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Differences in the Modified Disablement in the Physically Active Scale in Those With and Without Chronic Ankle Instability

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Context: The modified Disablement in the Physically Active scale (mDPA) has become a commonly utilized patient-reported outcome instrument for physically active patients. However, the factor structure of this instrument has not been verified in individuals with chronic ankle instability (CAI). Furthermore, additional evidence examining the mDPA in individuals with CAI is warranted. ***Objective:*** The purpose of this study was to verify the factor structure of the mDPA and compare the physical summary component (PSC) and mental summary component (MSC) in those with and without CAI. ***Design:*** Cross-sectional. ***Setting:*** Laboratory. ***Participants:*** A total of 118 CAI and 81 healthy controls from a convenience sample participated. ***Intervention:*** Not applicable. ***Main Outcome Measures:*** All subjects completed the 16-item mDPA that included the PSC and MSC; higher scores represent greater disablement. To examine the model fit of the mDPA, a single-factor and 2-factor (PSC and MSC) structures were tested. Group differences were examined with independent *t* tests ($P \leq .05$) and Hedges' *g* effect sizes (ESs). ***Results:*** Model fit indices showed the 2-factor structure to possess adequate fit to the data, $\chi^2(101) = 275.58$, $P < .001$, comparative-fit index = .91, root mean square error of approximation = .09 (95% confidence interval [CI], .08–.11), and standardized root mean square residual = .06. All items loaded significantly and in expected directions on respective subscales (λ range = .59–.87, all Ps < .001). The CAI group reported greater disablement as indicated from PSC (CAI: 11.45 [8.30] and healthy: 0.62 [1.80], $P < .001$, ES = 1.67; 95% CI, 1.33–1.99) and MSC (CAI: 1.75 [2.58] and healthy: 0.58 [1.46], $P < .001$, ES = 0.53; 95% CI, 0.24–0.82) scores. ***Conclusions:*** The 2-factor structure of the mDPA was verified. Individuals with CAI reported greater disablement on the PSC compared with healthy controls. The moderate ES on the MSC between groups warrants further investigation. Overall, these results indicate the mDPA is a generic patient-reported outcome instrument that can be utilized with individuals who have CAI.

Keywords: quality of life, patient-reported outcome measures, patient-centered care

The assessment of health-related quality of life (HRQL) in physically active patients with a history of musculoskeletal injury is an emerging consideration in the clinical management of this population. Athletes with a history of injury report decreased HRQL compared with athletes without a history of injury.[1] Similarly, retired college-level athletes with a history of injury reported diminished HRQL compared with nonathletes.[2] Ankle sprains are one of the most common injuries sustained by athletes and often result in recurrent injury and subsequent functional loss.[3] Approximately 40% of individuals who sustain an ankle sprain develop chronic ankle instability (CAI).[4] This is troubling because individuals with CAI are less active than their healthy counterparts,[5] and more likely to develop ankle osteoarthritis.[6] Therefore, continued efforts are necessary to understand the limitations and restrictions that are associated with this condition to affectively assess HRQL after injury and throughout rehabilitation.

The results of a recent systematic review indicate that self-reported functional deficits are routinely reported in individuals who have CAI.[7] However, self-reported function has been primarily assessed through patient-reported outcome instruments (PROs) that are often specific to the ankle region.[8] While gaining perspective from the patients regarding limitations and restrictions associated with physical function of the ankle is important, there may be other aspects of HRQL that have not been examined. Therefore, to advance an evidence-based practice model that is patient-centered and goal oriented for patients with CAI, additional research incorporating general, or generic, PRO instruments that capture other HRQL dimensions in this population is warranted.

Generic PRO instruments are valuable for clinicians to utilize in practice as they provide a more general assessment of HRQL.[9] Given the generality of these instruments, they can be provided to various patient populations, which allows for not only clinician familiarization but also assessment of HRQL detriments across a variety of health conditions.[9] A generic PRO that encompasses questions specific to physically active populations may provide additional information to better understand the impact of the condition on HRQL compared with other generic instruments, such as the Short Form 36 (SF-36).[10] The Disablement in the Physically Active scale (DPA) is a generic instrument that was developed for physically active populations.[11,12] This scale was subsequently modified to include 2 summary components: the modified DPA-physical summary component (mDPA-PSC) and the mental summary component (mDPA-MSC).[13] However, the factor structure or correlational relationship of the summary components originally identified has yet to be verified. Furthermore, although the DPA has been used in studies that have examined HRQL in individuals with CAI,[8] examination of the differences in the mDPA summary components between participants with CAI

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and those without CAI has yet to performed. The purpose of this study was to verify the factor structure of the mDPA and compare the PSC and MSC in those with and without CAI.

Methods

Design

A cross-sectional study design was used to confirm the factor structure of the mDPA and compare the mDPA-PSC and mDPA-MSC in those with and without CAI. The independent variable is the group (CAI and healthy control), and the dependent variables were the scores on the mDPA subscales.

Participants

A total of 118 people with CAI and 81 healthy controls were recruited from a convenience sample at a large public university in an urban setting. Participant demographics can be found in Table 1. Inclusion in the CAI group required the person to (1) be aged 18–45 years, (2) report a history of ankle sprain within the last 6 months, (3) report an episode of "giving way" within the last 3 months,[14] (4) answer "yes" to 5 or more questions on the Ankle Instability Instrument,[15] and (5) score 24 or less on the Cumberland Ankle Instability Tool (only collected for 91/118 participants).[16] The Foot and Ankle Ability Measure Activities of Daily Living and Sport subscales were collected to quantify self-reported function within this CAI sample.[17] To be included in the healthy control group, participants had to be an adult (aged 18–45 y) and report no history of ankle sprain. Participants in both groups reported regular participation in at least moderate levels of physical activity a minimum of 3 times per week. Participants were excluded in both groups if they reported a history of lower-extremity injury in the past year (other than an ankle sprain in the CAI group), a history of lower-extremity surgery, or other health conditions that could affect a participant's response on the mDPA scale.

Procedures

Data were collected in the laboratory during one testing session. After completion of a basic demographic and injury history questionnaire and other inclusionary measures, all participants completed the mDPA. All study procedures were approved by the Old Dominion University Institutional Review Board (IRB), and all participants provided written informed consent prior to their participation.

Instrumentation

The mDPA[13] is a generic instrument that was developed from the original DPA[11,12] to have 2 separate summary components: the mDPA-PSC and the mDPA-MSC. A 5-point Likert scale is used to score the individual items on the summary components, where 0 represents "no problem" and 4 represents "severe problem." The mDPA-PSC contains 16 items, with a total possible score of 48 points, whereas the mDPA-MSC contains 4 items, with a total possible score of 16 points. A higher score on each summary component indicates greater levels of disablement.[13] The mDPA-PSC and mDPA-MSC have excellent internal consistency with Cronbach's alpha values of .94 and .88, respectively.[13]

Statistical Analyses

Means and SDs for the mDPA-PSC and the mDPA-MSC scores were calculated. To examine mode fit of the mDPA, a single-factor and 2-factor (ie, PSC and MSC) structure were tested using confirmatory factor analysis. Model fit determination was judged according to established fit index cutoffs in the statistical literature.[18,19] The internal consistency for each subscale was assessed using Cronbach's alpha. Consistent with health scale measurement literature,[20,21] construct validity was evaluated by examining mDPA subscale scores by extreme groups—in this instance, a healthy group versus those with CAI. Due to the lack of normality, Mann–Whitney U tests were used to examine differences in mDPA-PSC and mDPA-MSC scores between groups. Nonparametric effect sizes (ESs; r) were also calculated to examine the clinical utility of group differences ($r = z/\sqrt{n}$).[22] ESs were interpreted as small (0.10–0.29), moderate (0.30–0.49), or large (>0.50).[23] All analyses were performed using IBM SPSS and AMOS version 24 (IBM Corporation, Armonk, NY; 2016).

Results

Summary statistics for each group for both summary components can be found in Table 2. Inspection of model fit indices showed the 2-factor structure to possesses adequate fit to the data, $\chi^2(101) = 275.58$, $P < .001$, comparative-fit index = .91, root mean square error of approximation = .09 (95% confidence interval, .08–.11), and standardized root mean square residual = .06. All items loaded significantly and in expected directions on respective subscales (λ range = .59–.87, all Ps < .001; see Figure 1 for a visual depiction of the model). The internal consistency for the mDPA-PSC and

Table 1 Participant Demographics

	CAI group (n = 118)	Healthy group (n = 81)
Gender (female/male)	79/39	56/25
Age, y	23.67 (4.90)	22.91 (2.77)
Height, cm	169.80 (10.09)	167.52 (11.74)
Weight, kg	73.45 (15.16)	67.05 (10.57)
Previous ankle sprains (n)	3.96 (3.28)	–
Episodes of giving way in the previous 3 mo (n)	5.37 (6.20)	–
Ankle Instability Instrument	6.38 (1.42)	–
Cumberland Ankle Instability Tool	16.78 (4.58)	–
Foot and Ankle Ability Measure Activities of Daily Living, %	87.23 (11.92)	–
Foot and Ankle Ability Measure Sport, %	75.29 (15.99)	–

Table 2 Summary Statistics (Median [Range]) and Mann–Whitney *U* Test Results Between the mDPA-PSC and mDPA-MSC for Both CAI and Healthy Groups

	CAI group (n = 118)	Health group (n = 81)	*P* value	Effect size
mDPA-PSC	11.0 (46.0)	0.0 (13.0)	<.001	0.78
mDPA-MSC	0.0 (13.0)	0.0 (7.0)	<.001	0.27

Abbreviations: CAI, chronic ankle instability; mDPA, modified Disablement in the Physically Active scale; MSC, mental summary component; PSC, physical summary component.

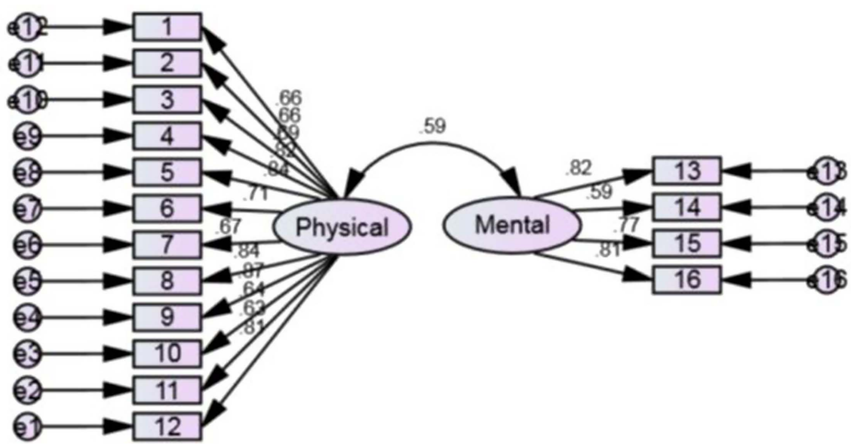

Figure 1 — Two-factor mDPA confirmatory factor analysis model. Note: Physical = physical summary component; Mental = mental summary component; subscales allowed to correlate as supported by theory and prior subscale intercorrelations. mDPA indicates modified Disablement in the Physically Active scale.

mDPA-MSC was 0.94 and 0.83, respectively. Participants with CAI reported significantly greater disablement on the mDPA-PSC and mDPA-MSC ($P < .001$) with large and moderate ESs, respectively (Table 2).

Discussion

The purpose of this study was to confirm the factor structure of the mDPA and compare the mDPA-PSC and mDPA-MSC in those with and without CAI. The 2-factor structure of the mDPA was verified in the CAI population. This finding advances our psychometrically based confidence in the use of this instrument. In addition, a secondary purpose was to examine differences in the mDPA-PSC and mDPA-MSC between individuals with and without CAI. The results of our investigation determined individuals with CAI had greater levels of self-reported disablement on both the mDPA-PSC and mDPA-MSC compared with healthy controls.

The mDPA summary components were originally developed using a large sample of college athletes (n = 456) in which a principal component analysis revealed items 1 to 12 loaded on to the PSC and items 13 to 16 loaded on to the MSC.[13] The authors also examined the internal consistency of each of the summary components, and both were considered excellent (Cronbach's $\alpha > .87$).[13] Additional construct validity analyses were performed, which correlated the summary component scores to the original DPA scores, and each summary component was strongly correlated (mDPA-PSC: $r^2 = .956$ and mDPA-MSC: $r^2 = .691$).[13] We verified the 2-factor structure through confirmatory factor analysis to provide additional psychometric evidence to support the use of the mDPA-PSC and mDPA-MSC for individuals with CAI. This is important, as currently there is limited use of generic PROs in outcomes research that includes CAI participants.[7,24] For example, a recent meta-analysis included 15 studies, none of which included a generic PRO instrument in their battery of patient-oriented outcome measures.[24] Furthermore, Houston et al[7] included 27 studies that examined PROs in individuals with CAI and healthy controls. The authors identified only 2 studies that utilized a generic instrument.[7] Generic instruments are not specific to certain health conditions and can provide valuable information of the effect of the health condition on overall health and well-being.[9] A frequently used generic instrument in the orthopedic literature is the SF-36[10]; however, this instrument was not developed for use in physically active populations. The DPA was developed for use in physically active populations[11,12] and may be more acceptable for use in the CAI population. Our results confirmed the 2-factor structure. Items 1 to 12 again loaded on to the PSC (λ range - .63–.87), and items 13 to 16 loaded on to the MSC (λ range = .59–.82). Our results are similar to the original mDPA principal component analysis, where all items had a loading factor of >.58.[13] Although the model fit indices did not fall within ideal fit ranges in the literature,[18,19] the confirmatory factor analysis, root mean square error of approximation, and standardized root mean square residual were within acceptable ranges of adequate fit. Additionally, we examined the internal consistency of these subscales within this population. Our results were in agreement with the original mDPA development because the Cronbach's alpha scores were excellent. While very few other generic instruments have been used in adult populations, the verification of the 2-factor structure supports the use of this instrument in this population to evaluate the impact of their health condition on both the physical and psychological domains of HRQL.

In this study statistically and clinically meaningful group differences were observed for the mDPA-PSC. These results add to the literature that decreased physical function exists in the CAI population. A recent systematic review of PROs in individuals with CAI compiled 27 studies that examined HRQL in individuals with CAI and compared them to controls or ankle sprain copers.[7] Although only 2 studies[8,25] included a generic HRQL instrument, large ESs were noted in the physical component summary of the SF-36 and the DPA.[7] Given the limited number of studies, the authors were able to conclude that there was only moderate evidence to suggest individuals with CAI experienced HRQL deficits compared with healthy controls.[7] However, a large number of studies utilized region-specific instruments, and the authors were able to conclude there was strong evidence that individuals with CAI had decreased region-specific outcomes than healthy control participants.[7] Thus, our generic PSC findings support the region-specific functional limitations and generic PRO findings by Houston et al.[7] In concert, these results further elucidate the impact of CAI on the physical domains of function and HRQL. It is imperative that researchers continue to investigate evidence-based treatments that address these physical limitations identified on region-specific PROs and also generic instruments that assess physical health.

Although statistically significant, the ES for the mDPA-MSC in this study was small, suggesting the magnitude of the difference between the 2 groups may not be clinically meaningful. Previous literature utilized the SF-36 mental component summary and identified no significant differences in scores between individuals with CAI and healthy controls.[25] Thus, it appears that general psychological function may not be as impacted for individuals with CAI compared with physical function. However, clinicians and researchers should continue to assess psychological health on an individual patient-by-patient basis to ensure they are providing whole-person, patient-centered care. In addition to generic instruments to assess mental aspects of HRQL, clinicians and researchers should consider the use of other instruments that assess psychosocial contextual factors that may impact the health condition, such as fear of reinjury and fear-avoidance beliefs. Houston et al[8] utilized both the Fear-Avoidance Beliefs Questionnaire[26] and the Tampa Scale of Kinesiophobia-11[27] and found significant differences with large ESs between individuals with CAI and healthy controls. In a subsequent study,[28] individuals with a history of recurrent ankle sprain had elevated fear-avoidance beliefs compared with individuals with a history of one ankle sprain and also controls. The authors concluded a single ankle sprain can impact fear-avoidance beliefs, and individuals with recurrent sprains have even greater levels.[28] Therefore, in addition to utilizing a generic HRQL instrument for individuals with CAI, clinicians and researchers should also include other measures of biopsychosocial contextual factors, such as fear-avoidance beliefs and fear of re-injury.

This study is not without limitations. First, a causal link between individuals with CAI and decreased HRQL outcomes cannot be made due to the retrospective nature of this study. Second, participants in this study were aged 18–45 years. This sample may not be representative of all individuals with CAI in younger or older cohorts; thus, the results of this study may not be applicable for these populations. Also, the International Ankle Consortium[14] suggests using threshold values of 90% and 80% on the Foot and Ankle Ability Measure Activities of Daily Living and Sport subscales, respectively. We utilized this instrument to describe self-reported function within the CAI sample; however, these thresholds were not used for inclusion into the study. Finally, CAI is determined based on self-reported information. It is possible the individuals included in these analyses failed to report adequately their musculoskeletal injury history for either group. However, based on the results, we believe even if this was the case, there was minimal impact on the overall findings.

Conclusions

The 2-factor structure of the mDPA was verified, adding to the available psychometric evidence to support the use of this instrument in clinical practice. Furthermore, individuals with CAI had greater self-reported disablement as assessed by the mDPA-PSC and mDPA-MSC when compared with healthy controls. However, the clinical relevance of the mDPA-MSC group difference should be further investigated as there was only a moderate ES between groups. The results of this study support the use of the mDPA summary components in future CAI research and clinical practice. Future research should explore minimal detectable change and minimal clinically important differences to provide clinical interpretations of the mDPA-PSC and mDPA-MSC. Additionally, further psychometric assessment of the mDPA-MSC could clarify whether the moderate ES was a result of other psychological factors unrelated to their injury.

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