Original Article :

Patient-Perceived Improvement Following Lateral Ankle Sprain

Ahmed M Almansour [1,*]

1. Department of Physical Therapy and Health Rehabilitation, College of Applied Medical Sciences, Majmaah University, Al Majmaah 11952, Saudi Arabia.

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Corresponding author:
Ahmed M Almansour, Department of Physical Therapy and Health Rehabilitation, College of Applied Medical Sciences, Majmaah University, Al Majmaah 11952, Saudi Arabia,
Email: ah.almansour@mu.edu.sa

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Abstract

Background and Aims:
Lateral ankle sprain is a common musculoskeletal injury that can result in long-term complications. While objective measures are commonly used to assess recovery, patient-perceived improvement also is important to measure recovery status and readiness for a safe return to normal activities. This study aimed to measure patient-perceived improvement following a lateral ankle sprain over an 8-week period using the Global Rating of Change (GROC) scale.

Methods:
Thirty participants with lateral ankle sprain were recruited. Demographic data were recorded. Participants completed the GROC, Single leg hop test (SLHT) and heel raise (HR), at 4 weeks and 8 weeks post-injury. Statistical analysis compared the difference of GROC scores over time, and the relationship between GROC change score, SLHT change score and HR change score.

Result:
A significant increase in participants' perceptions of their improvement from Week 4 to Week 8 post-injury ($Z = -4.79$, $p < 0.001$, with a 95% CI of [4.5, 6] and large effect size ($r = 0.62$). A moderate correlation was found between the GROC change score and the SLHT change score ($\rho=0.42$, $p=0.021$). A weak, non-significant correlation was observed between the GROC change score and the Heel Raise change score ($\rho=0.16$, $p=0.39$).

Conclusion:
The GROC scale effectively captures patient-perceived improvement following lateral ankle sprain. A moderate correlation between the GROC and functional performance (SLHT) suggest that increases in dynamic function are related with subjective improvement. Therefore, monitoring patient-perceived improvement may support clinicians in their decision-making during rehabilitation.

Keywords:
Lateral ankle sprain; Global Rating of Change; Recovery; patient-reported outcome measures

Introduction:

Lateral ankle sprain (LAS) is a common musculoskeletal injury affecting physically active individuals, accounting for nearly 20% of all sports-related injuries[1–5]. The severity of LAS is commonly underestimated by patients; however, inadequate management may result in serious short and long-term complications[1,6]. Studies reported that up to 70% of individuals may experience symptoms like instability, perceived pain and develop long-term functional impairments[1,7].

Moreover, persistent impairments may affect an individual's ability to perform daily activities and increase the risk of developing osteoarthritis[8,9]. Due to the high prevalence and potential long-term complications, comprehensive assessment following a lateral ankle sprain are important to optimize outcomes and prevent chronic conditions[4,10]

Recovery is typically assessed through objective measures; however, symptoms like perceived pain, instability, or fear of re-injury are often not captured by clinical tests alone[11,12]. Thus, incorporating patient-reported outcome measures (PROMs) is important to get a complete picture of the patient's improvement status and readiness for a safe return to their normal activities[13].

The Global Rating of Change (GROC) scale showed good reliability and validity in musculoskeletal populations and commonly used in both clinical and research settings to summarizes the patient's perception of improvement[14–17]. The GROC scale rate the overall change over time using a 15-point Likert scale ranging from -5 ("a very great deal worse") to +5 ("a very great deal better"), with zero indicating no change[16].

Limited studies have investigated how patients evaluate their improvement over time following a lateral ankle sprain using measures such as the GROC scale. Therefore, the primary aim of this study is to measure patient-perceived improvement over an 8-week period following a lateral ankle sprain using the GROC. While the secondary aim is to measure the relationship between GROC scores and functional performance. The findings may help clinicians in rehabilitation strategies, and ultimately support their decision-making regarding return-to-activity guidelines and prevention of recurrent injuries.

Materials and Methods:

Study design:

A prospective cohort study was conducted from July 2023 to December 2023. The study was approved by the Institutional Review Board at Majmaah University, Saudi Arabia (IRB No: MUREC-Jan.19/COM-2023/23-4; date 19/6/2023).

Participants:

All participants referred to physical

therapy department with a confirmed diagnosis of lateral ankle sprain injury, aged ≥18 years, had no history of neurological disease, cognitive impairment, or other lower limb injury that could affect participation in the study.

Procedure:

All participants provided and signed written informed consent and were assessed twice, with a 4-week interval between the two sessions. The baseline session was conducted 4 weeks following ankle sprain, while the follow-up session was conducted 8 weeks post-injury. Demographic data were collected including age, height, weight, dominant limb and injured side.

Patient-Perceived change:

Using Global Rating of Change (GROC) Scale, participants were asked to rate their perceived change since the initial injury using a 15-point Likert scale ranging from -5 ("a very great deal worse") to +5 ("a very great deal better"), with zero indicating no change.

Functional performance test:

The assessment of functional performance was measured using the Single leg hop test (SLHT) and heel raise (HR), all testing were performed with participant barefoot. The SLHT is a valid and reliable assessment of muscles power and dynamic stability[18,19]. While, the HR test also is a valid test to evaluate recovery after lower extremity injuries[20]. Together, these tests widely used in clinical and research sitting to evaluate functional recovery by addressing both performance and endurance. The SLHT was performed using a method similar to that described in a previously published study[21]. Participants were instructed to hop forward as far as possible. Participants completed three practice trials prior to the testing trials. The best of the three testing trials in centimeter was used for analysis. For the HR test, participants were instructed to stand on the injured side with the non-injured leg raised and the knee bent at about 90 degrees. They performed Single-leg heel raises at a cadence of approximately 1 per second, until fatigued, or a maximum of 50 repetitions[22].

Data Analysis:

The data analysis performed using IBM SPSS Statistics (Version 26.0), with a significance level set at $p < 0.05$. Descriptive statistics of all variables were reported as mean, standard deviation, and median. The change scores also were reported for GROC, SLHT and HR by subtracting the scores of baseline session (week 4) and follow-up session (week 8). The Shapiro-Wilk test was used to assess data normality, and the results indicated that the data for GROC were not normally distributed $p < 0.05$. To assess the perceived improvement, differences in the GROC scores between the baseline session (week 4) and follow-up session (week 8) were calculated using the

Wilcoxon Signed-Rank Test. Effect sizes were calculated with the Mann-Whitney U z-score divided by the square root of the group size. Effect sizes were interpreted as small (0.10-0.29), medium (0.30-0.49), and large (≥0.50)[23]. Differences in functional performance tests between week 4 and week 8 were measured using a paired sample t-test. Further analysis was conducted to assess the relationship between (GROC change score) and the change scores of SLHT and HR outcomes using Spearman's Rank-Order Correlation Coefficient (Spearman's rho).

Results:

Participant Characteristics:

A total of 30 participants (18 males, 12 females; mean age = 26.3±5.86 years) participated in this study. Baseline demographic data, including height, weight, dominant limb, and injured side are summarized in Table .

Table 1: Participant Characteristics.

Variable	M ± SD / (%)
Age (years)	26.3±5.86
Height (cm)	169.17±5.83
Weight (kg)	78.73±14.60
Dominant Limb (Right/Left)	Right=90% Left=10%
Injured Side (Right/Left)	Right=70% Left=30%

M= mean; SD= standard deviation; cm= centimeter; Kg= kilogram

Change of Patient-Perceived :

The Wilcoxon Signed-Rank Test showed a statistically significant increase in participants' perceptions of their improvement from Week 4 to Week 8 post-injury (Z = -4.79, p < 0.001). The median GROC score increased from -2 to 4, (Z = -4.79, p < 0.001) over eight weeks. The median change was 5.5, with a 95% confidence interval of [4.5, 6] and large effect size (r) = 0.62, as presented in Table 2.

Table 2: Change in Global Rating of Change Scores.

Outcome Measure	Week 4 (Median)	Week 8 (Median)	Change (Median)	Z-Value	95% CI	ES	p-value
GROC	-2	4	5.5	-4.79	[4.5, 6]	0.62	0.001*

***Significant value if p < 0.05; ES= effect size; GROC= Global Rating of Change; CI= Confidence interval level: 95%.**

Change of Functional Performance Test:

Change of Functional Performance Test: Paired sample t-test showed a statistically significant improvements in both SLHT and HR tests from Week 4 to Week 8

post-injury. Participants in the SLHT demonstrated a mean increase of 22.7 cm (%95 CI [26.46 ,19.07], t =-12.07 p < 0.001). For the HR, the mean change was 8.07 repetitions (%95 CI [8.89 ,7.25], t = -19.30 p < 0.001), as presented in Table 3.

Table 3: Change in Functional Performance Test.

Functional Test	Week 4 (M ± SD)	Week 8 (M ± SD)	Change (M)	95% CI	t p-value
SLHT (cm)	32.70±16.03	55.47±16.7	22.77	[19.07, 26.46]	-12.07 p < 0.001
HR (rep)	11.4±3.19	19.47±3.98	8.07	[7.25, 8.89]	-19.30 p < 0.001

***Significant value if p < 0.05; M=mean; SD=standard deviation; t= Paired sample t-test; SLHT= Single leg hop test; HR= Heel raise; cm= centimeter; rep= repetitions; CI= Confidence interval level: 95%.**

Correlation Between the change score of GROC and Functional Performance (SLHT and HR):

Spearman's rank correlation analysis was conducted to explore the relationship between the change in GROC scores and the change scores of the two functional performance tests. Table 4 present Spearman's rank analysis, a moderate correlation was found between the GROC change score and the SLHT change score (p=0.42, p=0.021), suggesting that perceived improvements were moderately associated with improvements in single leg hopping performance. A weak, non-significant correlation was observed between the GROC change score and the Heel Raise change score (p=0.16, p=0.39), indicating that perceived improvement was not strongly associated with heel raise performance improvement.

Table 4: Correlation Between change score of GROC, SLHT and HR.

Variable	Spearman's rho (ρ)	p-value
GROC vs SLHT	0.42	0.021
GROC vs HR	0.16	0.39

***Significant value if p < 0.05; GROC= Global Rating of Change; SLHT= Single leg hop test; HR= Heel raise.**

Discussion:

The purpose of this study was to assess patient-perceived improvement using the Global Rating of Change (GROC) scale over an 8-week period following a lateral ankle sprain (LAS) and to examine its relationship with objective functional performance measures (Single-Leg Hop Test and the Heel Raise Test). These two tests were selected because they are widely used clinically to capture multiple aspects of lower extremity recovery by addressing dynamic stability, power and muscle endurance.

A statistically significant improvement in both GROC scores and functional

performance from Week 4 to Week 8. The change in in GROC scores increased with a median change of 5.5, with a 95% confidence interval of [4.5, 6] and large effect size (r) = 0.62, which indicate a large and clinically meaningful improvement in perceived recovery. In functional performance participants improved significantly in hop test, with mean average of 22.7 cm, 95% CI between 19.07, 26.46 cm, and improved their performance in heel-rise repetitions, averaging 8 more repetitions, with the 95% CI between 7.25, 8.89 repetitions.

Also, a moderate positive correlation was found between changes in GROC scores and SLHT performance. These findings are consistent with previous investigations that shows the GROC scale is a useful instrument for evaluating how well patients feel they are recovering from lower extremities and sports-related injuries. For example, patients with patellofemoral pain, showed improvements in the Knee Injury and Osteoarthritis Outcome Score (KOOS) subscales among those who scored "better" or "much better" on the GROC scale[15].

A moderate correlation (p = 0.42, p = 0.021) between GROC change scores and the SLHT, suggesting that as patient perceived they become better, they also showed improvements in hop performance. However, the change in Heel Raise Test and GROC change scores was weak and non-significant correlation (p = 0.16, p = 0.39), indicates that the reported improvements were not related to muscular endurance or strength measured by heel raises. Similar results were found in studies involving hip and ankle, where GROC scores did not consistently correlate with objective functional improvements[17]. These findings highlight the multiple nature of recovery, as patients' self-perceptions of their own recuperation may be influenced by psychological, emotional, and social aspects separate from physical performance indicators.

The current study findings were further supported by research such as the University of Wisconsin Running Injury and Recovery Index (UWRI), which demonstrated a moderate correlation between GROC scores and changes in running-specific recovery markers[24.] This shows that although GROC offers valuable information about subjective recovery, condition-specific and performance-based measures are still essential for a complete assessment.

However, other musculoskeletal rehabilitation research also suggests that the GROC scale may be able to capture patient experiences that go beyond physical function, such as psychological adaptability, coping mechanisms for pain, and individual recovery goals[16]. Because perceptions of improvement may not accurately reflect

muscular endurance deficiencies, these considerations may account for the GROC score in our study's greater correlation with dynamic performance (SLHT) than with strength-endurance tasks (heel raises).

Clinical Implications:

Results show that the GROC scale is an effective tool for measuring how well patients feel they are recovering from LAS. However, to get a complete picture of patient improvement, clinicians should use GROC scores with functional performance assessments. Additionally, dynamic performance may have a greater impact on patients' perceptions of improvement than isolated strength activities,

Conclusion:

This study showed significant improvements in patient-perceived improvement following lateral ankle sprain using the GROC scale. Also, moderate correlations between GROC and functional performance (SLHT) suggest that increases in dynamic function are related with subjective recovery. To improve clinical decision-making in injury related to sports, future studies should continue investigating these relationships in larger and more varied populations.

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