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원 저

Comparison of Modified-Modified Schober Test with Range of Motion in Evaluating Visual Analog Scale of Patients with Low Back Pain

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국문초록

요통 환자의 시각 통증 등급 평가에 있어서 Modified-Modified Schober Test와 관절 운동 범위의 비교

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목적 : 요통 환자에서 Modified-Modified Schober Test(MMST)와 관절 운동 범위를 비교하여 시각 통증 등급 평가에 있어서 타당도의 우위를 추정하여 보고자 하였다.

방법 : 요통으로 입원한 31명의 환자들을 대상으로 MMST, 관절 운동 범위 및 시각 통증 등급을 주 3회씩 입원 기간 동안 측정하였다. 각 측정 방법의 시행 순서는 무작위로 선택되었으며, 환자들은 맨발로 환자복을 입은 채 측정하였다.

결과 : 각 자료의 상관성을 분석하기 위하여 피어슨 상관계수가 사용되었다. 요추의 MMST 측정값(r = -0.61 ; 99%CI)이 요추의 신전 및 굴곡의 관절 운동 범위 측정값보다 시각 통증 등급에 통계적으로 의미 있게 나타났다. 또한 요추의 MMST 측정값(r = -0.77 ; 99%CI)은 요추의 신전 관절 운동 범위 측정값보다 요추의 굴곡 관절 운동 범위 측정값과 통계적으로 의미 있게 나타났다.

결론 : 이상의 결과를 통하여 요통 환자의 평가에 있어서 MMST가 관절 운동 범위보다 높은 타당도를 가지는 것으로 추정된다.

핵심단어 : 요통, 시각 통증 등급, Modified-Modified Schober Test, 관절 운동 범위, 타당도

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Ⅰ. Introduction

Low back pain(LBP) affects 58~84% of all adults at some point in their life, and places a significant burden on health services internationally[1,2] Measurement of low back pain is important, because it is used to evaluate spinal function, select appropriate treatments, and monitor patients' progress[3 5]

Musculoskeletal disorders include pain and functional change[6]. Many musculoskeletal disorders have used visual analog scale(VAS) as a primary outcome. But, pain is a difficult symptom to measure and it also needs to be judged by the patient's change in function[6]. In a clinical setting, limited range of movement is considered as a common impairment. Various pathologies or injuries may result in restrictions of range of movement. Theses limitations prevent normal function, and so it is necessary that physical therapists assess with valid and reliable tools to treat restrictions adequately[7]. Range of movements is a key component of physical examination in most processes[8].

Many clinicians routinely use range of motion (ROM) as assessing impairments of spinal range of movement. Even with regular use of lumbar ROM measuring, its value as a prognostic tool of the client's condition has not been convincing. Also, it appears illogical to use it alone when aiming to measure or compensate disability[9]. However, assessing ROM continues to be a key in the identification of impairment, an integral component of treatment planning in physical therapy[10].

A frequently used method in clinics to measure lumbar active range of movement is Schober test. Schober test is simple and showed high reliability comparing radiographic measurement[11]. Schober test has an advantage in evaluating the movement of lumbar spine that clinicians may easily utilize to check muscle contraction and rigidity, specifically. The latest version of Schober test is the Modified-Modified Schober Test(MMST) using the 15 cm distance cranial to posterior superior iliac spine(PSIS) landmarks[12].

As a summary, to assess a patient with low back pain, function and pain are two axes. Clinicians frequently use VAS for to asses pain, and ROM to analyze for function. However, ROM is hard to measure accurately and MMST remains alternative for clinicians. In this study, the purpose was to compare MMST with ROM as measurement for lumbar movement.

Ⅱ. Materials and Methods

1. Materials

1) Measuring tape

A measuring tape(Hoechstmass, Germany) is a plastic ribbon with linear-measurement markings. The markings have graduation every 1mm. Its total length is 150㎝.

2) Dualer IQ

The Dualer IQ(JTECH Medical, USA) is an electronic digital inclinometer. The Dualer IQ uses gravity(or the floor) as the reference point when measuring range of motion. It is composed of two inclinometers and the measurement in degrees is displayed on LCD.

2. Methods

1) Subject

Subjects were consisted of 31 inpatients with low back pain in Dongguk university Ilsan oriental hospital.(9 men and 23 women ; age : 24~81 years). All subjects had to fulfill following criteria : (1) to be having treatment for a lumbar and/or sacral spine problem : (2) to be at least 18 years of age ; and (3) to tolerate active trunk flexion(without increasing the pain) for at least 30 seconds.

2) Procedure

Examiner evaluated MMST, lumbar flexion ROM, lumbar extension ROM and VAS during the patient's admission period. Taking the measurements were carried out 3 times a week and numbers of taking the measurements were varied by each patient's admission period. The order of examination was operated randomly. Total numbers of taking the measurements were 102. The subjects were wearing patients' gowns with bare feet.

3) Modified-Modified Schober Test

The examiner puts his thumbs on the inferior margin of the subject's PSIS. An ink mark is drawn along the midline of the lumbar spine horizontal to the PSIS(lower landmark). While the examiner holds the measuring tape firmly against the subject's skin, he marks a second line 15cm above the original one(higher landmark). Then, the subject is asked to perform an active anterior flexion of the trunk without increasing the pain. The new distance between the lower and higher landmarks is then measured. The subject returns to the neutral position. The difference between the initial distance of the skin markings in the neutral position and difference measured in the flexion position is used to indicate the amount of lumbar flexion. The measurements are recorded to the nearest mm[12].

4) ROM(Measuring with the Dualer IQ)

The subject stands with spine in neutral position, knee straight, weight equally on both feet and hands on hips The examiner places a primary sensor at T12 and the a secondary sensor over the sacral midpoint in the sagittal plane. A subject flexes maximally and then extends maximally.

5) Statistic analysis

Data are analyzed by using SPSS, version 10.0. A correlation coefficient is used to indicate the strength and direction of a linear relationship between two random variables. A range of opinion exists as to what constitutes an appropriate minimal coefficient value to determine validity. With regard to Pearson's product moment correlation coefficient(r), which is a measure of the linear association between two normally distributed variables that have been measured on interval or ratio scales, Williams et al.[13] advocate the following interpretation : 0~0.20 slight agreement ; 0.21~0.40 fair agreement ; 0.41~0.60 moderate agreement ; 0.61~0.80 substantial agreement ; 0.80~1.00 almost perfect agreement.

Ⅲ. Results

1. Coefficient of Correlation between of MMST, ROM(flex.) and ROM(ext.) with VAS

Table 1, 2, and 3 show coefficient of correlation of MMST, flexion ROM, extension ROM with VAS. Each scatterplot, determination coefficient, is shown in Fig. 1, 2 and 3.

2. Coefficient of Correlation of ROM (flex.) and ROM(ext.) with MMST

Table 4 and 5 show coefficient of correlation of MMST with ROM(flex.). Each scatter plot, determination coefficient, are shown in Fig. 4 and 5.

Table 1. Coefficient of Correlation of MMST and VAS(n=102)

		VAS
MMST	Pearson Correlation	-.610**
	Sig.(2-tailed)	.000
	N	102

** Correlation is significant at the 0.01 level(2-tailed).

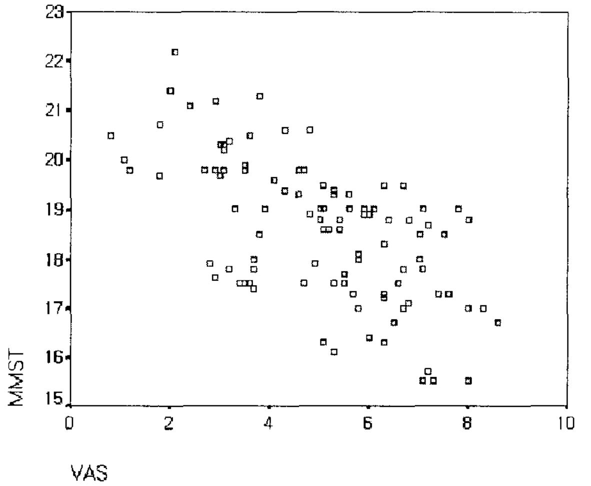

Fig. 1. Scatterplot of MMST and VAS(n=102)

Table 2. Coefficient of Correlation of ROM(flex.) and VAS(n=102)

		VAS
ROM(flex.)	Pearson Correlation	-.599**
	Sig.(2-tailed)	.000
	N	102

** Correlation is significant at the 0.01 level(2-tailed).

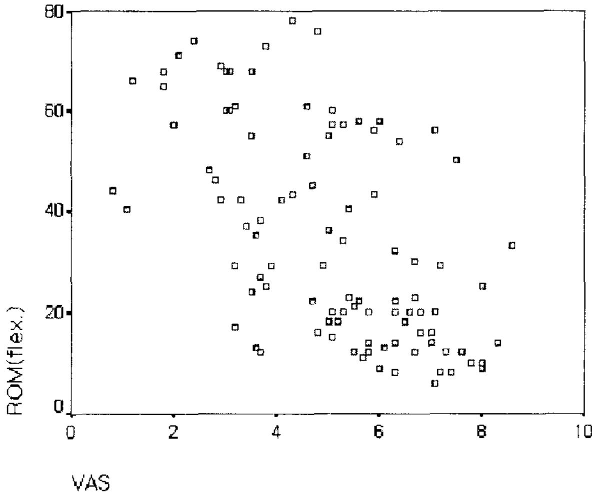

Fig. 2. Scatterplot of ROM(flex.) and VAS(n=102)

Table 3. Coefficient of Correlation of ROM(ext.) and VAS(n=102)

		VAS
	Pearson Correlation	-.465**
ROM(ext.)	Sig.(2-tailed)	.000
	N	102

** Correlation is significant at the 0.01 level(2-tailed).

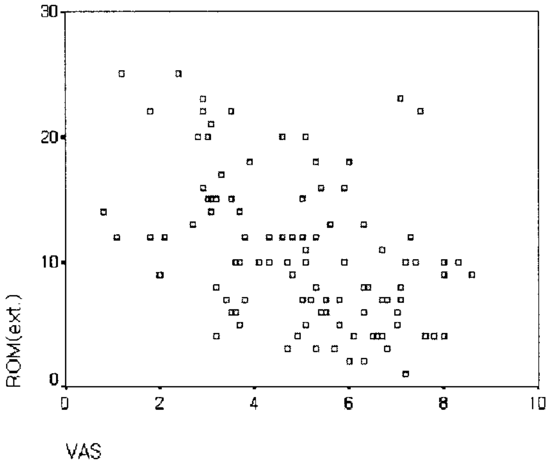

Fig. 3. Scatterplot of ROM(ext.) and VAS(n=102)

Table 4. Coefficient of Correlation of MMST and ROM(flex.)(n=102)

		ROM(flex.)
	Pearson Correlation	.770**
MMST	Sig.(2-tailed)	.000
	N	102

** Correlation is significant at the 0.01 level(2-tailed).

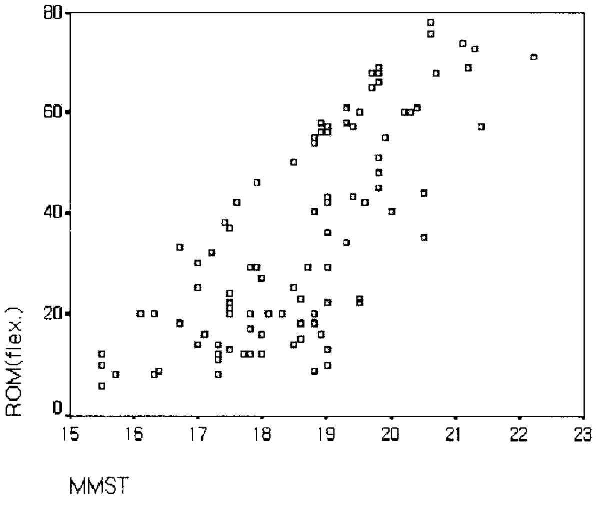

Fig. 4. Scatterplot of MMST and ROM(flex.)(n=102)

Table 5. Coefficient of Correlation of MMST and ROM(ext.)(n=102)

		ROM(ext.)
MMST	Pearson Correlation	.513**
	Sig.(2-tailed)	.000
	N	102

** Correlation is significant at the 0.01 level(2-tailed).

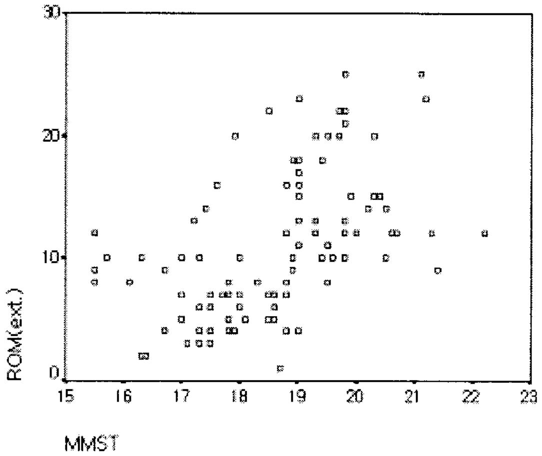

Fig. 5. Scatter plot of MMST and ROM(ext.)(n=102)

IV. Discussion

The purpose of this study was to determine the validity of clinical measurement method of lumbar range of movement obtained with MMST and ROM. Both measurements were compared with VAS and correlations between them were determined.

In this experiment, coefficient of correlation of MMST and VAS showed substantial validity(r = -0.610) which was higher than flexion ROM and VAS(r = -0.599), and extension ROM and VAS(r = -0.465). On the other hand, coefficients of correlations of MMST and flexion ROM(r = 0.770) were higher than that of MMST and extension ROM(r = 0.513). Coefficient of correlation over 0.80 is recognized as 'almost perfect agreement'. Coefficient of correlation of MMST and flexion ROM was nearly 0.80. The experimental data indicate that MMST expressed more similarities to VAS than ROM. Furthermore, the data suggested that flexion ROM expressed closer similarities to MMST than extension ROM.

Validity is a property of measurement that measure what it is intended measure. As validity is the most important property of an instrument, it is the essential issue in the quality of a measurement instrument[14]. There is a need to identify validity as a measurement is used for clinical examination[15].

Because there were no previous studies on the validity between MMST and ROM with VAS, it was impossible to compare the results with previous researches. But however there were few researches regarding correlations between MMST and ROM.

R. Williams et al.[16]compared MMST with double inclinometer for measuring lumbar flexion and extension. Pearson product-moment correlation coefficients for test-retest reliability for the MMST varied from 0.78 to 0.89 for lumbar flexion and from 0.69 to 0.91 for extension. For the double inclinometer method, Pearson correlation coefficients varied from 0.13 to 0.87 for lumbar flexion and from

0.28 to 0.66 for extension. Analysis of variance-derived intra-class correlation coefficients for inter-rater reliability for the MMST were 0.72 and 0.76 for flexion and extension, respectively. For the double inclinometer technique, they were 0.60 for flexion and .48 for extension. Thus, the MMST appeared to be a reliable method for measuring lumbar flexion and extension for patients with low back pain, whereas the double inclinometer technique seemed to need improvement.

However, Tousignant et al.[12] compared ROM measurements of lumbar flexion in LBP patients using the MMST with measurements calculated on X-rays as the gold standard, and compared the measurements taken by two independent examiners. Pearson's r equaled 0.67, which, for the purpose of this review, was regarded as unacceptable levels of agreement. MMST measured 6.3cm(S.D.± 1.4), compared to radiography 52.4°(S.D.±13.2). To clarify, Pearson's product moment correlation coefficient was utilized as a measure of the linear association between two variables that had been measured on interval or ratio scales. In this situation, evaluation of a linear(cm) and an angular measurement(°) using this method was valid and appropriate. Adequate data were not provided within this experiment to enable calculation of 95% limits of agreement. This study was not regarded as high quality, due to lack of positive supporting evidence. The MMST for evaluating lumbar flexion range of movement was not valid in comparison to radiographic analysis[17].

This study was significant since MMST and ROM were compared with VAS, which were outcome measurements for pain and function of musculoskeletal disorders. The reason MMST expressed closer similarity to flexion ROM rather than extension ROM was due to difference in the measurement techniques. Both MMST and flexion ROM were measured when lumbar spine flexed. As ROM has been a routine measurement for LBP, MMST, which has more similarity with VAS than ROM and which has similarity with flexion ROM, might be a useful measurement for LBP.

V. Conclusion

The results were helpful in drawing a conclusion on the use of the MMST as an outcome measurement of LBP. In this experiment, MMST had high validity coefficient with flexion ROM, which was routinely used by clinicians for measuring lumbar range of movement. In addition, MMST also appears to have more similarity with VAS than ROM, both flexion and extension. Therefore, MMST might be a more reasonable choice as a measurement for LBP than measuring ROM. However, further researches will need to be conducted to overcome weakness of this study. It was recommended that future study should include inter- and intra-rater reliability and minimum metrically detectable change(MMDC) studies. Still, the validity suggested a potential that MMST may be a useful alternative for clinicians in measuring patients with LBP.

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