Review Article

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Foot Function Index: An Overview of Its Measurement Properties and Application in Orthopedic Examination

Kumar Senthil P.*, Kumar Anup**

Author Affiliation: *Professor & Principal, Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation (MMIPR), Maharishi Markandeshwar University (MMU), Mullana University Road, Mullana, Ambala, Haryana- 133 207, **Associate Professor, Dept of Orthopaedics, Kasturba Medical College (Manipal University), Mangalore.

Reprint Request: Senthil P. Kumar, Professor & Principal, Maharishi Markandeshwar Institute of Physiotherapy and Rehabilitation (MMIPR), Maharishi Markandeshwar University (MMU), Mullana University Road, Mullana, Ambala, Haryana- 133 207

E-mail: senthilparamasivamkumar@gmail.com

Abstract

The objective of this review article was to update the measurement properties and application of Foot function index (FFI) in orthopedic examination. There were studies found on description of FFI, short-form FFI, revised FFI and revised short-form FFI. Studies on measurement properties were on validity, reliability, and side-side reliability. Population-specific use was on rheumatoid foot deformities and post-surgical outcomes. There were studies on comparison with other measures such as SF-36, the Ankle Osteoarthritis Scale (AOS), and the American Orthopedic Foot and Ankle Society (AOFAS) Ankle Hindfoot Score. Cross-cultural adaptation studies were on Italian, German and Taiwan-Chinese languages. The presented evidence suggested that FFI and its modified measures are valuable tools in evaluation of functional status and disability in orthopedic foot disorders.

Keywords: Functional Status; Disability; Activity limitation; Foot Function; Orthopedic Examination.

The objective of this review article was to update the measurement properties and application of Foot function index (FFI) in orthopedic examination.

The Foot Function Index

Budiman-Mak et al [1] developed the FFI to measure the impact of foot pathology on function in terms of pain, disability and activity restriction. The FFI is a self-administered index consisting of 23 items divided into 3 sub-scales. The FFI was examined for test-retest reliability, internal consistency, and construct and criterion validity in 87 patients with rheumatoid arthritis were used in the study. The study had following findings; "Test-retest reliability of the FFI total and sub-scale scores ranged from 0.87 to 0.69. Internal consistency ranged from 0.96 to 0.73. Strong correlation between the FFI total and sub-scale scores and clinical measures of foot pathology supported the criterion validity of the index."

The foot function index with verbal rating scales (FFI-5pt)

Kuyvenhoven et al [2] assessed the Dutch version of the Foot Function Index (FFI) in comparison with the original FFI using verbal rating scales (FFI-5pt) rather than visual analog scales (VAS) on 206 patients with non-traumatic forefoot complaints. Two scales (Pain and Disability) were identified with high internal consistency and good agreement between both versions. Test-retest reliability was high, responsiveness to change was low to moderate, and concurrent validity was good.

FFI versus FFI-R

Budiman-Mak et al [3] reviewed the uses of FFI and FFI-revised (FFI-R) as reported in medical and

surgical literature through a systematic literature search of PubMed / Medline and Embase databases. FFI and FFI-R were used in 78 studies of foot and ankle disorders in 4700 people worldwide. Re-analysis of FFI-R subscales' confirmed uni-dimensionality, and the FFI-R questionnaires' response categories were edited into four responses for ease of use, so as to enhance its user friendliness for measuring foot health.

FFI-R

Budiman-Mak et al [4] developed and field-tested a revised FFI (FFI-R) based upon a theoretical model of foot functioning. The FFI-R items were developed from the original 23 FFI items, and developed FFI-R which consisted of four subscales and comprised 68 items with a six-point response scale. The FFI-R was assessed on 92 patients and construct validity of FFI-R was supported based on the correlation of 50-ft walk time resulting in a short form with 34 items. Both long and short forms were found to have very good psychometric properties.

Measurement properties

Validity

SooHoo et al [5] evaluated the validity of the Foot Function Index (FFI) by examining its level of correlation to the Medical Outcomes Study Short Form-36 (SF-36) on 69 patients and found that all three FFI domains had moderate to high levels of correlation to many of the SF-36 scales which supported that the FFI was a valid measure of health status.

Reliability

Agel et al [6] assessed the reliability of Foot Function Index (FFI), in a population of patients with foot complaints without systemic disease. The first trial was completed by 96 patients and the second trial was completed by 54 patients. The authors found acceptable reliability with 23.5% of the patients providing retest values within one point of the initial response and an average of 45.3% of the patients providing the same response, for a total of 68.8% of all respondents answering within one point between their initial and second questionnaire. The findings of the study suggested that FFI appeared to be a reasonable tool for low functioning individuals with foot disorders and may not be appropriate for individuals who function at or above the level of independent activities of daily living.

Side-to-side reliability

Saag et al [7] assessed the side-to-side reliability of the seven-question Foot Function Index pain subscale since one foot serves as an internal control in orthopedic studies. The authors studied 30 patients with rheumatoid arthritis and found high internal reliability, good left versus right discriminatory abilities.

Population-specific application

Rheumatoid foot deformities

Bal et al [8] evaluated the type, frequency and impact of foot deformities on FFI in 156 feet of 78 rheumatoid arthritis (RA) patients and 76 feet of 38 healthy controls. The frequency of deformities was 96.2% in RA patients and 97.4% in controls and frequency of each deformity was markedly increased in RA patients, with the exception of calcaneal valgus deformity. There was significant correlation between SFC and HAQ with FFI and subscales. For FFI and subscales, HAQ was the most important predictor factor, followed by gender and hallux rigidus.

Post-surgical outcome- Revised Foot Function Index Short Form

Dux et al [9] used FFI-R SF to evaluate functional outcome after surgical correction for hallux valgus using the Foot Function Index Revised short formin 59 patients who underwent 68 osseous and soft tissue procedures. The following findings were noted;"the Foot Function Index Revised scores had improved by 39% at 6 months and 50% at 12 months. The improvement in all scores indicated an improvement in health-related foot function after hallux valgus surgery, evidencing effective surgical intervention."

Comparison with other measures

Madeley et al [10] compared four commonly used scores, the SF-36, the Ankle Osteoarthritis Scale (AOS), the American Orthopedic Foot and Ankle Society (AOFAS) Ankle Hind-foot Score, and the Foot Function Index (FFI) to determine their responsiveness and validity, and found that all four scores showed acceptable responsiveness, and when using the validated SF-36 as the standard the three region or disease specific scores all showed similar criterion validity. The study recommended use of a purely subjective score such as the Ankle Osteoarthritis Scale or Foot Function Index as the

region–or disease-specific score of choice in this population.

SooHoo et al [11] compared the responsiveness of the Foot Function Index (FFI), American Orthopedic Foot and Ankle Society (AOFAS) Clinical Rating Systems, and Medical Outcomes Study Short Form-36 (SF-36) in 25 patients with foot and ankle surgery of whom 13 patients (52%) had conditions affecting the ankle, hind-foot, or mid-foot, while 12 patients (48%) had conditions affecting the forefoot. This study demonstrated increased responsiveness of foot and ankle specific outcomes tools compared to the SF-36.

Cross-cultural adaptation

Italian version

Martinelli et al [12] translated the Foot Function Index (FFI) into Italian, and performed a cross-cultural adaptation by evaluating the psychometric properties in 89 patients. The Italian version of the FFI consisted in 18 items separated into a pain and disability subscales. It had satisfactory psychometric properties for use in Italian patients with foot and ankle diseases.

German version

Naal et al [13] cross-culturally adapted the Foot Function Index (FFI) in German language for 53 patients with foot complaints. The German FFI (FFI-D) was feasible, with excellent reliability and internal consistency which suggested that the German version of the FFI was a reliable and valid questionnaire for the self-assessment of pain and disability in German-speaking patients with foot complaints.

Taiwan Chinese version

Wu et al [14] evaluated the reliability and validity of the Taiwan Chinese version of the Foot Function Index (FFI) among 50 patients with plantar fasciitis and 29 with ankle/foot fracture."The internal consistency of the 21-item FFI was high and the test-retest reliability was satisfactory, moderate correlation existed between the FFI total and subscale scores to the physical component summary scores rather than to the mental component summary scores of the SF-36."The adapted Taiwan Chinese version of the FFI was found to be reliable and valid and was recommended for use in traumatic and non-traumatic foot disorders.

There were studies found on description of FFI, short-form FFI, revised FFI and revised short-form FFI. Studies on measurement properties were on validity, reliability, and side-side reliability. Population-specific use was on rheumatoid foot deformities and post-surgical outcomes. There were studies on comparison with other measures such as SF-36, the Ankle Osteoarthritis Scale (AOS), and the American Orthopedic Foot and Ankle Society (AOFAS) Ankle Hand-foot Score. Cross-cultural adaptation studies were on Italian, German and Taiwan-Chinese languages. The presented evidence suggested that FFI and its modified measures are valuable tools in evaluation of functional status and disability in orthopedic foot disorders.

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