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Letter to the Editor

Response to 'Inter and intraobserver reliability and critical analysis of the FFP classification of osteoporotic pelvic ring injuries: Methodological issue' (doi:10.1016/j.injury.2019.04.011)

We appreciate the letter to the editor by Naderi and Sabour [1] regarding the use of Cohen's kappa statistic in our original article 'Inter- and intraobserver reliability and critical analysis of the FFP classification of osteoporotic pelvic ring injuries' [2]. Unfortunately, we became aware of this letter only recently. Moreover, we noticed the numerous similar letters to the editor by the authors in response to research published in a variety of medical fields.

We are aware of the ongoing controversy about the most appropriate measures of reliability and agreement [3–5]. In our article, we presented both percentage of agreement and Cohen's kappa coefficients. We acknowledge that Cohen's kappa statistic has limitations, such as its dependence on marginal distribution, number of categories and prevalence, and that weighted kappa statistic may be more appropriate for the purpose of our study. In addition to the unweighted kappa coefficients given in our original article, we therefore now also present the linear weighted kappa (κ) coefficients [6] in Table 1. For overall intra- and interobserver reliability of the FFP classification system, weighted κ values ranged from 0.69 to 0.82 (unweighted κ : 0.68–0.72) and from 0.45 to 0.68 (unweighted κ : 0.42–0.59), respectively. For FFP IIb and IIc injuries, weighted κ values describing intra- and interobserver reliability ranged from 0.38 to 0.71 (unweighted κ : 0.62–0.67) and from 0.13 to 0.51 (unweighted κ : 0.20–0.44), respectively. For FFP IIc, IIIC and IVb injuries, weighted κ values describing intra- and interobserver reliability ranged from 0.35 to 0.76 (unweighted κ : 0.28–0.66) and from 0.17 to 0.64 (unweighted κ : 0.10–0.52), respectively. In addition to agreement between pairs of raters, we also assessed agreement between all four raters using Fleiss' kappa statistic. Fleiss' kappa values for all cases, for FFP IIb and IIc injuries, and for FFP IIc, IIIC and IVb injuries were 0.49 (moderate), 0.30 (fair) and 0.23 (fair), respectively.

Although weighted kappa coefficients slightly differed from unweighted Cohen's kappa coefficients, this did not affect the main findings of our study: Overall interobserver reliability of the FFP classification system was mainly moderate, while intraobserver reliability was mainly substantial. Despite the acceptable overall reliability, classification of FFP subtypes involving a complete nondisplaced or displaced sacral fracture showed markedly lower reliability. The latter was also recently noted by Pieroh et al. [7]. In their multicenter study involving 13 raters and 60 cases, the au-

Table 1

Linear weighted Kappa coefficients of inter- and intraobserver (grey) reliability for all 100 cases/ for FFP IIb and IIc injuries ($n = 61$ cases) and for FFP IIc, IIIC and IVb injuries ($n = 32$ cases). Values of both sessions were used for the assessment of interobserver reliability.

	Pelvic Surgeon	Consultant	Resident	Radiologist
Pelvic Surgeon	0.69/0.38/0.35	0.57/0.16/0.34	0.54/0.13/0.35	0.54/0.26/0.17
Consultant	0.57/0.16/0.34	0.81/0.71/0.76	0.68/0.51/0.64	0.51/0.35/0.22
Resident	0.54/0.13/0.35	0.68/0.51/0.64	0.82/0.69/0.72	0.45/0.26/0.21
Radiologist	0.54/0.26/0.17	0.51/0.35/0.22	0.45/0.26/0.21	0.70/0.47/0.41

thors applied Fleiss' kappa statistics and found that both overall intra- and interobserver reliability of the FFP classification were moderate.

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