Goniometric Measurements at the Knee

To the Editor:

I read with serious interest the article by Gogia et al, "Reliability and Validity of Goniometric Measurements at the Knee," which appeared in the February 1987 issue of PHYSICAL THERAPY. I commend the authors' efforts to clarify the reliability and validity of goniometric measurements at the knee. Reliability and validity studies of goniometry, basic evaluation procedures, are extremely important. I was concerned after reading the article, however, because the conclusions drawn by the authors, that "1) goniometric measurements obtained by different therapists to assess the position of a patient's knees can be used interchangeably and 2) measurements recorded using the specified technique reflect the actual position of the knee joint," are misleading. I believe, based on my own interpretation of the procedures used, that the conclusions do not reflect accurately the results of the study. I offer my observations to help readers gain a more accurate interpretation of the results than that presented by the authors. Moreover, I encourage the authors to reexamine their results and clarify their conclusions based on their specific findings.

I have difficulty accepting the conclusions of the study because the knee angles measured consisted of different angles within a wide range of motion and the angles were "pooled" for analysis. The authors reported that the joint angles "ranged from 0 to 120 degrees; their average mean and standard deviation were about 59 and 15 degrees, respectively...." Careful examination of these data reveals that the majority of the measurements (about 68%, assuming a normal distribution) ranged from 44 to 74 degrees (±1 s). About 96% of the measurements ranged from 29 to 89 degrees (±2 s). This means that knee-flexion angles less than 29 degrees and greater than 89 degrees either were represented minimally in the results or were not represented. For me, accepting goniometric measurements of knee-flexion angles less than 29 degrees as reliable and valid, based on the results of this study, is particularly difficult given the results of published studies that have reported examining the reliability and validity of measuring knee angles near terminal extension.1,2 The authors acknowledged that Rothstein et al reported poor intertester reliability for knee extension with different patients.1 In a more recent study, Enwemeka compared goniometric knee measurements with radiographic bone angle measurements in healthy adults and found that, within the first 15 degrees of knee flex-
The angle measured by goniometry differed significantly from angles measured by radiography. Enwemeka stated that "within the first 15 degrees of knee flexion, goniometric measurement of joint excursion may be remarkably wrong." The potential for error when measuring near-terminal knee extension apparently stems from knee rotation that changes the relative position of the bony landmarks used in goniometry.

Physical therapists may accept most knee goniometric measurements as clinically valid, and the evidence indicates that most of these measurements are reliable, but controversy remains about the reliability and validity of goniometric measurements near terminal knee extension. Based on the results of the study by Gogia et al, the controversy continues. Because the researchers did not study specifically the reliability and validity of knee measurements near terminal extension and their conclusions could be interpreted to include all knee angles from 0 to 120 degrees, these conclusions need clarification. Furthermore, the authors cannot comment on the reliability of measuring a "patient's" knee because the subjects were apparently healthy adults, not patients. Obtaining reliable measurements for patients with different conditions may be even more difficult than for healthy adults.

The primary dilemma facing readers of this article is deciding what angles measured indeed were reliable. Granted, the correlation coefficients were extremely high, suggesting that all measurements were reliable, but "pooling" the measurements clouds the interpretation of the results, especially when the potential for error when measuring knee angles near terminal extension is considered. The majority of the measurements (68%) were between 44 and 74 degrees. Can readers really accept the reliability coefficients (n = 30) for all goniometric measurements between 0 and 120 degrees, as the authors suggested?

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REFERENCES

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