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Addressing Ordinal Variables through Integrated IRT and CTT Methods in Cultural Capital Measurement

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In quantitative measurement, Likert scales are often treated as continuous variables, potentially distorting results due to their ordinal nature. This study addresses the issue of appropriately handling ordinal variables by integrating classical test theory (CTT) and item response theory (IRT) to validate a novel Scale of Cultural Capital (SCC). SCC consists of 14 items measuring three dimensions: cultural fruition, cultural technical skills/knowledge, and involvement in groups/associations (Balboni et al., 2019). The SCC was administered online to 923 adults, 51% women, aged 20 to 66 years M(SD) = 41.70(12.44), with an educational level lower/equal (48%) or higher (52%) than a high school degree.

First, the original 5-point response scale was reduced to 4 points due to underrepresented response categories, with contiguous low-frequency categories being merged. Second, exploratory factor analyses were conducted on a random half-group of participants (n = 461), using the weighted least squares method, oblimin rotation, and a polychoric matrix (KMO = .83; Bartlett's test $p < .05$), as suggested for ordinal data. Based on the Parallel Analysis and MAP test, alternative solutions from 5 to 1 factors were explored. The results confirmed the three-factor solution as the most appropriate, consistent with the theoretical model. Third, confirmatory factor analysis conducted in the remaining participants using the DWLS method for ordinal data showed that the three-factor model exhibited an adequate fit (CFI = .961, SRMR = .075, RMSEA = .069) and was better than alternative one- and two-factor models. Cronbach's ordinal alpha (Zumbo et al., 2007) revealed good scale reliability ($\alpha = .84$).

Invariance analyses for gender, age, and education level were conducted on the total group, comparing nested models with progressive constraints (configural, metric, scalar with threshold constraints to ensure equivalent ordinal category boundaries, and comparison of latent means) also using RMSEA_D (Savalei et al., 2023). Scalar invariance was achieved across gender (CFI = .958; RMSEA = .063; SRMR = .074), with women showing higher latent means for cultural fruition (Cohen's d = .31) and cultural technical skills/knowledge (d = .12). Partial scalar invariance across age (CFI = .957; RMSEA = .065; SRMR = .071) was achieved by freeing the thresholds of the foreign language usage item, as younger participants required a lower latent level to select higher response categories. Younger participants showed latent means that were lower for involvement in groups/associations (d = -.24) and cultural fruition (d = -.07), but higher for cultural technical skills/knowledge (d = .42). Freeing the loadings of two items allowed for achieving partial metric invariance and scalar invariance across educational levels (CFI = .923; RMSEA = .072; SRMR = .084). Participants with a higher educational level showed higher latent means on all dimensions of cultural capital. Concerning IRT, the RMSEA value of all items was below .05, indicating an overall good item fit.

Utilizing suitable methodologies for ordinal variables, the present study validated the three-factor structure of the SCC and its stability across gender, age, and level of education.

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