



ASSESSMENT OF FUNCTIONAL OUTCOME OF TOTAL HIP REPLACEMENT USING HIP DISABILITY AND OSTEOARTHRITIS OUTCOME SCORE

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**ABSTRACT**

**Background:** Hip osteoarthritis (OA) significantly impacts individuals' quality of life, leading to pain, disability, and reduced independence. While various assessment tools exist, the Hip Disability and Osteoarthritis Outcome Score (HOOS) was developed to comprehensively evaluate hip OA-related constructs. However, its correlation with performance-based measures in different patient populations remains unclear. **Methods:** A cross-sectional study was conducted on patients scheduled for primary total hip arthroplasty (THA) due to OA. Self-reported outcomes were assessed using the HOOS, while performance-based measures included the Stair Climb Test (SCT), Timed Up and Go (TUG), and 6-Minute Walk (6 MW) test. Data were collected preoperatively and at 1 and 6 months postoperatively. **Results:** Thirty unilateral THA patients participated. Significant improvements were observed in HOOS ADL and pain subscales at 1 and 6 months postoperatively. However, performance-based measures showed declines at 1 month postoperatively, followed by improvements at 6 months. Correlations between HOOS subscales and performance-based measures were poor or moderate, suggesting discordance between self-reported and functional outcomes. **Conclusion:** Patients undergoing THA may overestimate their functional capacity early postoperatively, possibly due to improvements in pain. Therefore, comprehensive outcomes assessment should include both self-report and performance-based measures to accurately characterize recovery and guide postoperative management.

**KEYWORDS :** Osteoarthritis, Hip Joint, Arthroplasty

**INTRODUCTION-**

Hip osteoarthritis (OA) is a debilitating degenerative joint disorder that leads individuals to experience a multitude of symptoms including pain, disability in daily activity, reduced independence and quality of life (QoL).<sup>1,2</sup> With the multifaceted nature of hip OA on the rise, there is a need for a valid multidimensional (i.e., not specific to body location or injury) scale to adequately assess constructs across varied sub-populations.<sup>3-6</sup> Although several region-specific instruments (e.g., Lower Extremity Functional Scale) exist,<sup>3,4</sup> the majority of patient-reported outcome (PRO) measures for the hip joint primarily measure recovery following a total hip arthroplasty (THA) due to hip OA. Thus, many scales may not sufficiently assess all the relevant dimensions associated with OA (e.g., QoL), other pathologies, nor may be applicable to certain sub-populations (e.g., individuals who have not had a total hip replacement, younger active individuals, etc.). Additionally, some scales place an excessive response burden on patients and clinicians due to item redundancy, excessive number of items, or inclusion of items with inappropriate difficulty.<sup>7</sup> To adequately address these concerns, the Hip Disability and Osteoarthritis Score (HOOS) scale was developed.<sup>8-11</sup>

The HOOS consists of 40 items used to assess five dimensions: pain (10 items); other symptoms (five items); function in daily living (activities of daily living [ADL]; 17 items), function in sport and recreation (Sport/Rec; four items); and hip-related QoL (four items).<sup>7,10,12</sup> The HOOS can be used over both short-term and long-term intervals. For example, the HOOS can be used to evaluate changes from week-to-week, as produced by treatments such as medication, operation, or physical therapy, or to evaluate changes over years as a result of the primary injury or post-traumatic OA.<sup>7,12</sup> The HOOS is primarily intended to evaluate functional limitations and symptoms related to hip pathology or disability, with or without OA.<sup>7</sup> The HOOS has been studied in relatively small sample sizes (n < 200) of adults aged 42-85,<sup>1,7,10,13</sup> and in patients who have either been diagnosed with hip OA or who

have received a THA due to OA.<sup>7,14</sup> The HOOS, has not been extensively studied in healthy or younger populations, or in patients with-out hip OA.

**METHODS-**

This cross-sectional study investigates self-reported and performance-based outcomes in patients undergoing primary, posterior approach total hip arthroplasty (THA) due to osteoarthritis (OA). Patients with bilateral disease, hip trauma history, or septic joint disease were excluded, along with those with uncontrolled hypertension, diabetes, BMI over 40 kg/m<sup>2</sup>, additional orthopedic pathology, or neurologic disorders impairing daily function. Patients were assessed preoperatively and at 1 and 6 months postoperatively using the Hip Disability and Osteoarthritis Outcome Score (HOOS) and performance-based measures (Stair Climb Test, Timed Up and Go, 6-Minute Walk test). HOOS evaluates pain, symptoms, function in daily living (ADL), sports/recreation function, and hip-related quality of life using a Likert scale. Performance tests assess ADL-related activities. The Stair Climb Test measures stair ascent/descent time, the Timed Up and Go evaluates chair rising, walking, turning, and sitting time, and the 6-Minute Walk test measures distance walked in 6 minutes. These tests are reliable, valid, and responsive to change after joint arthroplasty. The study spans from September 2022 to September 2023 and aims to provide insights into post-THA functional outcomes.

**RESULT-**

Thirty patients (13 women and 17 men) with unilateral THA participated in the study. Further characteristics of THA patients are shown in Table 1.

S.No.		
1.	Age [years]	66.2 ± 4.9
2.	Height [m]	1.68 ± 0.11
3.	Mass [kg]	75.2 ± 16.4

4.	BMI [kg/m <sup>2</sup> ]	26.4 ± 3.7
5.	Operated leg	17 × right, 13 × left
6.	Male	17
7.	Female	13

Patients with end-stage hip osteoarthritis scheduled for primary posterior approach total hip arthroplasty (THA) experienced significant improvements in HOOS ADL and pain subscale scores at 1 month post-operation, with nearly 40% and 60% improvements, respectively. However, there were significant declines in TUG time, SCT time, and 6 MW test at this time point. Over the 1 to 6-year timeframe, both HOOS ADL and pain subscales improved by approximately 29% and 18%, respectively. Additionally, TUG time improved by 26%, SCT time by 42%, and 6 MW test time by 29%.

**TABLE 2 Raw data for all outcome measures**

Outcome	Preoperative	1 mo Postoperation	6 mos Postoperation
TUG, seconds	8.80 ± 3.27	10.86 ± 5.87	7.28 ± 1.90
SCT, seconds	14.84 ± 6.35	21.56 ± 13.70	11.21 ± 3.92
6 MW test, m	460.99 ± 123.36	419.77 ± 119.75	544.62 ± 111.55
HOOS ADL subscale	54.22 ± 18.81	74.68 ± 14.36	93.16 ± 7.88
HOOS pain subscale	51.74 ± 18.13	78.04 ± 14.53	89.67 ± 11.06

Data are mean ± SD.

The study found poor correlation between changes in self-reported HOOS ADL and pain subscales and performance-based assessments at 1 and 6 months after total hip arthroplasty (THA). Specifically, changes in HOOS ADL subscale were poorly correlated with TUG and SCT, but moderately correlated with 6 MW test time. Changes in HOOS pain subscale scores also showed poor correlation with TUG and SCT, but moderate correlation with 6 MW test distance. Additionally, there was a moderate and significant correlation between changes in HOOS ADL and pain subscales.

**TABLE 3 Correlations between the change in functional measures (TUG, SCT, 6 MW test) and change in self-report (HOOS ADL and pain subscales) measures from the preoperative time point to 1 mo postoperation and from 1 mo to 6 mos postoperation**

Preoperative 1-mo Outcomes			1Mo to 6-mo Outcomes		
	Correlation Coefficient	P-value		Correlation Coefficient	P-value
HOOS ADL vs. TUG	0.08	0.68	HOOS ADL vs. TUG	0.32	0.16
HOOS ADL vs. SCT	0.08	0.72	HOOS ADL vs. SCT	0.27	0.24
HOOS ADL vs. 6 MW test	0.46	0.03	HOOS ADL vs. 6 MW test	0.34	0.13
HOOS pain vs. TUG	0.04	0.87	HOOS pain vs. TUG	0.11	0.64
HOOS pain vs. SCT	0.04	0.85	HOOS pain vs. SCT	0.01	0.96
HOOS pain vs. 6 MW test	0.49	0.02	HOOS pain vs. 6 MW test	0.07	0.77
HOOS ADL vs. HOOS pain subscales	0.51	0.02	HOOS ADL vs. HOOS pain subscales	0.70	G0.01

**DISCUSSION**

Self-report measures like the HOOS assess THA surgery recovery and success. However, self-report measures may not capture functional recovery limitations. Performance-based outcome measures may inform clinical decision-making about patients' functional capacity. This study characterized self-report and performance-based changes in THA patients to compare their outcomes. Self-reported and performance-based measures did not correlate during the first six months of recovery after THA. Functional performance declines 1 week after THA, indicating significant post-operative changes.<sup>22</sup> This cohort had functional decline 1 month after surgery, consistent with this literature. These patients had trouble walking, standing, and climbing stairs. Following surgery, people often use an assistive device for ambulation and need help at home with daily tasks and self-care.

This study found that HOOS ADL subscale scores improved 1 month after THA, despite a relative decline in functional capacity. This supported the hypothesis that the HOOS ADL subscale score and functional performance (TUG, SCT, and 6 MW test) would not correlate during THA recovery. The first postoperative assessment showed poor correlation between the HOOS ADL subscale and change in the three functional, with only the change in 6 MW test distance showing a moderate but significant correlation (Table 2). The moderate relationship between the HOOS ADL subscale and 6 MW test distance may be due to the fact that 6 MW test distance declined less than other functional performance measures 1 month after THA. The 6 MW test distance declined about 40 m (G10%), so although patients reported improvements in the HOOS ADL subscale, the moderate correlation may be due to the smaller magnitude of the change compared to other functional measures. After the first postoperative month (1Y6 mos), self-report on the HOOS ADL subscale improved along with functional performance. There was still little correlation between self-reported and performance-based outcomes. The improvement in HOOS ADL subscale scores appears unaffected by the trend in functional scores from preoperation to 1- and 6-mo postoperation. Comparing final functional performance values at 6 months to preoperative values (Table 1) shows an increase in performance after the first month. Although a stronger relationship emerges, suggesting that patient perception of recovery and actual functional capacity may be more closely aligned later, these relationships were still not significant. This suggests using self-report and functional performance outcomes postoperatively. The HOOS pain subscale and functional performance measures also showed discrepancies between self-reported outcomes and functional performance measures early after THA. Similar to the HOOS ADL subscale and functional performance early after surgery, patients reported pain improvements but functional performance declines. This suggests that post-THA pain does not affect functional capacity. Patients experience most postoperative pain in the early perioperative period, but it may not compare to preoperative degenerative disease. Thus, self-reported postoperative HOOS pain scores may be optimistic compared to preoperative levels and early functional decline. These significant correlations between HOOS ADL and HOOS pain trajectories suggest that patients' perception of their ability to complete functional tasks may be based on pain rather than efficiency. This is similar to a recent study and supports the idea that postoperative pain improvements in non-THA patients will improve all aspects of self-report.<sup>7</sup> Self-report measures are useful despite the idea that pain drives patient function perception. Assessing patients' perceptions of recovery can inform postoperative decisions like rehabilitation participation. Additionally, this information may help patients resume activity properly.

Early functional performance measures and self-report differ, which is consistent with studies of patients after joint

arthroplasty, such as TKA.<sup>7,15,19,23</sup> Unlike a similar study with TKA, THA functional performance returned to and exceeded preoperative levels by 6 months postoperatively.<sup>7,15</sup> However, published data suggest that TKA patients have significantly lower pre- and post-operative functional performance than healthy age-matched controls.<sup>24</sup> Despite the lack of comparable data for THA patients, deficits in this population will encourage future interventions to improve patient outcomes.

HOOS measures patients' functional ability perception. The HOOS asks patients to recall difficulty with specific tasks from the past week to assess their self-perception of functional status. But it doesn't ask patients to answer questions about preoperative functional status. However, the lack of significant correlations between HOOS subscales and performance-based outcome measures suggests that self-report measures may not accurately assess patients' functional capacity after THA. Assessing THA outcomes helps guide postoperative management and rehabilitation. Self-report and performance-based measures follow opposite recovery paths and have poor relationships in the first six months after surgery. Despite their reduced ability to move for these tasks, this study suggests that postoperative pain reduction may drive patients' perception of their functional performance. Thus, rehabilitation and postoperative decisions should be based on self-report and performance-based outcome measures, not just self-report.

#### CONCLUSION:

The discrepancy between Hip Disability and Osteoarthritis Outcome Score changes and functional performance postoperatively suggests that patients may overestimate their functional capacity early after THA due to pain improvements. Thus, post-THA outcomes assessment should include self-report and performance-based functional measures.

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