The objective of this study was to determine if the figure-of-eight tape measurement method is as responsive to detect hand size changes as the volumeter is when applied by experienced hand therapists in a clinical setting. The hand sizes of 25 outpatient hand therapy patients were assessed by five trained hand therapists at initial examination, and after a minimum of two weeks of therapy, utilizing both the figure-of-eight hand measurement and the volumeter technique. Dependent samples t-tests (two-tailed, alpha = 0.05) were used to determine significant changes in hand size from initial to follow-up assessments. Effect size (d) and Standardized Response Mean (SRM) were used to determine the relative responsiveness of the two measures. The t-test results indicated statistically significant differences in hand size from pre- to post-test with both measures (p<.05). Effect size results showed similar responsiveness to changes in hand size (d=0.19 volumeter and 0.25 figure-of-eight; SRM=1.04 volumeter and SRM=0.87 figure of eight measure and method). The figure-of-eight measurement demonstrated similar responsiveness to changes in hand size, compared with the hand volumeter, with patients who have suffered hand injuries. Results indicate the figure-of-eight method is an appropriate alternative to measure hand size changes in patients with hand pathologies.

INTRODUCTION

Accurate hand size assessment is one of the critical impairment measurements used when treating pathologies of the hand and wrist (Bear-Lehman and Abrou 1989). There are many conditions that cause hand size changes (Sorenson 1989). Trauma, carpal tunnel syndrome, and post-operative swelling are examples of conditions that require a clinician to repeatedly measure hand size to monitor the progress of the patient and assess the severity of the condition. Hand size change is one of the measures used to modify care and determine a prognosis of a patient with certain hand pathologies. For all of these reasons, hand size is a crucial clinical measure (Foss 1986, Palmada et al 1998).

A clinical measuring device must possess several characteristics to provide meaningful results for the clinician to measure hand size (Portney and Watkins 2009). The device must have consistent results between and among examiners. The data that are collected from the device must be meaningful by measuring what it is intended to measure. The measuring device must also be responsive enough to measure changes in hand size when hand size change has occurred.

The two primary methods to determine hand size are volumeter water displacement measurement (Beach 1977) and girth measurement (Pellecchia 2003, Maihafer et al 2003). Volumeter measurement has been shown to be accurate within 1% of the total volume (Waylett-Rendall and Seibly 1991). Farrell et al (2003) has shown the volumeter to have very good inter-tester (ICC=0.99) and intra-tester reliability (ICC=0.99).

As a result, volumeter measurement has been considered the best choice for measuring hand size and is often used as the criterion reference or 'gold standard' in studies of alternative measurement methods (Pellecchia 2003, Leard et al 2004). However, several factors limit the implementation of this technique clinically (DeVore and Hamilton 1968).

The time required to perform this measurement makes it impractical in some clinical settings. A level area near a sink is needed, as well as expensive specialised volumeter equipment to perform the measurement. In addition, patients who are unable to immerse their hands in water due to open wounds, sutures, or grafts are not able to have hand size measured with a volumeter until wounds are closed or sutures removed.

Girth measurements use a tape measure to determine the size of a body part by wrapping the tape in single or multiple areas, based on bony landmarks. The figure-of-eight measurement technique wraps the tape measure in a particular fashion (see Figure 1) around the wrist and hand to determine hand size. Intra and Intertester reliability of the figure-of-eight hand size measurement technique has recently been investigated. Pellecchia (2003) found high intra-tester (ICC=0.99, SEM=0.29 cm) and inter-tester reliability (ICC=0.97, SEM=0.50 cm) using the figure-of-eight method to measure hand size in non-pathological hands. In the same study, Pellecchia (2003) was also able to show good concurrent validity (Pearson product-moment correlation coefficient = 0.94) of the figure-of-eight method using volumetry as the gold standard measure (Pellecchia 2003). Leard et al (2004) found the figure-of-eight method as reliable as the volumeter for measuring hand size in patients with hand pathologies (intra-tester reliability ICC=0.99, SEM...