Test-Retest Reliability of the Total Motion Release[®] Scale

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Context: Total Motion Release[®] (TMR[®]) is a novel treatment paradigm used to restore asymmetries in the body (eg, pain, tightness, limited range of motion). Six primary movements, known as the Fab 6, are performed by the patient and scored using a 0 to 100 scale. Clinicians currently utilize the TMR[®] scale to modify treatment, assess patient progress, and measure treatment effectiveness; however, the reliability of the TMR[®] scale has not been determined. It is imperative to assess scale reliability and establish minimal detectable change (MDC) values to guide clinical practice. **Objective:** To assess the reliability of the TMR[®] scale and establish MDC values for each motion in healthy individuals in a group setting. **Design:** Retrospective analysis of group TMR[®] assessments. **Setting:** University classroom. **Participants:** A convenience sample of 61 students (23 males and 38 females; 25.48 [5.73] y), with (n = 31) and without (n = 30) previous exposure to TMR[®]. **Intervention:** The TMR[®] Fab 6 movements were tested at 2 time points, 2 hours apart. A clinician with previous training in TMR[®] led participant groups through both sessions while participants recorded individual motion scores using the 0 to 100 TMR[®] scale. Test-retest reliability was calculated using an intraclass correlation coefficient (2,1) for inexperienced, experienced, and combined student groups. Standard error of measurement and MDC values were also assessed for each intraclass correlation coefficient. **Outcome Measure:** Self-reported scores on the TMR[®] scale. **Results:** Test-retest reliability ranged from 0.57 to 0.95 across the Fab 6 movements, standard error of measurement values ranged from 4.85 to 11.77, and MDC values ranged from 13.45 to 32.62. **Conclusion:** The results indicate moderate to excellent reliability across the Fab 6 movements and a range of MDC values. Although this study is the first step in assessing the reliability of the TMR[®] scale for clinical practice, caution is warranted until further research is completed to establish reliability and MDC values of the TMR[®] scale in various settings to better guide patient care.

Keywords: statistical analyses, patient-reported outcomes, manual therapy, clinical interventions

Total Motion Release[®] (TMR[®]) is an assessment and treatment paradigm based on the body functioning as a connected unit attempting to maintain balance to function optimally.¹ The concept of regional interdependence, which infers connectedness across body segments and helps determine the root cause of dysfunction in patient examinations, is fundamental to the TMR[®] paradigm.² Within the TMR[®] assessment, a series of 6 bilateral movements (termed the Fab 6) are performed across the upper body, lower body, and the trunk (Figure 1).³⁻⁵ The patient rates each motion, scoring the side of greatest dysfunction (ie, right or left) for each motion using a 0 (no problems at all) to 100 (the worst) scale. The motion with the greatest impairment/imbalance (ie, highest score) is commonly treated first on the patient's "good" side (ie, the side without impairment/imbalance).^{1,4,5}

After initial assessment, treatment typically begins with repetitions (eg, 2 sets of 20 repetitions) or isometric holds (eg, 20-second holds at end range) on the "good" side of the motion with the highest TMR[®] score (ie, greatest impairment/imbalance).^{1,4,5} Once the treatment approach is completed (eg, 2 sets of 20 repetitions), the patient reevaluates the same motion bilaterally and reports an updated score using the TMR[®] 0 to 100 scale.^{1,4,5} If a 10-point or greater decrease in patient-reported score occurs, the clinician will

continue with the same treatment parameters until the patient rates the motion asymmetry at a 5 or less on the TMR[®] 0 to 100 scale.⁵ If the initial treatment did not produce a change, the clinician typically modifies the treatment parameters (eg, repetitions, speed, etc) and retests; if modification fails to produce a change, clinicians will commonly move to the next greatest motion impairment/imbalance, treat that motion, and then reassess patient motion scores.^{1,4,5} Generally, reassessment occurs after any treatment set or after any motion impairment is resolved (ie, score of 5 or less); treatment may be continued until all identified imbalances have been resolved.^{1,3,5} Common recommendations to maximize the treatment effects of a single session include addressing one imbalance in the upper body, trunk, and lower body; focusing on motions with initial TMR[®] scores ≥ 30 ; and to avoid continuing to treat motions with TMR[®] scores ≤ 10 if improvement plateaus with those motions.^{1,4,5}

Although TMR[®] has not been studied extensively in patient care, researchers have indicated that the clinical application of TMR[®] has reduced pain, improved function, and restored range of motion (ROM) in the shoulder, low back, and knee.^{4,6-8} The application of TMR[®] has also been found to restore nonpainful ROM limitations.^{3,9-11} Specifically, researchers have reported improved shoulder ROM^{3,9,11} and hip rotation ROM¹⁰ following completion of selected TMR[®] movements in a variety of overhead athletes, and these improvements exceeded those associated with dynamic warm-up and stretching protocols.^{3,9-11} Researchers have also identified statistically and clinically significant improvements in Functional Movement Screen[™] scores after 1 TMR[®] Fab 6 treatment session.¹²

The current evidence supports TMR[®] as a viable treatment option in certain patient care situations; however, little is known

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about the reliability of the TMR[®] scale. Clinicians currently implementing TMR[®] within their clinical practice use the scale to modify treatment, assess patient progress, and determine treatment effectiveness. Furthermore, TMR[®] has been utilized in individual or group settings, with either clinician or patient tracking of TMR[®] motion scores to guide TMR[®] application.^{3,10–12} Thus, determining reliability of the TMR[®] scale within group and individual assessment sessions is valuable; determining minimal detectable change (MDC) values may also guide clinicians in assessing when true change has occurred posttreatment. Therefore, the purpose of this study was to assess the reliability of the TMR[®] scale and establish MDC values for each motion in healthy individuals in a group setting.

Methods

The institutional review board at the University of Idaho granted approval (19-180) to conduct retrospective analysis of de-identified data. The data were collected using a convenience sample of students with and without exposure to TMR[®], enrolled in 2 athletic training programs (1 professional and 1 postprofessional) housed within the same university, who completed group TMR assessment sessions during their educational experiences. The sessions were led by a dual-credentialed clinician (athletic trainer and physical therapist) with 11 years of practice, who had previously completed TMR[®] levels 1 and 2 training courses and had 5 years of experience using the technique.

The clinician discussed the basic concepts of the TMR[®] system in a session with students during a regularly scheduled class meeting. The session included an explanation of the TMR[®] scale, and students were instructed to self-report their TMR[®] scores; students used a scoring sheet developed specifically for the session. The clinician guided all students through the same order of the TMR[®] Fab 6 motions: (1) seated arm raise, (2) standing arm press, (3) seated trunk twist, (4) seated leg raise, (5) single-leg sit-to-stand motion, and (6) bent-knee toe reach (Figure 1).⁵ Each motion was performed bilaterally per TMR[®] protocol and scored using the TMR[®] scale 0 (no problems at all) and 100 (the worst) prior to moving to the next motion; movement difficulty was defined as any asymmetry or impairment (eg, reduced ROM, tightness, etc) between sides.⁵

The assessment sessions were performed 2 hours apart. Session 1 was completed after students had entered class and been at rest for at least 10 minutes; session 2 was completed 2 hours later at the end of the didactic class session. The timing of

session 2 was selected to prevent changes in TMR[®] scores due to exercise, movement, injury, or class activities while minimizing the chance of memory impacting scores at the second session. The instruction and testing sequence were matched across testing sessions. Participants recorded their TMR[®] scores on separate data sheets; the data sheets were collected after the completion of each session.

Data were analyzed using the Statistical Package for Social Sciences (SPSS, version 24; IBM Corp, Armonk, NY) and Microsoft Excel (version 16.37; Microsoft Corp, Redmond, WA). Data were screened for missing entries and recording errors that contradicted scoring instructions. Descriptive statistics were calculated for all self-reported demographic information. Reliability was assessed over 2 time points using an intraclass correlation coefficient (ICC) and 95% confidence interval calculated based on a single-rater (1), absolute agreement, 2-way random-effects model (2,1).¹² The TMR[®] scores were coded from 0 to 100.

The results of the ICC analysis were assessed using a priori values: <.50 as poor, .50 to .75 as moderate, .75 to .90 as good, and >.90 as excellent.¹³ Standard error of measurement (SEM) values were calculated using the previously established formula: $SEM = SD \times \sqrt{1 - ICC}$.¹⁴ The MDC, which is the minimal amount of change that a measurement must show to be greater than the measurement error, was calculated with the following formula: $MDC = SEM \times 1.96 \times \sqrt{2}$.¹⁴

Results

A total of 67 participants completed the TMR[®] educational sessions. The data from 6 participants were removed due to recording errors. The remaining 61 participants (23 males and 38 females; 25.48 [5.73] y) were included in the final analysis. Of the 61 participants, 31 had no previous experience with the TMR[®] system, and 30 had prior experience.

Test-retest reliability between the 2 sessions ranged from 0.57 to 0.95 for participants without experience, 0.68 to 0.94 for those with prior experience, and 0.67 to 0.94 for combined groups (Table 1). The SEM values for those without prior experience ranged from 4.90 to 11.90 and had MDC values ranging from 13.44 to 32.62 points (Table 1). The SEM for participants with experience were between 4.89 and 8.75 points, and the MDC values ranged from 13.54 to 24.24 points (Table 1). Finally, for all combined participants, the SEM and MDC values ranged from 4.89 to 9.60 and 13.58 to 26.62 points, respectively (Table 1).

Figure 1 — Total Motion Release[®] Fab 6 motions. (A) Seated arm raise, (B) standing arm press, (C) seated trunk twist, (D) seated leg raise, (E) single-leg sit-to-stand motion, and (F) bent-knee toe reach.

Table 1 Test-Retest Reliability for the FAB 6 Within the TMR® System

Motion	ICC (95% CI)	SEM	MDC
No experience group data			
Seated arm raise	.95 (.90–.97)	4.85	13.45
Standing arm press	.89 (.78–.95)	6.25	17.32
Seated trunk twist	.57 (.27–.76)	11.77	32.62
Single-leg sit-to-stand motion	.64 (.38–.81)	7.17	19.87
Seated leg raise	.80 (.80–.90)	7.13	19.77
Bent-knee toe reach	.64 (.37–.81)	9.98	27.67
Experience group data			
Seated arm raise	.94 (.87–.97)	4.88	13.54
Standing arm press	.69 (.45–.84)	8.45	23.41
Seated trunk twist	.81 (.57–.91)	6.66	18.46
Single-leg sit-to-stand motion	.89 (.77–.95)	6.09	16.89
Seated leg raise	.75 (.53–.87)	8.36	23.17
Bent-knee toe reach	.78 (.57–.89)	8.75	24.24
Combined group data			
Seated arm raise	.94 (.91–.96)	4.90	13.58
Standing arm press	.81 (.70–.88)	7.42	20.55
Seated trunk twist	.67 (.50–.86)	9.61	26.62
Single-leg sit-to-stand motion	.83 (.71–.90)	6.65	18.43
Seated leg raise	.77 (.65–.86)	7.78	21.57
Bent-knee toe reach	.71 (.54–.82)	9.40	26.07

Abbreviations: CI, confidence interval; ICC, intraclass correlation coefficient; MDC, minimal detectable change; SEM, standard error of measurement; TMR, Total Motion Release®.

Discussion

The TMR® has been used in clinical practice to treat a wide array of patients, ranging from postoperative patients to those who are pain free with ROM impairments/imbbalances.^{6,12–14} Although preliminary research results have indicated that TMR® is an effective treatment option, a literature search revealed no studies examining the reliability of the TMR® scale. Therefore, the purpose of this study was to assess the reliability of the TMR® scale in healthy individuals in a group instruction test-retest study.

Our results indicated varying levels of acceptable reliability, ranging from moderate to excellent, across the Fab 6 movements. Across all 3 analyses, excellent reliability was identified for the seated arm raise (ICC = .94–.95), while good reliability was found for the seated leg raise (ICC = .75–.80). Moderate to good reliability was identified for the standing arm press (ICC = .69–.89), seated trunk twist (ICC = .57–.81), single-leg sit-to-stand motion (ICC = .64–.89), and bent-knee toe reach (ICC = .64–.78) (Table 1).

Our results indicate participants without TMR® experience report reduced reliability across most TMR® motions when performed in a group assessment. The inexperienced group produced the 3 lowest reliability scores for any of the motions in a group setting (Table 1). One potential explanation for this is the lack of experience with the TMR® Fab 6 motions and scale may impact scoring reliability. Another explanation is our study methodology prevented participants from directly interacting with the treating clinician during application of the scale, which may be more

challenging for novices to TMR®. In clinical practice, patients can seek clarification on the TMR® scale or patient-reported outcomes (eg, numerical pain rating scale) when the patient is unfamiliar with a scale. It is possible that the participants with previous experience were more familiar with the movements and scale, which resulted in improved reliability in a group performance setting. Clinically, this may imply the need for further instruction or clarification of the Fab 6 motions and what specifically is being assessed (ie, what constitutes as an asymmetry), when first working with patients or when implementing TMR® into a group setting (eg, as part of a dynamic warm-up protocol).

When groups were combined, reliability ranged from moderate to excellent across all 6 motions (ICC = .67–.94) with 4 of the 6 motions having “good” or “excellent” reliability. Overall, this would indicate the TMR® scale has sufficient reliability when being assessed in group settings including various patient populations (ie, those with or without experience using TMR®). The seated trunk twist (ICC = .67) and bent-knee toe reach (ICC = .71) had the 2 lowest reliability scores in the combined group. The findings may indicate clinicians need to work carefully with patients to explain and accurately score these motions.

Across all groups (ie, inexperienced, experienced, combined), SEM values ranged from 4.85 to 11.17 points; the majority of SEM values were in the 5- to 10-point range, which indicated a participant’s true score was most likely within 5 to 10 points of their recorded score. The MDC values ranged from 13.45 to 32.62, with most values falling below 25 points (Table 1). The findings are clinically relevant because inexperienced participants, who more closely represent a patient population at initial intake, generally had higher MDC values. Thus, larger changes in TMR® scores may be necessary to guide clinicians in determining when a true change (ie, improvement) has occurred when utilizing TMR® with patients new to the technique.

Clinical Implications and Future Research

To the best of our knowledge, this is the first study to assess the reliability of the TMR® scale. The MDC values found in the study provide insight to guide clinicians with the clinical application of TMR®. For example, the MDC values indicate that true change can be assessed when following certain TMR® recommendations: treating larger TMR® asymmetry scores (ie, >30) and tracking their improvement.^{1,3–5} While the MDC values may be inflated due to our methods utilizing a group assessment, clinicians may need to consider using larger changes (ie, more than the 10-point change often recommended to indicate improvement)^{3–5} to indicate true change has occurred when utilizing the TMR® system in clinical practice. The cut-point guidelines for clinical change may also need to be movement dependent or may be impacted by the clinical scenario (eg, patient experience with TMR®). Thus, clinicians may want to consider providing detailed explanation of the Fab 6 motions, especially the seated trunk twist, bent-knee toe reach, and single-leg sit-to-stand motion, and the TMR® scale at multiple time points when patients are first being introduced to the TMR® system. Future research should focus on assessing the reliability of the TMR® scale in different practice settings (eg, individual, group) and with different patient populations (eg, healthy, injured, etc). Additionally, researchers should conduct longitudinal studies to assess TMR® as an intervention and develop minimal clinically important differences to further guide clinical practice.

Conclusion

This reliability study should be considered the first step in assessing the reliability of the TMR[®] scale for clinical practice. Our results indicate varying levels of reliability, ranging from moderate to excellent across the Fab 6 movements in a group setting. Additionally, our results found a range of MDC values that may serve as a starting point for clinicians when considering assessing patient change during TMR[®] treatment sessions. However, caution is warranted until more research is done to establish reliability and MDC values of the TMR[®] scale in various clinical settings to better guide patient care.

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