p < .10$). The three groups had significance levels of less than .01. This resulted in a moderate effect size of .384 ($p < .001$) for the aggregate attention placebo control condition.

The significant findings within the control group have potential implications for the use of literature transcripts to help convey psychoeducational and other health information to the deaf population.

Following Rosenstock's (1974) health belief model, which postulates that an individual's use of health care services may be partially explained by the knowledge of and perceived benefits of health services, having access to health or psychoeducational literature may help deaf individuals gain access to needed information they might otherwise not obtain. Interestingly, research findings have noted that deaf people have poorer health than that of the general population (Barnett & Franks, 2002; Steinberg, Wiggins, Barmada, & Sullivan, 2002; see also Leigh & Anthony-Tolbert, 2001; Leigh, Robins, Welkowitz, & Bond, 1989; Watt & Davis, 1991). Such health disparities may be the result of a lack of resources, knowledge, or support on the signs and symptoms of various health problems (Jones, Ouellette, & Kang, 2006), lending support to the health belief model theory. Providing health information via printed format can be an inexpensive and effective way of disseminating essential health information to this population. In addition to being distributed in a hardcopy format, printed information may be distributed electronically to various sites that the deaf population is likely to access, such as statewide deaf news listserves and community centers. Printed information may also be used as an adjunct in providing health treatment. Having pertinent health information available as a handout for the deaf individual to take away from a health care appointment allows the individual the opportunity to peruse or find answers to information he or she might have missed during the communication interaction with the clinician.

Alternative means of health information dissemination might also include taking advantage of the high-quality video streaming provided via today's Internet. Currently, thousands of health care segments are proliferating online, from professionally produced programs to video bloggers sharing experiences about their latest office visit (Hoos, 2008). Although many of these educational videos do not target the deaf population, in August 2008, YouTube site administrators launched an effort to include closed captions on some of its videos (Lowensohn, 2008). Video streaming may especially be amenable to the deaf population given that it allows for communication in ASL. Of note, there has been a boom in personal sign language video blogs or "vlogs," as well as imbedded video e-mails (Anand, 2007). In September 2008, a health information Web site, "deafMD.org" was launched with the purpose of providing a variety of health education topics in ASL (Davis, 2008). Making use of such culturally affirmative resources in clinical practice may augment the care provided. Although health information Web sites that target the deaf population is an excellent start for disseminating much needed health care education, the reciprocal interaction that allows for a consumer to ask questions and obtain specific personal information is missing. A live interactive encounter with a health professional that may be provided via telehealth or face-to-face communication is also necessary for assessment, diagnosis, and treatment.

As can be deduced from the above findings, the telehealth and attention placebo control conditions did not differ significantly from each other in pretest to posttest depression knowledge score gains. Analyses for possible confounds across time matched by condition did find one significant difference between the 12 and 6 p.m. Posttest 1 Control group, with the 12 p.m. group scoring higher (M = 18.62) than the 6 p.m. group (M = 13.30). As stated previously, such results should be interpreted with caution, given the unequal variances and sample sizes between the 12 (n = 13) and 6 p.m. (n = 23) groups. The significant score differences between these two groups may simply be the result of varying individual reading levels within the group, given the literature medium that was administered as the psychoeducational intervention within the control group. This premise may be substantiated by the fact that the same 6 p.m. (n = 23) group attained pretest to posttest statistical significance in the telehealth condition, M = 14.17, $t(22)$ = −2.689, p = .013, which provided access to the psychoeducational intervention visually via the MHP lecturer and ASL interpreter. It is also of interest to note that of the four groups, the 6 p.m. n = 23 group was the largest sample size group and only group in which one condition—the attention placebo control—did not obtain statistical significance when the other condition did. However, such findings should be tempered given the nonsignificant differences between these two groups on posttest scores, $t(22)$ = −.675, p = .507.

A statistically significant drop in BDI-II scores was found at 1-week retest. Based on the clinical interpretation of BDI-II scores which is accomplished through criterion-referenced procedures (Beck et al., 1996), a clinically significant drop was also found with the overall participants' classification category going from that of "mild depression" to a classification of "minimal depression". The BHS scores did not have a statistically significant drop at 1-week retest; however, a clinically significant drop was found. Using the criterion-referenced procedures established for the BHS (Beck et al., 1974), the overall mean BHS scores dropped from a descriptive classification of "mild" to "normal" on the retest.

Although such decreases in scores upon retest were unexpected—especially given the psychoeducational and single exposure nature to the intervention—a review of the literature suggests that such significant findings are not isolated only to this article. For instance, a recent literature review indicates that between one-third and one-half of clients seen for a single session report being sufficiently helped by the experience so that the therapeutic episode can be terminated (Bloom, 2001). Although single-session interventions are not considered to be a therapeutic panacea, single-session interventions do take advantage of the heightened reception of many clients during initial sessions. Furthermore, single-session interventions may be helpful when a specific problem or topic of interest is being addressed (Goleman, 1991; Talmon, 1990); psychoeducational interventions that address a specific topic appear to meet this criterion and have been shown to be effective in previous studies (Baer et al., 1992; De Jongh et al., 1995; Zaretsky, Lancee, Miller, Harris, & Parikh, 2008). Within this article, perhaps learning about possible treatment options for depression was enough to give participants a sense of hope or of having some tools with which to deal with depressive symptoms. However, a statistical artifact such as regression to the mean cannot be entirely ruled out as a possible reason for the drop in scores. Like much of the single-session research evidence which was also found unexpectedly, the findings in this article have implications for the existing literature on single-session interventions.

Moderate to high satisfaction scores were found in both the telehealth and the attention placebo control conditions, with no significant differences between the two conditions. Participants rated such items as "I would seek help that was delivered through (two-way video/printed material)," "The (lecture/literature handouts) really helped me," and "I would recommend health education that was delivered through (two-way video/printed material) to a friend" similarly across the two conditions. Given the combination of higher than expected scores in the attention placebo control condition and the technical difficulties with the videoconferencing transmission, it is not surprising that no differences between the two conditions were found. It should be noted, however, that there were several comments found in the margins of the telehealth condition satisfaction scale. For example, one participant commented that he or she would seek help that was delivered through two-way video "if the technology works [correctly]." Another participant stated that "it's hard to see what the interpreter was [sic] saying." Yet another participant indicated a 1 on the Likert scale (Very Strongly Disagree) for the item, "I would seek help that was delivered through two-way video" and then added the following comment, "slow speed—bad picture." Despite these individual comments, it is intriguing that moderate to high satisfaction mean scores were found in the videoconferencing condition regardless of the technical difficulties. Such findings may be the result of sign language's amenability to brief disruptions in the flow of conversation. Although not maximally effective, parts of the conversation can still be understood by the listener regardless of these disruptions (e.g., Manoranjan & Robinson, 2000). The MHP also found the interaction with the telehealth medium to be satisfactory.

The findings of moderate to high satisfaction scores within the telehealth condition in this article parallel previous research findings. Hughes, Hudgins, and MacDougall (2004) described a quality assurance evaluation of telehealth which was used to deliver a variety of health care services to deaf individuals in Canada, using a sign language interpreter to facilitate communication. All participants in the evaluation—the deaf patient, health professional, and sign language interpreter—indicated mean average to high levels of satisfaction with the technology on domains such as picture and sound quality, ease of communication, and comfort level.

Perhaps, the most surprising finding with regard to the domain of satisfaction is in reference to the moderate to high mean satisfaction scores found within the attention placebo control condition. This finding coupled with the significant pretest to posttest knowledge score gains found within this condition corroborates the previously described implications for the use of literature handouts to disseminate essential health information to the deaf population. Deaf individuals, at least for this particular sample, appeared to approve of receiving such health information through the printed literature medium. The moderate to high satisfaction scores may also suggest that deaf participants were pleased to get any information or attention on a health topic, regardless of format.

With regard to cost-effectiveness, the findings within this article support the use of telehealth as a cost-effective and viable alternative to traditional face-to-face health care encounters. Significant mean travel cost savings in excess of $1,800.00 were found for the participants and MHP combined, with estimates based on travel to the care site at one session a week for 1 year. With the current volatile state of gas prices, almost any health care encounter that allows the individual to forgo the cost of fuel consumption will stand to save money.

Societal costs of telehealth in which costs for the purchase of the videoconferencing technology, replacement of the technology every 3 years, and bridging and line charges were estimated totaled to an average of $690.00 a year. Caution should be used in interpreting such societal costs as they may not generalize to the mainstream population. For example, many deaf individuals may qualify to receive free videoconferencing equipment from a number of different video relay providers currently on the market. However, a TV or computer monitor and Internet service still must be provided. Some videoconferencing equipment also may not be suitable for health care encounters due to the lack of robust firewalls to ensure confidential communication. For this reason, a low-cost Polycom PVX 8.0.1 videoconference machine was included in the average societal cost estimates. Regardless of the lack of generalizability to the societal cost estimates within this article, it needs to be recognized that the costs for videoconferencing equipment have decreased exponentially over the years as technology has improved (Artinian, 2007; Maheu, 1999; Turner, 2003). These decreases in costs have made the technology more accessible to health care providers.

The cost savings results further indicate that in addition to saving money, users of telehealth stand to save time. Based on the data garnered from study participants, an annual average of 55 travel time hours would have been saved. The MHP indicated annual cost savings of 104 hrs, if consultations were conducted from home. These travel time estimates were calculated based on one session a week for 1 year, for a total of 52 sessions. Having access to health care at one's own home significantly eliminates the time it takes to travel to the health care site. For the participant and clinician alike, such time savings can free up resources and contribute to overall effectiveness.

Although individuals stand to save both money and time by having access to health care from home, there are also some potential drawbacks that need to be considered. For instance, there is the possibility of in-home interruptions and distractions which could come from a myriad of sources such as family members, friends, or pets. Even if the telehealth consumer lives alone, the environment may not always be conducive to health care encounters. The very milieu of the home setting may inadvertently bring out some yet unspecified behaviors that do not positively contribute to the health care encounter. Furthermore, by foregoing the need to attend the clinic, the opportunities for possible social contact and interactions with others are nonexistent. The absence for social contact opportunities can be especially obvious when clinics are located near or are places where other deaf individuals are known to gather. Although such specialized clinics are few and far between (Vernon & Leigh, 2007), this is an issue that needs to be considered when determining treatment options.

Given the chance findings on the effectiveness and satisfaction with the literature handouts in the attention placebo control condition, a formal cost-effectiveness analysis was not conducted for this aspect of the study. However, the cost savings of using literature handouts as an educational tool or to supplement health care cannot be discounted. Literature handouts are likely to be less expensive than many types of media presentations such as lectures, TV programs, Web sites, or radio—the latter of which is generally inaccessible to the deaf.

As with all studies, there are some inherent limitations within this article. It is unclear how well these findings may generalize to the overall deaf population. The high educational level within the study's deaf sample—two-thirds of the sample had some college education or higher—may have skewed the results. In addition, different conclusions may have been found had the telehealth picture transmission during the experiment been clear and problem free, although such conditions in the study might be regarded as a conservative test of telehealth's effectiveness. The study would have also benefited from having trained raters objectively code how well the MHP and ASL interpreter adhered to the psychoeducational lecture transcripts. The use of self-administered Lecture/Interpreting Adherence Scales in this article was meant to be a basic check on the integrity of the lecture as the use of a rater was not feasible in this study. A final significant limitation may be related to the lack of appropriate cross-culturally validated measures available for the deaf population. With the exception of the BDI-II, none of the dependent measures had previously attained psychometric data for a deaf sample. An attempt to address this issue was made, however, by comparing the psychometrics of this article sample with those of previously validated samples. Comparable psychometric properties were found across all measures.

Conclusions

In essence, the purpose of this article was to examine the viability and effectiveness of telehealth as a means of health care delivery to the deaf population. To this end, telehealth's effectiveness for this population was affirmed. The results also provided evidence of the durability of telehealth despite the technical glitches that were experienced with the videoconferencing equipment. Such results corroborate telehealth's amenability to the language of the deaf, ASL—a language which is both visual and capable of overcoming brief disruptions in its conversational flow.

Several other surprising and unexpected implications were also gleaned from this study. The significant outcome that resulted from the control condition has implications for the use of literature handouts to disseminate health education objectives. Although literature handouts can never completely replace a reciprocal interactive encounter with a health care professional, such interventions can be used as an avenue toward or as an adjunct to health care. Where possible, literature transcripts should be provided to accommodate deaf individuals. Another unexpected finding was the demonstrated robustness of the one time exposure to the psychoeducational lectures, which have implications for the literature on single-session interventions.

There are currently no empirically controlled experimental studies in the literature that explore the feasibility of using telehealth to alleviate the barriers to health care within the deaf population. Much of the results within this article are also generalizable to the mainstream general population. Using telehealth as a time-saving and interactive medium of effective health care delivery can be of great benefit to society in general.

Future research might examine the effectiveness of telehealth in conducting other areas of health care delivery, such as diagnostic assessments or actual treatment where outcomes could be assessed. Complex ethical issues in the use of telehealth such as privacy and confidentiality, Health Insurance Portability and Accountability Act compliance, interstate treatment, and management of high-risk patients (e.g., suicidal ideation) need to be addressed. An MHP who can communicate in ASL might also be used in a future telehealth study with the deaf population; however, given the dearth of MHPs available who can themselves communicate in ASL, having the lecture signed by an interpreter helped make the study more generalizable to real-world settings (Hughes et al., 2004; Lane et al., 1996).

The future of telehealth is an exciting one. Advances in the technology can only bring about more reliable videoconferencing capabilities along with clearer and better picture quality. The findings within this article provide support for continued research in the use of telehealth with the deaf population. Interest in implementing alternative avenues to care such as telehealth to overcome the unique accessibility barriers that deaf individuals face is likely to grow. Indeed, such investigations of alternative health care delivery strategies must be forthcoming or the deaf population is likely to remain a significantly underserved group.

References

Afrin, J., & Critchfield, B. (1997). Low-cost telepsychiatry for the deaf in South Carolina. *Journal of American Medical Informatics Association, 901.*

Anand, S. (June 9, 2007). Sign of the times: Video, email, are boons to the deaf; Internet and texting open a 'Fourth Dimension' of real-time conversation. *Wall Street Journal, A1.*

Artinian, N. T. (2007). Telehealth as a tool for enhancing care for patients with cardiovascular disease. *Journal of Cardiovascular Nursing, 22,* 25–31.

Austen, S., & McGrath, M. (2006). Telemental health technology in deaf and general mental-health services: Access and use. *American Annals of the Deaf, 151,* 311–317.

Baer, L., Elford, R., & Cukor, P. (1997). Telepsychiatry at forty: What have we learned? *Harvard Review of Psychiatry, 5,* 7–17.

Baer, J. S., Marlatt, G. A., Kivlahan, D. R., Fromme, K., Larimer, M. E., & Williams, E. (1992). An experimental test of three methods of alcohol risk reduction with young adults. *Journal of Consulting and Clinical Psychology, 60,* 974–979.

Barnett, S., & Franks, P. (2002). Deaf adults and healthcare utilizations: Relationship with age at onset of deafness. *Health Services Research, 37,* 103–118.

Beck, A. T., & Steer, R. A. (1988). *Beck hopelessness scale manual.* San Antonio, TX: The Psychological Corporation Harcourt Brace Jovanovich, Inc.

Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *BDI-II: Beck Depression Inventory manual* (2nd ed.). San Antonio, TX: The Psychological Corporation.

Beck, A. T., Weissman, A., Lester, D., & Trexler, L. (1974). The measurement of pessimism: The Hopelessness Scale. *Journal of Consulting and Clinical Psychology, 42,* 861–865.

Best, A. (1943). *Deafness and the deaf in the United States.* New York: Macmillan.

Bloom, B. L. (2001). Focused single-session psychotherapy: A review of the clinical and research literature. *Brief Treatment and Crisis Intervention, 1,* 75–86.

Brauer, B. A. (2008). Careers for the twenty-first century: Psychologists promote physical and mental health. Retrieved December 19, 2008, fromhttp://www.apa.org/topics/psychcareer04.html.

Brauer, B. A., Marcus, A. I., & Morton, D. D. (Eds.) (1999). *Proceedings of the First World Conference on Mental Health and Deafness at Gallaudet University.* Retrieved August 1, 2005, from http://mhdeafintl.gallaudet.edu/proceedings1/proc1toc.html.

Davis, C. A. (2008). Website offers health education in American Sign Language. Retrieved December 15, 2008, from http://www.kcdhh.ky.gov/bulletin/deaf_md.pdf.

De Jongh, A., Muris, P., Ter Horst, G., Van Zuuren, F., Schoenmakers, N., & Makkes, P. (1995). One-session cognitive treatment of dental phobia: Preparing dental phobics for treatment by restructuring negative cognitions. *Behavior Research and Therapy, 33,* 947–954.

Devinney, J., & Murphy, S. (2002). Mental health experiences and deafness: Personal and legal perspectives. *Psychiatric Rehabilitation Journal, 25,* 304–309.

Feldman, D. M., & Gum, A. (2007). Multigenerational perceptions of mental health services among deaf adults in Florida. *American Annals of the Deaf, 152,* 391–397.

Frueh, B. C., Deitsch, S. E., Santos, A. B., Gold, P. B., Johnson, M. R., Meisler, N., et al. (2000). Procedural and methodological issues in telepsychiatry research and program development. *Psychiatric Services, 51,* 1522–1527.

Glueckauf, R. L., & Ketterson, T. U. (2004). Telehealth interventions for individuals with chronic illness: Research review and implications for practice. *Professional Psychology: Research and Practice, 35,* 615–627.

Goleman, D. (1991). Therapists say a single session may be enough. The New York Times. Retrieved December 29, 2008, from http://query.nytimes.com/gst/fullpage.html?res=9D0CE7DE173AF931A35756C0A967958260&sec=health&spon=&pagewanted=all.

Gournaris, M. J., & Leigh, I. W. (2004). Comparison of face-to-face and video-mediated communication with deaf individuals: Implications for telepsychotherapy. *Journal of Professionals Networking for Excellence in Service Delivery with Individuals who are Deaf and Hard of Hearing, 37,* 20–41.

Hailey, D. (1999). An assessment framework for telemedicine applications. *Journal of Telemedicine and Telecare, 5,* 162–170.

Hilty, D., Liu, W., Marks, S., & Callahan, E. (2003). The effectiveness of telepsychiatry: A review. *Canadian Psychiatric Association Bulletin, 10,* 10–17.

Holt, J. A. (1994). Stanford Achievement Test—8th edition: Reading comprehension subgroup results. *Annals of the Deaf, 138,* 172–175.

Hoos, M. (2008). Surgery on demand: Docs on TV. *The Gadsen Times.* Retrieved December 15, 2008, from http://www.gadsdentimes.com/article/20080302/NEWS/803020301/1049/LIFETIMES.

Hughes, G., Hudgins, B., & MacDougall, J. (2004). Using telehealth technology to improve the delivery of health services to people who are deaf. In Engineering in Medicine and Biology Society, *Proceedings of the 26th Annual International*

Conference of the IEEE EMBS (pp. 3084–3087). San Francisco, CA, USA.

Hyler, S. E., Gangure, D. P., & Batchelder, S. T. (2005). Can telepsychiatry replace in-person psychiatric assessments? A review and meta-analysis of comparison studies. *CNS Spectrums, 10,* 403–413.

Jacobs, D. (2004). *National Depression Screening Day: Regular lecture.* Wellesley Hills, MA: NDSD.

Jones, E. G., Ouellette, S. E., & Kang, Y. (2006). Perceived stress among deaf adults. *American Annals of the Deaf, 151,* 25–31.

Kazdin, A. E. (2003). *Research design in clinical psychology.* Boston, MA: Allyn & Bacon.

Lane, H., Hoffmeister, R., & Bahan, B. (1996). *A journey into the deaf world.* San Diego, CA: Dawn Sign Press.

Leigh, I., & Anthony-Tolbert, S. (2001). Reliability of the BDI-II with deaf persons. *Rehabilitation Psychology, 46,* 195–202.

Leigh, I., Robins, C., & Welkowitz, J. (1988). Modification of the Beck Depression Inventory for use with a deaf population. *Journal of Clinical Psychology, 44,* 728–732.

Leigh, I., Robins, C., Welkowitz, J., & Bond, R. (1989). Toward greater understanding of depression in deaf individuals. *American Annals of the Deaf, 134,* 249–254.

Liss, H. J., Glueckauf, R. L., & Ecklund-Johnson, E. P. (2002). Research on telehealth and chronic medical conditions: Critical review, key issues, and future directions. *Rehabilitation Psychology, 47,* 8–30.

Lopez, A. M., Cruz, M., Lazaru, S., Webster, P., Jones, E. G., & Weinstein, R. S. (2004). Case report: Use of American Sign Language in telepsychiatry consultation. *Telemedicine Journal and E-Health, 10,* 389–391.

Lowensohn, J. (2008). YouTube gets closed captioning support. *CNET News.* Retrieved February 9, 2009, from http://news.cnet.com/8301-17939_109-10028095-2.html.

Luckner, J. L., & Handley, C. M. (2008). A summary of the reading comprehension research undertaken with students who are deaf or hard of hearing. *American Annals of the Deaf, 153,* 6–36.

Maheu, M. (1999). Telehealth and the future of your psychotherapy practice. *California Psychologist, 28–32.*

Manoranjan, M. D., & Robinson, J. A. (2000). Practical low-cost visual communication using binary images for deaf sign language. *IEEE Transactions on Rehabilitation Engineering, 8,* 81–88.

Marschark, M. (1993). *Psychological development of deaf children.* New York: Oxford University Press.

Marschark, M., & Harris, M. (1996). Success and failure in learning to read: The special case (?) of deaf children. In C. Cornoldi & J. Oakhill (Eds.), *Reading comprehension difficulties: Processes and interventions* (pp. 279–300). Mahwah, NJ: Lawrence Erlbaum Associates.

Moores, D. (2001). *Educating the deaf: Psychology, principles, and practices* (5th ed.). Boston: Hougton Mifflin.

Munro-Ludders, B., Simpatico, T., & Zvetina, D. (2004). Making public mental-health services accessible to deaf consumers: Illinois deaf services 2000. *American Annals of the Deaf, 148,* 396–402.

Myklebust, H. (1964). *The psychology of deafness.* New York: Grune & Stratton.

Nickelson, D. W. (1998). Telehealth and the evolving health care system: Strategic opportunities for professional psychology. *Professional Psychology: Research and Practice, 29,* 527–535.

Pollard, R. (1994). Public mental health service and diagnostic trends regarding individuals who are deaf or hard of hearing. *Rehabilitation Psychology, 39,* 147–158.

Pollard, R. (1998). Psychopathology. In M. Marschark & D. Clark (Eds.), *Psychological perspectives on deafness* (Vol. 2, pp. 171–197). Mahwah, NJ: Lawrence Erlbaum, Inc.

Qi, S., & Mitchell, R. E. (2007). *Large scaled academic achievement testing of deaf and Hard of hearing students: Past, present, and future.* Paper presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Rosenstock, I. M. (1974). Historical origins of the health belief model. *Health Education Monographs, 2,* 328–335.

Schneider, P. (2000). A comparison of outcome variables in psychotherapy: Distance technology versus face-to-face. Dissertation: University of Illinois at Urbana-Champaign.

Schopp, L., Demiris, G., & Glueckauf, R. (2006). Rural backwaters or front-runners? Rural telehealth in the vanguard of psychology practice. *Professional Psychology: Research & Practice, 37,* 165–173.

Siwicki, B. (2000). Telepsychiatry a sign of the times: Technology enables hearing-impaired patients throughout South Carolina to see a psychiatrist fluent in sign language. *Health Data Management, 8,* 182–185.

Steinberg, A. G. (1991). Issues in providing mental health services to hearing-impaired persons. *Hospital & Community Psychiatry, 42,* 380–389.

Steinberg, A. G., Sullivan, V. J., & Loew, R. C. (1998). Cultural and linguistic barriers to mental health service access: The deaf consumer's perspective. *American Journal of Psychiatry, 155,* 982–984.

Steinberg, A. G., Wiggins, E. A., Barmada, C. H., & Sullivan, V. J. (2002). Deaf women: Experiences and perceptions of healthcare system access. *Journal of Women's Health, 11,* 729–741.

Talmon, M. (1990). *Single session therapy: Maximizing the effect of the first (and often only) therapeutic encounter.* San Francisco, CA: Jossey-Bass.

Tracey, T. J., & Dundon, M. (1988). Role anticipations and preferences over the course of counseling. *Journal of Counseling Psychology, 35,* 3–14.

Turner, J. W. (2003). Telemedicine: Expanding health care into virtual environments. In T. L. Thompson, & A. M. Dorsey, et al. (Eds.) *Handbook of health communication* (pp. 515–535). Mahwah, NJ: Lawrence Erlbaum Associates.

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

Vernon, M. (1983). Deafness and mental health: Emerging responses. In E. Petersen (Ed.), *Mental health and deafness: Emerging responses* (pp. 1–15). Silver Spring, MD: American Deafness and Rehabilitation Association.

Vernon, M., & Leigh, I. W. (2007). Mental health services for people who are deaf. *American Annals of the Deaf, 152,* 374–381.
Warner, H. C. (1987). Community service centers for deaf people: Where are we now? *American Annals of the Deaf, 132,* 237–238.
Watt, J., & Davis, F. (1991). The prevalence of boredom proneness and depression among profoundly deaf residential school adolescents. *American Annals of the Deaf, 136,* 409–413.
Zaretsky, A., Lancee, W., Miller, C., Harris, A., & Parikh, S. V. (2008). Is cognitive-behavioural therapy more effective than psychoeducation in bipolar disorder? *The Canadian Journal of Psychiatry, 53,* 441–448.

Received August 19, 2008; revisions received March 13, 2009; accepted March 29, 2009.