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INTER RATER RELIABILITY THE NUMERIC RATING SCALE IN INDIVIDUALS WITH KNEE OSTEOARTHRITIS

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Abstract

***Background*:** Pain is one of the most commonly reported and prominent factors that are responsible for physical inactivity in patient with knee Osteoarthritis (OA). There are many measuring tools that can used in clinical practice, one of is which is the Numerical Rating Scale (NRS). The aim this study was analyzing the inter rater reliability of NRS in individuals with knee osteoarthritis.
***Metode*:** The study was planned in accordance with guidelines for reporting reliability studies. 10 participants enrolled in this study. Intra-class correlations, two-way random effects model, (ICC 2.1) with 95% confidence intervals, standard error of measurement and minimal detectable change.
***Result*:** The inter rater reliability of NRS was excellent (ICC=0.929 95% CI = 0.712 – 0.982). The correlation coefficient recorded has higher than 0.8. The average of ages 59,9 years old.
***Conclusion*:** This study had excellent inter rater reliability by excellent ICC, which means the NRS is acceptable measurement that can be used to evaluate pain

Keyword: Pain, Knee Osteoarthritis, NRS

Introduction

Osteoarthritis (OA) has become a major public health challenge because it causes chronic pain, reduce physical function and quality of life [14]. American Collage of Rhematology Diagnostic and Therapeutic Committe defined OA as, a heterogeneous group of conditions that lead to joint symptoms and signs which are associated with defective integrity of articuler cartilage, in addition to relative changes in the underlying L bones at the joints margins. The National Health and Nutritional Examination Survey reported that the overall symptomatic prevelance of OA was 15.6 million, around 8.5 million individuals reported with advanced OA in adults aged under 45 years. This study also noted, OA was found higher in males (36% to 40%) than the females (28% to 35%). Among the individuals aged 45-65 years, the OA symptomatic were found approximately 7 million people, which the prevelance was higher among females than males. Among the women over 65 years of ages, one of five was estimed to have symptomatic OA, with two third of them having the disease at an advanced [11]. The incidence of OA in Indonesia from 1990 to 2010 has increased by 44.2%. The prevalences of OA by age in Indonesia are quite hight, categorized bya age, i.e: 40 years old, 40-60 years and over 65 years, thoese are 5%, 30% and 65% respectively [2].

The risk factors of knee OA such age, gender, obesity, profession, sports, osteoporosis, previous trauma, internal derangement, heredity, irregularity in joint surfaces, leisure and disease leaving articular cartilage damage [10]. The comon clinical manifestations of knee OA include pain, stiffness, joint enlargment, crepitus, muscle weakness, deformity, impaired propioception, reduce joint motion, and disability [15]. The disease limits activities daily living, such as getting in and out of bed, dressing and climbing stairs [5].

Pain is one of the most commonly symptom and prominent factors that dimisnishing physical activity in patient with knee OA [1]. Impaired physical activity associated with knee OA that related to the pattern of pain and the severity of knee OA itself. Classification of mild, moderate, severe, or very severe severity that can affect knee joint rang of motion (ROM), daily activities and the patient's quality of life [8].

Several scales are commonly used for measuring pain intensity, as well the Numeric Rating Scale (NRS), Visual Analog Scale (VAS), and Visual Rating Scale (VRS) are often used in clinical practice. These pain-rating scale have shown good validity and reliability for assessing pain intensity, however, none has shown superiority over the others, as various aspects, such as the response categories, patient preference, application methods, and correction for missing information [3].

Titin Marlina *et al*. [19] reported the isntrument used to assess pain intensity was the Numerical Pain Rating Score (NPRS), starting from 0 to 10 with 0 indicating no pain and 10 indicating worst pain. Shim *et al*. [16] reported OA was commonly occuring over 50 years in elderly. The knee pain was assesses with NRS in participantss who had more than 30 days during the previous 3 months.

Therefore, researchers chosen the NRS to evaluate the reliability of its to knee OA patients, because it was measuring instrument commonly used practically and applicable in research as well. Hence, the purpose of this study was to analyze the interreter rater reliability of NRS in individuals with knee osteoarthritis.

Methods

This study had been approved by the Health Sciences Faculty, Universitas Muhammadiyah Surakarta (1292.2/C.8-III/FIK/VIII/2021).

Protocols and instruments

This study assessed the reliability of inter rater by the NRS to measure pain, especially for motion pain. The patient was supine and ordered to flexion and extension of knee. Thus, asked the patients to identify the number of pain.

Participants

The study recruited 10 eligible osteoarthritis patients who visited Physiotherapy Department, Soeselo Slawi Hospital, Central Java, Indonesia. The inclusion criteria as follows i.e: (1) grade 1 - 4 of OA scored using the Kellgren and Lawrence (K-L) grading system,(2) had morning stiffness < 30 minutes, (3) had crepitus, unilateral knee OA, (4) had pain when move to knee flexion or extension, and (5) no had neuromuscular disorders as well. This study did not include the participants who can't understand verbal communication.

Procedure

There were 2 raters measured pain to the patients. The measurement has done after the patients get the infrared treatment on the knee for 15 minutes. The first rater started ordering the patients to move the knee flexion and extension, subsequently asked the score of pain. Thus, the second rater instructed the patients to repeat the movement, and gave the score as well as the first trial. The same pattern did for 10 patients.

Statistic Analyzed

The statistic package for social sciences (SPSS) version 24 was used for data analysis. The psychometric properties of the NRS including inter rater reliability, standard error measurement and minimal detectable change was analyzed as follows.

Inter Rater Reliability

The Intraclass Correlation Coefficient (ICC) conducted to measure inter rater reliability between two raters. Scores was > 0.80 considered to be good to excellent [17].

Standard error measurement (SEM)

The spread of measurement errors when estimating an examinee's true score from the observed score. Standard error of measurement is most frequently useful in test reliability. A large standard error indicates a large amount of variability between different samples; therefore, the sample may not accurately represent the population. Formula of SEM as follow [20]:

SEM = SD √1-ICC

Minimal Detectable Change (MDC)

The minimum detectable change at 95% confidence level (MDC95) for the PSSS-IB was calculated. The following formulas were used to estimate the standard error of measurement [20].

MDC_{95} = SEM * √2 * 1.96

Result

The descriptive characteristics of the participants are shown in Table 1. The average age was 59.9 years, the oldest was 73 years old and the youngest was 51 years old. Most of the participants were male (60%), married (70%), had a working (70), and had right side affected knees (60%). NRS highest score of rater 1 and rater 2 is 7, lowest score of rater 1 and 2 is 4 and the average of rater 1 and rater 2 is 5,6 and 5,2.

Table 1 Subject characteristics

	Mean±SD	N	(%)
Age	59,9± 6.8		
50-59 years old		5	50
60-69 years old		4	40
>70 years old		1	10
Gender			
Female		4	40
Male		6	60
Marital status			
Married		7	70
Single			
Others		3	30
Profession			
Working		7	70
Retired		3	30
Knee OA status			
Left		4	40
Right		6	60
Pain (NRS)			
Rater 1	5,6±0.9	10	100
Rater 2	5,2±1.0	10	100

Table 2. Inter Rater Reliability

	ICC	95% CI	r value
NRS	0.929	0.712 – 0.982	0.869

Table 2 presents the inter rater reliability of NRS was excellent (ICC=0.929 95% CI = 0.712 – 0.982). Likewise the correlation coefficient recorded has higher than 0.8.

The Standard Error Measuring calculated by multiple the SD (0.96) and 1-ICC (1-0.929), the result was 0.25. Thus, identified the MDC_{95} by using SEM result multiply root of 2 and 1.96. The MDC_{95} was 0.69.

Disscusion

Subjects characteristics

The youngest participant age is 51 years old, and all participants age over 50 years. Previously, Abdurrachman *et al.* [2] reported impact of aging is decrease muscle strength because happens by decreased morphology of muscle. The age 40 years old body will progressively lose lean body masa by decreased of 2% basal metabolism accompanied by body system, so age increases incidence of knee osteoarthritis. Ambarini [4] reported approximately 10-15% of adults aged over 60 years old have a greater risk incidence of knee osteoarthritis. The age have a significant role by happening knee osteoarthritis because of aging. Decreased joint

proprioception,

calcification of cartilage, and chondrocyte function is problem of the joint on aging process that why joint are weak.

Regional differences contribute much among the pattern of OA. In Asia and Africa, OA of knee seems to be less common than in western countries. Also gender differences are observed higher prevalence in females during menopausal stage. Asian women with average menopausal age of 46.3 years has risk of OA earlier than that of western women with 51 years age. Apart from ageing and sex other etiological factors of OA described as nature of work, physical activities, community lifestyle and obesity [6]. But, in this study population of OA mostly in male rather than female. But, might a small numbers of populations could not conclude the representative of case incidence.

The studies in the US and Europe have reported that OA has signifikan impact on worker absenteeism and presenteeism. Workers who were diagnosed with OA and experienced arthritis pain in the last month reported significantly more work impairment than those without OA pain, which was mainly due to presenteeism. Similarly, prior research in five European countries reported that employees with OA experienced reduced work productivity caused by absenteeism (reported by 7%) and presenteeism (reported by 24%) [13].

The average age of the respondents is 59.9 years which is in the elderly category. The relationship of physiology changes due to aging, the elderly have a greater chance of developing chronic diseases, such as osteoarthritis (OA). A study carried out with 1,769 individuals older tha 60 yeras concluded that arthropathy is the main cause of physical disability among older people, and it is the second most frequent chronic condition found among this population, and this condition has a significant influence in functional dependency of these individuals [18]. Because OA occurs in older adults who also have agerelated changes in muscle, bone, fat and the nervous system, it is lika that a more general and systemic approach will be needed to better understand about the link between aging and OA [7]. In line with the research above, respondents complained that their daily activities were disturbed, such as squatting to standing, going up and down stairs and praying.

Accordingly to table 2 showed the ICC of NRS was excellent reliability with high correlation coefficient. Similarly to Alghadir *et al*. [3] reported ICC for VAS, NRS, and VRS is 0,97, 0,95, and 0,93 respectively. Sarkar *et al*. [15] reported fifty-six percent of the participants were women. Baseline score for all the participants were 5.9 (NRS). Huang *et al*. [9] reported the many advantages of the NRS, including ease of administration, straightforward scoring

mechanism, patient preference, and ability to be used in paramatric analyses. Maughan & Lewis [12] reported the ICC values calculated in this study were 0.92 on Chronic Low Back Pain. Notably, this study had minimal error of variance, indicated with small SEM and $MDC_{95.}$

The NRS may be more appropriate for research purpose, as it lends itself to statistical analysis and is becoming the international standard, thereby facilitating comparisons to be mase with other population [9].

The understanding about the NRS was not easy by respondent, for further the respondents needed encourage explanation until be succsessful. People in their 50s can understand intructions well, but those who are close to the elderly can understand but have to be explained over and over. Previously Kangeswari *et al*. [11] reported beacuse it is easy to understand and administer, NRS is preffered over VAS by the elderly population. For example, the administration of a VAS requires the patients to mathematically understand his pain level, which can be very difficult for parents. In addition, VAS has a 7-16% higher correlated and sensitive for pain assessment, the NRS shows higher reliability, particulary in elderly and less educated patients, and useful for chronic pain assessment.

The measurement of pain depends on each individual who will measure it. However, if there is something easier to use and ICC proves to be very good to implement then use that tool. This study had limitations, which had a small sample size. Second to complate data of this study should added age, weight, employment so that it can be used as a measurement standard. In addition, only subject aged 51-73 years participated. Impaired cognitive function and severe pain were reported in patient > 70 years with knee OA. But, we were considered about the minimal biases by correct measurement procedures.

Conclusion

This study had excellent inter rater reliability by excellent ICC, which means the NRS is acceptable measurement that can be used to evaluate pain. May suggestion for other reaserchers is development of inter-reter and intra-reter reliability researchers on the use of outcome measurments under certain conditions so that we can find out whether they are suitable for use for certain diseases.

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