



Contents lists available at ScienceDirect

## Journal of Hand Therapy

journal homepage: [www.jhandtherapy.org](http://www.jhandtherapy.org)

Scientific/Clinical Article

## The suitcase packing activity: A new evaluation of hand function

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## ARTICLE INFO

## Article history:

Received 3 July 2016

Received in revised form

3 February 2017

Accepted 6 February 2017

Available online xxx

## Keywords:

Hand function

Hand therapy

Hand assessment

Treatment outcome

Functional outcome measure

Outcomes assessment

## ABSTRACT

**Study Design:** Prospective, repeated-measures study.**Introduction:** Understanding individual hand function can assist therapists with the process of determining relevant treatment approaches and realistic therapeutic outcomes. At this point in time, a composite test that assesses both unilateral and bimanual hand function in relation to a functional activity is not available.**Purpose of the Study:** To establish the reliability and validity of the suitcase packing activity (SPA).**Methods:** An expert panel established face and content validity. Eighty healthy, English-speaking volunteers aged between 18 and 45 years were randomly assigned to either 1 or 2 sessions (test-retest reliability). Relative agreement between 2 examiners using an intraclass correlation coefficient (ICC)<sub>3,1</sub> determined interrater reliability. Test-retest reliability was determined by using a repeated-measures analysis of variance and an ICC<sub>3,2</sub>. Concurrent validity was evaluated against 2 well-established hand evaluations using separate tests of correlational coefficients.**Results:** Face and content validity were established across 4 focus groups. Our results demonstrate good to excellent interrater reliability (ICC<sub>3,1</sub> ≥ 0.93) and good to excellent test-retest reliability (ICC<sub>3,2</sub> ≥ 0.83). SPA scores were moderately correlated with the 2-hand evaluations.**Discussion:** Through evaluating hand function during participation in a goal-directed activity (eg, packing a suitcase), the SPA exhibits promise in usefulness as a future viable outcome measure that can be used to assess functional abilities following a hand injury.**Conclusion:** The SPA is a valid and reliable tool for assessing bimanual and unilateral hand function in healthy subjects.**Levels of Evidence:** Diagnostic level II.

Published by Elsevier Inc. on behalf of Hanley &amp; Belfus, an imprint of Elsevier Inc.

## Introduction

Understanding individual hand function can assist therapists with the process of determining relevant treatment approaches and realistic therapeutic outcomes.<sup>1</sup> Research suggests that the

dominant hand and nondominant hand each function differently during task performance.<sup>2</sup> The dominant hand is used for object manipulation, whereas the nondominant hand acts to orient or stabilize the load imposed by the dominant hand.<sup>3,4</sup> The dominant hand produces more accurate arm movements, with less energy required; and during functional movements, the dominant hand is able to anticipate the movement speed necessary before action without the need for visual feedback. The nondominant hand requires sensory feedback to adjust the speed of a movement while the given action is in progress.<sup>5,6</sup> The dominant hand is more capable of adapting and demonstrating complex, rhythmic movement patterns when compared with the nondominant hand.<sup>7</sup> Due to the unique functional differences in individual hand function, during the recovery process, it is imperative that rehabilitation professionals accurately and objectively quantify a patient's dominant and nondominant hand abilities in relation to personally meaningful, everyday activities.<sup>4</sup>

**Disclaimer:** The views expressed herein are those of the authors and do not reflect the official policy or position of Brooke Army Medical Center, the U.S. Army Medical Department, the U.S. Army Office of the Surgeon General, the Department of the Army and Department of Defense, or the U.S. government.

**Funding:** This study was supported by the Center of the Intrepid, Brooke Army Medical Center.

**Ethical approval:** Ethical approval was granted by the San Antonio Military Medical Center Institutional Review Board on 05OCT2015.

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## Hand evaluation measures

The importance of using standardized measurement instruments in assessing individual hand function is well recognized.<sup>8,9</sup> This appreciation correlates with the increasing emphasis on outcome measures used within health care, which, in turn, is driven by the need for more cost-effective treatment.<sup>10</sup> With shortened hospital stays and increased administrative pressure for productivity, hand therapists must evaluate a patient's function quickly and accurately.<sup>11</sup>

Psychometrically, sound evaluations help assess an individual's performance abilities across the continuum of care<sup>12</sup> and can be used to assist in: (1) setting treatment priorities, (2) determining the effectiveness of treatment, and (3) recognizing treatments that can lead to improved client performance.<sup>13</sup> Given the focus on outcomes in rehabilitation and the variety of ways in which measurement can be achieved, clinicians are challenged to select instruments that are most appropriate for their patient populations, setting, and objectives.<sup>1,14</sup>

Many approaches to assessing hand function exist, yet a "gold standard" functional hand assessment remains unavailable.<sup>9,15,16</sup> A comprehensive hand assessment should reflect the actions an individual carries out daily,<sup>17</sup> and therapists should therefore seek to relate measurement instruments to everyday living tasks.<sup>11</sup> On average, hand therapists use 8 or more assessment tools on a daily to weekly basis to comprehend patients' functional hand abilities.<sup>18</sup> Different performance measures are used to evaluate the range of motion, endurance, dexterity, strength, and sensation to provide an accurate picture of hand function.<sup>8</sup> At this point in time, a composite test that assesses both unilateral and bimanual hand function in relation to everyday functional activities is not available.

## The SPA

In 2013, Gosling et al.<sup>19</sup> established the suitcase packing activity (SPA) to provide an accurate, objective, and composite measure of bimanual and unilateral hand function. Conceptualized to be occupation based, the SPA aims to evaluate unilateral and bimanual hand function through participation in a goal-directed activity—packing a suitcase. A packing list with specific step-by-step instructions is provided to direct the individual in packing items into a suitcase. Fine and gross motor tasks embedded within the SPA seek to use practical, real-world activities such as folding clothes to highlight functional strengths and weaknesses.

The purpose of this study was to evaluate the psychometric properties of the SPA. More specifically, this study aimed to: (1) establish the interrater and test-retest reliability of the SPA; (2) establish the face, content, and concurrent validity of the SPA; (3) compare the psychometric properties of the SPA to the Southampton Hand Assessment Procedure (SHAP), a standardized test of unilateral hand function, and to the Minnesota Manual Dexterity Test (MMDT), a standardized test of unilateral and bimanual hand function.

## Materials and methods

### Participants

A convenience sample of 80 self-reported healthy, English-speaking, men and women volunteers between the age of 18 and 45 years were recruited from a level I trauma center in San Antonio, Texas. Subject recruitment took place between January 2016 and May 2016. Potential subjects were excluded if they reported existence of an unresolved upper extremity injury or a cognitive impairment. A healthy population was recruited to prevent the influence of confounding variables. This study was approved by the

local institutional review board; subjects received detailed information about the study and signed informed consent before participation.

### Phase 1: Manual development, face, and content validity

A standardized procedure must exist in any evaluation process to ensure an assessment's efficacy.<sup>20</sup> There are no statistical means to appropriately assess an evaluation's face and content validity. Claims of these validations are commonly made through procuring a panel of well-trained "experts" on the subject matter.<sup>21</sup> Thus, to evaluate face and content validity of the SPA before subject recruitment, 4 separate 1-hour focus groups were held with a panel of experts. The purposes of the focus groups were to (1) critically analyze the SPA, (2) develop an objective, standardized procedure for administering the SPA, and (3) determine the assessment's face and content validity. The expert panel consisted of 12 licensed occupational therapists—5 of whom were certified hand therapists and 2 of whom were academics. The expert panel collectively agreed on a revised version of the SPA, and a manual for executing the revised SPA was created. To reduce the variability among test administrators, specific details regarding the arrangement of materials and testing procedures were documented.

### Phase 2: Data collection

A prospective, repeated-measures design quantified performance of the SPA evaluation. A generic a priori power analysis was conducted with G\*Power<sup>22</sup> with  $\alpha$  set at 0.05 for all statistical tests determined that a minimum of 78 subjects were needed. Once an individual's eligibility and consent were confirmed, a short, nonstandardized questionnaire was given to each subject to gain details including the person's age, gender, and hand dominance. Blocked randomization using IBM SPSS Statistical Software 22 (SPSS Inc, Chicago, IL) was used to randomly assign subjects to participate in either 1 or 2 sessions. All testing sessions occurred in a quiet, well-lit room with limited distractions present. Subjects performed the follow-up session in the same room they had performed the initial session.

During the initial session, all subjects completed the SPA first, SHAP second, and MMDT third. The follow-up session, which occurred 7–14 days after the initial session, involved timed performances in each of the 3 conditions of the SPA. The choice of a 7- to 14-day interval between sessions was to avoid changes in a subject's condition while also decreasing the risk for a direct learning effect. In this between-session interval models, similar test-retest procedures were used in other hand evaluation studies.<sup>23–25</sup> All subjects performed each evaluation measure in a manner consistent with the established guidelines for the given assessment. A 5-minute break between performances of the SPA, SHAP, and MMDT was part of the testing protocol.

All investigators were trained in the administration of the SPA, SHAP, and MMDT evaluations. While randomizing and counterbalancing the order in which investigators are assigned to subjects are recognized as best practice,<sup>21</sup> time and scheduling conflicts among the 5 investigators prevented this process from occurring. Thus, 2 investigators were allocated to each subject based on individual availability. Once assigned to a given subject, the same 2 investigators rated all performance tasks at initial and (if applicable) follow-up sessions. Each investigator rated subject performance independently.

### Instruments used

#### Suitcase Packing Activity

The SPA was established to provide an accurate, objective measure of bimanual and unilateral hand function through

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