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Performance Characteristics of the Verbal QuickDASH

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Abstract

Purpose—To quantify the performance of the verbally administered Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH) by assessing its replication of self-administered scores, its test-retest reliability, and its rate of scorable completion compared to its self-administered, written administration.

Methods—50 patients presenting for initial visits to a hand clinic were enrolled regardless of diagnosis. All patients completed a written and a verbal QuickDASH 1 day apart (25 patients written first, 25 patients verbal first). Intraclass correlation coefficients quantified the verbal questionnaire's ability to reproduce written scores. Participants verbally completed the questionnaire a final time, 5 months later, to assess test-retest reliability. To quantify the usability of survey data, we compared percentages of scorable surveys between written and verbally administered QuickDASH questionnaires in this study and in prior studies within our division.

Results—The intraclass correlation coefficient between the 2 QuickDASH administration types for the entire sample was 0.91. Across all participants, there was a minimal change in mean score from a patient's written QuickDASH to that patient's first verbal QuickDASH score. Scoring consistency between QuickDASH administrations was similar for each administration sequence (phone followed by written vs. written followed by phone) and by diagnosis. Test-retest reliability between the 2 verbal administrations demonstrated good reliability and a minimal difference between scores. In this study, no written or verbal surveys were incomplete. Reviewing our practice, 17% of 258 written questionnaires produced unscorable data compared to 0% of 140 verbally administered surveys.

Discussion—Our results indicate that verbal administration of the QuickDASH replicates clinically relevant scores of the written QuickDASH, has good test-retest performance, and may minimize unusable data. These data allow researchers greater flexibility in gathering patient outcome data in both retrospective and prospective studies.

Level of Evidence—Diagnostic, Level II

Keywords

DASH; outcome measure; QuickDASH; reliability; verbal

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INTRODUCTION

Clinical research relies heavily on standardized patient-rated questionnaires. For upper extremity research, the Quick Disabilities of the Arm, Shoulder, and Hand (QuickDASH) questionnaire is a widely referenced measure of self-reported disability.(1, 2) The QuickDASH is an abbreviated 11-question subset from the original Disabilities of the Arm, Shoulder, and Hand (DASH) questionnaire.(2, 3). The questionnaire's answers are scored on a 1-5 point scale that is then transformed to result in a score that ranges from 0 (indicating least disability) to 100 (indicating most disability).(2) Both versions of the questionnaire, in their standard written format, have been tested in clinical populations and have shown to be valid, reliable, and responsive to changes in patient-rated upper extremity function.(2-6)

The QuickDASH decreases responder and data entry burden while maintaining a high degree of correlation ($r \geq 0.97$) with scores derived from the original, full-length DASH questionnaire. (2) The ease in administering the QuickDASH lends itself to verbal administration, even over the phone, as it takes less than 5 minutes to ask all 11 questions. However, the comparability of patients' responses to the QuickDASH administered verbally compared to patients' responses to the written QuickDASH is unknown, and the creators of the QuickDASH "do not recommend or endorse using the DASH/QuickDASH over the telephone,(7)" until its characteristics have been formally tested. Additionally, for other outcome measures, including abbreviated questionnaires 6 - 11 questions in length, patients have reported better health and reduced levels of symptoms when asked by phone compared to written administration, which may be related to patients minimizing symptoms when rating health to an interviewer.(8-10)

The purpose of this study was to compare the performance characteristics of the QuickDASH following administration over the telephone to responses recorded from self-administration of the previously validated, written QuickDASH. We tested the null hypothesis that the verbally administered QuickDASH would perform similarly (i.e., replicate scores, test-retest reliability, completion rate) compared to the self-administered written QuickDASH.

METHODS

We obtained institutional review board approval prior to conducting this prospective cohort investigation. Patients were eligible to participate in the study if they were at least 18 years of age and presented as a new patient to the hand clinic. Patients were excluded if they were unable to provide verbal consent for study participation or if they lacked English proficiency.

First, we tested if verbal administration could replicate clinically relevant scores produced by the written QuickDASH. Patients were either contacted the day prior to their appointment by telephone (verbal first group), or on the day of their appointment in the office (written first group). Patients understood that participation would require completing the QuickDASH questionnaire both verbally and in writing, but they were not aware that our purpose was to determine if the 2 administration methods produced similar results. We first enrolled the verbal first group until 25 consecutive patients had completed both administrations of the QuickDASH. Over the phone on the day before their office visit (day -1), patients in the verbal first group were asked the 11 question QuickDASH exactly as it is written. When these patients arrived in the office the next day (day 0), they completed the written version of the QuickDASH. Subsequently, we enrolled 25 consecutive patients in the written first group. This written first group completed the written QuickDASH in the office (day 0) before being contacted the following day (day 1) to complete the QuickDASH by telephone. Five of the 25 patients in this group received treatment in the form of a steroid injection on the day of the written, in-office QuickDASH administration. These patients were still asked to complete the verbal QuickDASH per its instructions of activity over the past week. If patients had any questions

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or asked for clarification during verbal administration, interviewers reassured the patients that there were no correct or incorrect answers, apologized for being unable to directly answer their question(s), and repeated the current QuickDASH question. The medical record was used to determine patients' ages and diagnoses.

To investigate the test-retest reliability of the verbal QuickDASH, 49 of the 50 patients were contacted by telephone a third time approximately 5 months (range, 4-6 months) after their initial QuickDASH completion. During this conversation, patients completed the verbal QuickDASH based on their recollection of their prior health state when they initially presented to the clinic.

Finally, we compared the verbal and written QuickDASH to quantify the usability of questionnaire data. We analyzed 258 written QuickDASH questionnaires and 140 verbal QuickDASH surveys collected as part of 2 unrelated prior investigations in our division that employed the QuickDASH as an outcome measure as well as the 99 verbal questionnaires administered in this study. The prior written questionnaires were completed in the clinic after being handed to the patient by office staff at the request of the attending surgeons with no further review. The prior verbal QuickDASH questionnaires were administered over the phone in an identical manner to this study in that trained researchers administered both. QuickDASH questionnaires completed during this study were unique in having a dedicated researcher reviewing every questionnaire as they were completed. We determined how many questionnaires had data error but were scorable (only 1 question skipped or marked with duplicate answers), and the number of questionnaires with data error preventing scoring (more than 1 question skipped or with duplicate answers).

This study was designed based on 2 *a priori* sample size calculations. As the intraclass correlation coefficient (ICC) would assess both the replication of scores obtained during written administration and the test-retest reliability, we relied on the method of Walter et al. to established the appropriate sample size needed.(11) Based on our study design of 2 replications of the QuickDASH questionnaire, we would need 40 participants to achieve 80% power with an alpha of 0.05 to detect an ICC value of 0.8 with narrow enough confidence intervals to distinguish excellent reproducibility from fair/good reproducibility. Confirming this to be sufficient from a perspective of clinical relevance, we considered the reported minimal clinically important difference of the QuickDASH that ranged from 8 to 15 with a standard deviation of 15.(12, 13) To be able to detect an 8-point difference in an individual's QuickDASH score between administrations via a matched-pairs t test, the enrollment of 40 patients would provide 91% power at an alpha of 0.05. To ensure adequate power and to account for potential participant withdrawal, we chose to enroll 50 participants.

Data Analysis

All data were collected and managed using REDCap (Research Electronic Data Capture) tools (http://project-redcap.org/), which is hosted in the biostatistics division of our university and which is a secure, web-based application designed to support data capture for research studies. (14, 15)

Descriptive statistics were produced to characterize the participants. Means and standard deviations were used to report the distributions of numeric data. To demonstrate equivalency between groups, patients' mean ages were compared by an independent t test, and sex and diagnoses were compared by Fisher exact tests.

The ICC, based on absolute agreement of a single measure modeled by a 1-way random effects analysis of variance, was calculated to determine the measure of reproducibility of the written and first verbal QuickDASH administrations from the same subject. A coefficient greater than

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or equal to 0.75 indicates excellent reproducibility, a coefficient between 0.4 and 0.74 indicates fair to good reproducibility, and a coefficient less than 0.4 indicates poor reproducibility.(16) Due to limitations of ICC analysis(17), we also performed several confirmatory analyses. A Bland-Altman graph was created to visualize the differences of the verbal and written administrations against their mean values. A Student paired t test was used to compare the mean difference in QuickDASH scores from the written to the verbal administration for the entire population and patient subgroups. Comparisons of the difference in QuickDASH scores between groups defined by diagnosis were performed by examining their mean differences. We calculated Pearson correlation coefficients for the correlation between the difference in QuickDASH scores (verbal and written separated by 1 day) and investigated if age affected a patient's reliability of responses. To quantify the test-retest reliability of the verbal QuickDASH we calculated the ICC for the 2 verbal administrations of the QuickDASH separated by 5 months in a similar manner. Analysis of the completion rates between verbal and written QuickDASH questionnaires was performed by a Fisher exact test. An alpha value of 0.05 was used to determine significance for all tests.

RESULTS

Table 1 lists the entire study population's and both groups' (i.e., written first, verbal first) distribution of sex, mean age, and diagnoses. There were no statistically significant associations with either group with regards to sex, diagnosis, or mean age.

The ICC for the entire study population between the written and verbal QuickDASH was 0.91 (95% CI: 0.84-0.95, Figure 1). The Bland-Altman graph demonstrated that almost all of our data points were within the 95% agreement limits and that there was no systematic bias in the differences in QuickDASH administrations toward either higher or lower scores (Figure 2). For the entire study population, there was no significant or clinically relevant difference in score from a patient's written completed QuickDASH compared to that patient's verbally administered QuickDASH score (mean difference=1.1 points, 95% CI: -1.5-3.6).

The group of patients that completed the written, in-office QuickDASH first had an average difference of 0.2 points (SD = 9.6) from the first to the second (verbal) QuickDASH administration. The group that completed verbal administration of the QuickDASH first had an average difference of -1.9 points (SD=8.2) from the first to the second (written) QuickDASH administration. Comparisons of these 2 groups' means did not reveal a statistically significant difference (P=0.41).

Patient sex (male: -0.86, SD: 8.03; female: -0.74, SD: 10.86; P=0.97) did not have a significant impact on scoring differences between the written and verbal QuickDASH administration performed within 24 hours. Although underpowered for statistical analysis, clinical diagnosis did not produce any clinically relevant impact on the scoring differences (Figure 3). Additionally, there was no correlation of differences in QuickDASH scores between the in-office and verbal administration also performed within 24 hours with patients' age (Figure 4, r_p= -0.03, P=0.82).

The 2 verbal administrations of the QuickDASH separated by 5 months had an intraclass correlation coefficient of 0.68 (95% CI: 0.49-0.80), with a minimal and not clinically relevant difference between scores for the entire population (mean=1.2, 95% CI: -3.6-6.0).

None of the 50 written QuickDASH questionnaires or 99 verbally administered QuickDASH surveys had any missing data. QuickDASH questionnaires (n = 258) were analyzed from a prior study during which patients self-completed the written QuickDASH questionnaire. From this group, 44 questionnaires (17%) had 1 question incorrectly marked or skipped but remained

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scorable, and 45 questionnaires (17%) were unscorable due to multiple questions being skipped or multiple numbers being circled. In 140 prior verbal QuickDASH questionnaires, none was unscorable, and all had complete data. These differences demonstrated an association between written administration and unscorable responses ($P<0.001$).

DISCUSSION

This study demonstrated that verbal administration of the QuickDASH to patients with forearm and hand diagnoses sufficiently replicated the validated written QuickDASH. Assessing verbal administration of questionnaires is common. The Quality of Life in Epilepsy Inventory-89 (18) and the Western Ontario and McMaster University Osteoarthritis Index (19) have been studied with phone administration with patients completing the survey on consecutive days (19) or after 2-8 days.(18) Intervals between questionnaire administrations as low as 2 days are appropriate in orthopedic(20) and non-orthopedic studies.(18) We chose a next-day assessment to minimize the impact of recall inaccuracy while avoiding the perfect agreement we expected from same-day administration.

Prior studies provided participants with a paper copy of the survey during phone administration. (18, 19) While this may aid the patient, it is impractical. Studies capturing data with months between collections would require patients to maintain a home survey copy or to be re-sent the questionnaire. We believe that questioning patients without a paper reference is representative of how researchers would ask patients to complete the QuickDASH verbally.

The verbal QuickDASH demonstrated excellent ability to replicate scores obtained during written administration (ICC 0.91). This finding confirms that of Bot et al. who had 135 patients complete the written QuickDASH followed by verbal administration within 1 day and reported an ICC of 0.92.(21) Our data are also consistent with their calculated mean differences between administrations (1.1 vs. 3.2) and their variability (8.9 vs. 11.0).(21)

The verbal QuickDASH demonstrated good reliability and minimal differences in scores when administered 5 months later. Our study's latter reliability was lower than the reliability reported during creation of the written QuickDASH (ICC>0.9).(2) This may indicate diminished reliability of the verbal QuickDASH, but our ICC value (0.68) fell within the 95% CI's reported by Mintken when investigating the minimal clinical difference of the QuickDASH (ICC 0.9, 95% CI 0.58-.0.97).(13) It is also plausible that patients inaccurately recalled their health state 5 months prior and thus diminished our calculated reliability statistic, although we expect that this had limited impact(22). Considering the performance of similar patient-rated outcome measures, our data are comparable, as the Physical Activity Scale of the Elderly's test-retest reliability was found to be less when assessed by telephone ($r_p=0.68$) than by mail ($r_p=0.84$). (23) The Patient Rated Wrist Evaluation has also demonstrated similar magnitudes of reliability among functional questions (ICC 0.61).(24) We interpret our data to suggest that verbal administration may be less reliable from a test-retest standpoint for individual patients, but that its performance remains appropriate for studying a group of patients.

Our study is one of several examining facets of QuickDASH administration. The QuickDASH has been validated in multiple languages(25-27) and for tablet computer administration.(28) The latter allows for prompts that minimized the number of missed or improperly answered questions, and verbal administration offers the same benefit, as evidenced by no errors that would prevent scoring in verbally administered questionnaires compared to 17% of self-administered written surveys. This is consistent with the 24% of unscorable written DASH surveys collected by Dy et al. from 222 patients.(28) Having a trained interviewer on the phone should ensure that no patient responses are discarded due to multiple answers to a single question or multiple skipped questions. This occurred in our current study and a prior study

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that collected 140 verbal QuickDASH surveys. Researchers could institute similar data quality review after patients complete the written QuickDASH when it is self-administered. Although such a technique was successful in the 25 patients completing the written QuickDASH first in this study, our anecdotal experience from conducting larger studies is that various office staff collect surveys and patients can leave before a researcher/attending surgeon can review the survey.

In addition to the added quality control offered by an interviewer, administering the QuickDASH verbally is attractive for its efficiency. If not completed in the office during routine visits, completion of a written QuickDASH contributes to both the cost and inefficiency of clinical research. Collecting written QuickDASH surveys by fax, e-mail, or mail incur additional cost and require contacting patients and having them return the completed instrument. In our experience, return rates have been disappointing. Alternatively, having patients return to the office solely to complete follow-up QuickDASH surveys imparts undue burden on them. These factors may contribute to increased missing data and threaten the validity of research findings. While verbal administration of the QuickDASH requires successful phone contact, the instrument can be completed in a few minutes. For this reason, verbal administration methods of the QuickDASH have been used in prior research studies. (29-34) Our current study provides evidence that such data should be considered similar to written collection of the data.

Several limitations are inherent to our investigation. First, despite enrolling patients with a variety of diagnoses, our findings may not generalize to all hand and forearm conditions. Second, when patients received treatment during an office visit it could have produced QuickDASH score changes despite instruction to recall impairment prior to the visit. However, our results showed that the order of administration did not cause significant differences in QuickDASH scores, suggesting in-office treatment did not affect the results. Third, all properties of the verbal QuickDASH depend on the administrator of the questionnaire. Only 3 researchers verbally administrated the QuickDASH, and all 3 only read the instructions that were written on the paper version of the QuickDASH. Without strict adherence to a script, an administrator could influence the manner in which patients answer the questions. Finally, several patients demonstrated inconsistencies in QuickDASH responses even when tested on sequential days. This could be due to the limited number of questions on the QuickDASH; if a patient changed only a single answer on 1 question by 1 degree (e.g., mild difficulty to moderate difficulty), it would change the overall score by over 2 points. As we failed to demonstrate any systematic bias in scoring between administrations and found acceptable group level reproducibility, we interpret our data as supporting the acceptability of verbal administration of the QuickDASH.

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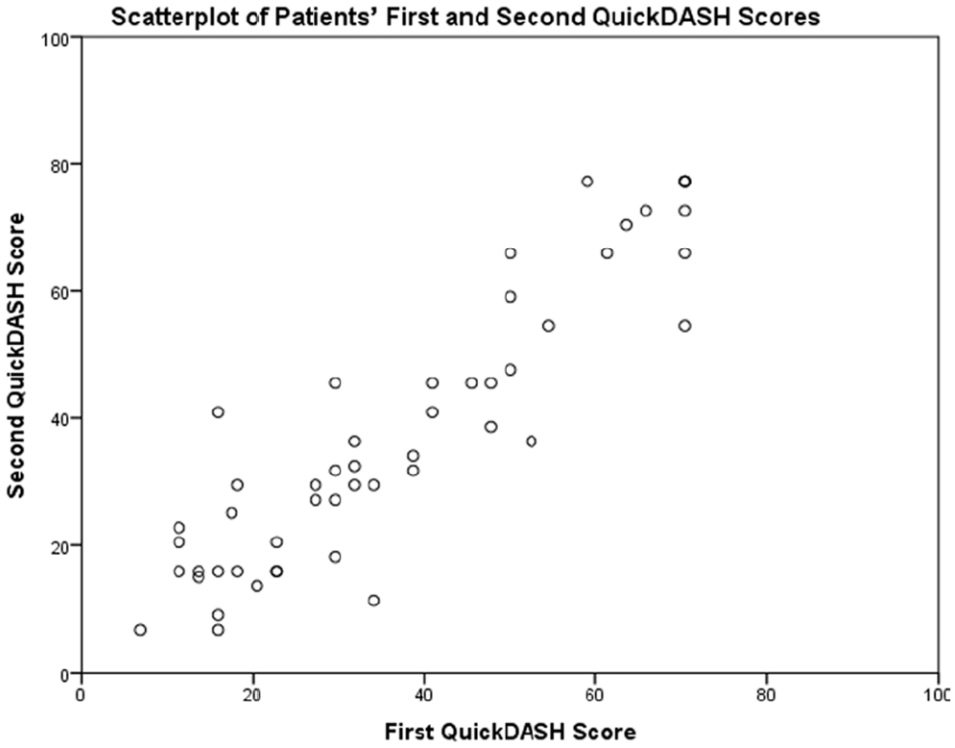

Figure 1.
Scatterplot demonstrating relationship between patients' first and second QuickDASH scores.

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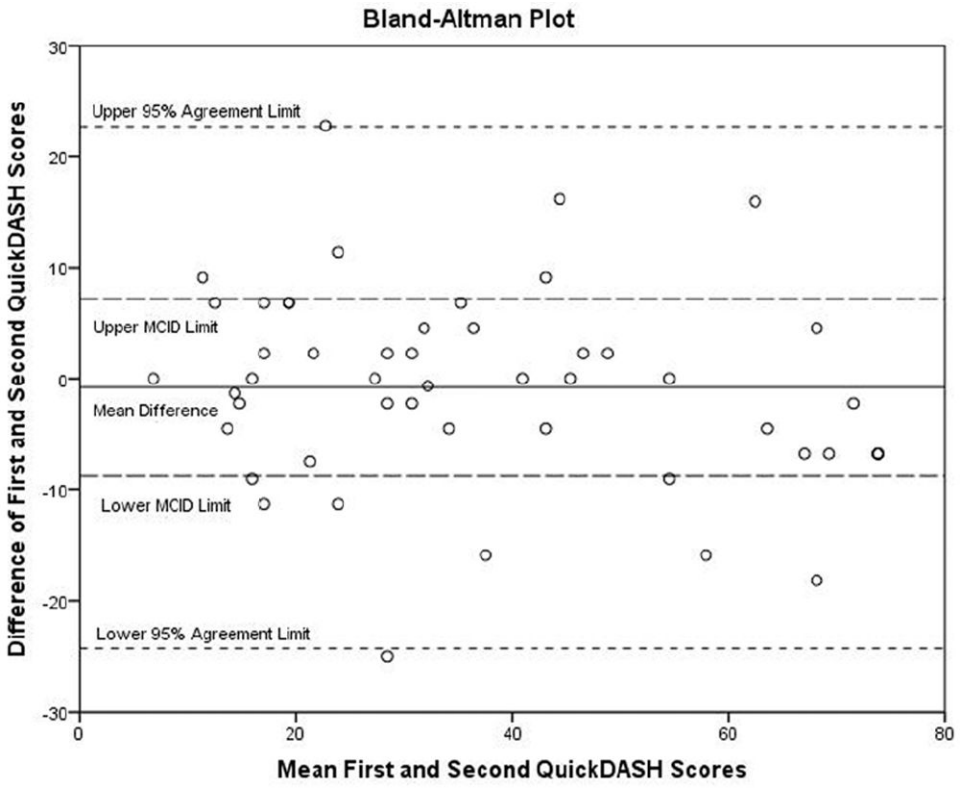

Figure 2.

Bland-Altman plot demonstrating the differences of the verbal and written administrations against their mean values. The mean difference value, upper and lower 95% agreement limits, and upper and lower minimal clinically important difference limits are all marked.

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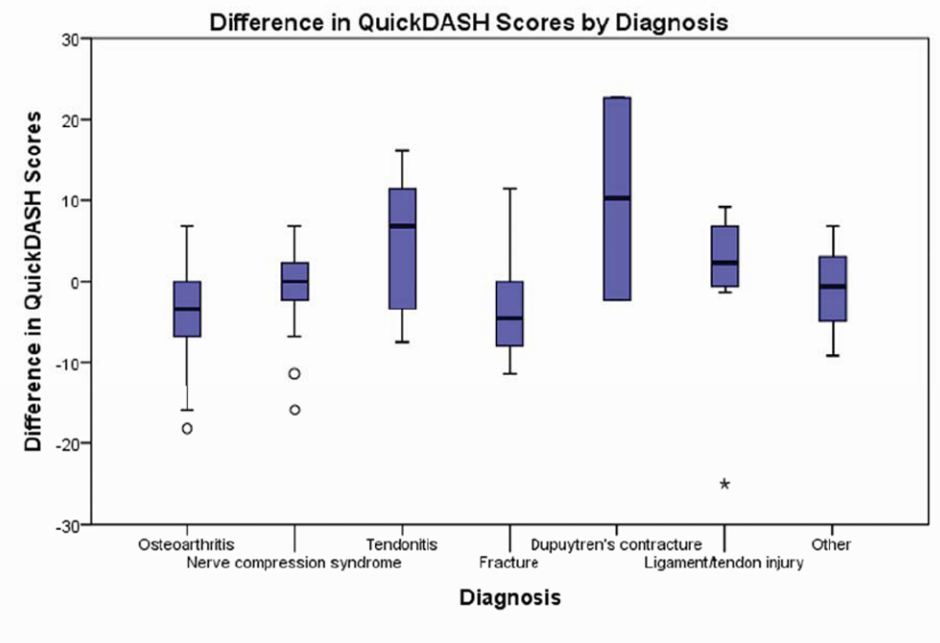

Figure 3.

Difference in QuickDASH scores by diagnosis. Boxplots of the difference in QuickDASH scores from the second to the first administration based on patients' diagnosis group. The t-bars represent 1.5 times the interquartile range or the maximum and minimum value if those are less. o are outliers defined as being more than 1.5 times the interquartile range. * are outliers defines as being more than 3 times the interquartile range.

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Figure 4.
Scatterplot demonstrating no correlation between patients' age and the difference in QuickDASH scores from the second to first administration (r_p= -0.03, p=0.82).

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Table 1

Demographic breakdown and descriptive statistics of the study participants and the two groups.

Variable	Entire study population	Phone first group	Written first group	*P* value
Sex (female)	34	17	17	1.0
Age (SD)	53 (17)	52 (18)	54 (15)	0.71
Diagnosis				0.53
Osteoarthritis	10	3	7	
Nerve compression syndrome	13	8	5	
Tendonitis	7	2	5	
Fracture	8	4	4	
Dupuytren’s contracture	2	1	1	
Ligament/tendon injury	7	5	2	
Other	3	2	1	