



## Can self-report instruments of shoulder function capture functional differences in older adults with and without a rotator cuff tear?



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### ABSTRACT

Rotator cuff tears (RCT) are prevalent in older individuals and may compound age-associated functional declines. Our purpose was to determine whether self-report measures of perceived functional ability are valid for older patients with RCT. Twenty five subjects participated (12M/13F; age = 63.9 ± 3.0 years); 13 with RCT and 12 controls (CON). Participants completed self-report measures of shoulder function (SST, ASES, WORC) and health-related quality of life (SF-36). Isometric joint moment and range of motion (ROM) were measured at the shoulder. Relationships among functional self-reports, and between these measures and joint moment and ROM were assessed; group differences for total and subcategory scores were evaluated. There were significant correlations among self-reports ( $r_s = 0.62-0.71$ ,  $p \leq 0.02$ ). For RCT subjects, ASES was associated with all joint moments except adduction ( $p \leq 0.02$ ); SST, ASES, and WORC were associated with abduction and external rotation ROM ( $p \leq 0.04$ ). For RCT subjects, SST and WORC were associated with SF-36 physical function subcategory scores ( $p \leq 0.05$ ). The RCT group scored worse than CON on all functional self-reports ( $p < 0.01$ ) and WORC and ASES subcategories ( $p < 0.01$ ). In conclusion, SST, ASES, and WORC demonstrate utility and discriminant validity for older individuals by distinguishing those with RCT, but this work suggests prioritizing ASES given its stronger association with functional group strength.

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### 1. Introduction

As the United States population grows older (National Institute on Aging, 2007), it is important to understand the functional implications of common musculoskeletal conditions that may impact older individuals' ability to maintain independence. Rotator cuff tears (RCT) are a common musculoskeletal injury affecting older adults (Yamaguchi et al., 2006), with a prevalence of 26% for individuals aged 60–69 years, 46% for 70–79 years, and 50% for 80+ years (Yamamoto et al., 2010). Sarcopenia and decreased strength occur in healthy aging (Clark and Manini, 2010; Janssen et al.,

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2002), and may play a role in an individual's ability to successfully perform activities of daily living (ADLs) (Katz et al., 1963). However, the physiological changes (muscle atrophy, decreased strength) associated with RCT may further diminish one's ability to perform ADLs (Lin et al., 2008).

Self-report instruments have been developed to evaluate overall health and function of the shoulder and rotator cuff (Amstutz et al., 1981; Brophy et al., 2005; Constant and Murley, 1987; Heald et al., 1997; Hudak et al., 1996; Kirkley et al., 2003; Lippitt et al., 1993; Patel et al., 2007; Richards et al., 1994; Smith et al., 2012; Wright and Baumgarten, 2010). These measures assess a patient's self-perceived functional status and can aid clinicians in the diagnosis and treatment decision-making process. Best practice suggests administration of several different self-report measures to obtain a broad assessment of the patient's physical health and functional status (Smith et al., 2012; Wright and

**Table 1**

Participant demographics. R = rotator cuff tear patient; C = control subject; F = female; M = male; N/A = not applicable.

Subject	Age	Height (cm)	Body mass (kg)	Dominant arm	Injured arm
RF01	64	162.6	58.5	Right	Right
RF02	65	165.1	83.9	Right	Right
RF03	65	149.9	53.5	Right	Left
RF04	63	160	73.5	Right	Right
RF05	60	180.3	122.5	Right	Right
RF06	75	162.6	55.3	Right	Right
RF07	65	162.6	65.8	Right	Left
RM01	64	175.3	73	Right	Left
RM02	61	167.6	83.9	Right	Left
RM03	64	177.8	108	Left	Left
RM04	64	182.9	88.5	Right	Left
RM05	62	177.8	95.3	Left	Left
RM06	66	168.9	87.1	Right	Left
CF01	64	152.4	74.8	Left	N/A
CF02	63	172.7	54.4	Right	N/A
CF03	67	172.7	70.8	Right	N/A
CF04	65	162.6	65.8	Right	N/A
CF05	60	157.5	79.4	Right	N/A
CF06	64	160	60.3	Right	N/A
CM01	64	172.7	70.3	Right	N/A
CM02	61	177.8	99.8	Right	N/A
CM03	64	182.9	86.2	Right	N/A
CM04	62	172.7	73.5	Right	N/A
CM05	61	175.3	70.3	Right	N/A
CM06	66	182.9	83.9	Right	N/A
Rotator cuff tear mean $\pm$ SD	64.5 $\pm$ 3.6	168.7 $\pm$ 9.6	80.7 $\pm$ 20.5		
Control mean $\pm$ SD	63.4 $\pm$ 2.1	170.2 $\pm$ 9.9	74.1 $\pm$ 12.1		

Baumgarten, 2010). Further, a more general health-related quality of life instrument, like the RAND 36-Item Short Form Health Survey (SF-36) (RAND; Stewart et al., 1992), should be acquired (Wright and Baumgarten, 2010) because it allows clinicians to examine unanticipated effects (Beaton and Richards, 1996; Patel et al., 2007) of a disease or treatment on physical function, which can be affected by both physical (e.g. reduced strength) and mental (e.g. depressed mood) aspects of a patient's health (Patel et al., 2007).

Existing self-report instruments have been developed for and are traditionally used in younger cohorts (Hegedus et al., 2014). These instruments have not been specifically validated in a cohort of older adults, for whom ADL tasks are of utmost importance. Self-report instruments of shoulder function often query patients on tasks which have little or no relevance to older individuals (e.g. ability to throw a ball) and it is unclear if they are able to effectively discriminate between older adults with and without RCT (Hegedus et al., 2014). Understanding which, if any, existing self-report instruments of shoulder function are useful for clinicians treating an increasingly large number of older adults will allow clinicians to select appropriate self-report measures for their patients.

The purpose of this work was to evaluate the Simple Shoulder Test (SST) (Lippitt et al., 1993), the American Shoulder and Elbow Surgeons Shoulder Outcome Survey (ASES) (Richards et al., 1994), and the Western Ontario Rotator Cuff Index (WORC) (Kirkley et al., 2003) self-report instruments in a sample of older individuals with and without a RCT. We examined whether these self-report measures of shoulder function (1) were related to one another and with the SF-36 in this older cohort; (2) could distinguish between older adults with and without a RCT; and (3) were related to physical symptoms associated with RCT. We hypothesized that self-reported measures of shoulder function (1) would be associated with one another and with the SF-36; (2) could distinguish between older adults with and without a RCT; and (3) would be positively correlated with physical symptoms of RCT.

## 2. Methods

### 2.1. Study participants

We recruited 25 subjects; 13 with a RCT (6M/7F) and 12 healthy age- and gender-matched asymptomatic controls (CON) (6M/6F) (Table 1). All subjects provided written informed consent in accordance with the Wake Forest University Health Sciences Institutional Review Board, which approved this study. Patients with RCT were recruited from our institution's orthopaedic clinic. Inclusion criteria included having at least a major thickness (>50% tendon thickness) supraspinatus tear, confirmed with magnetic resonance imaging. Patients were excluded if they had any prior shoulder surgery, concomitant pathology (e.g. severe osteoarthritis), or neurologic disorder. Asymptomatic control subjects with no history of shoulder pain or injury were recruited from the local community. They were further evaluated for a rotator cuff tear with a lateral Jobe's test (Gillooly et al., 2010) (positive likelihood ratio = 7.36) in which subjects abducted their arms to 90° in the scapular plane and maintained neutral shoulder rotation as manual resistance was applied.

### 2.2. Self-report questionnaires

To reduce treatment effect, data were collected from each RCT participant at baseline. Each subject completed three self-report instruments of shoulder function, including 2 region-specific measures (SST, ASES) and a disease-specific measure (WORC), and one self-report measure of health-related quality of life (SF-36). These instruments were chosen because previous studies report that each has demonstrated validity in younger cohorts (Brazier et al., 1992; Godfrey et al., 2007; Kirkley et al., 2003; Michener et al., 2002; Schmidt et al., 2014), they spanned a broad range of subcategories (Table 2), and they did not require any assistance from a physician.

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