Reliability and Validity of the Home Handedness Questionnaire

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Background and Aims

- Handedness is a frequently used behavioral marker of laterization in neuroscience and psychology, with ~85% of adults being right handed.\(^1\)
- The Edinburgh Handedness Inventory (EHI) is the most widely used adult handedness questionnaire.\(^2\) However, the EHI mixes different manual skill types and has insufficient items to statistically determine handedness.
- **Aims:** Develop a performance-based measure of hand preference to: 1) compare preferences for unimanual and role-differentiated bimanual manipulation (RDBM), 2) sample actions sufficiently to statistically determine handedness, 3) test if our new measure replicates prior adult research, and 4) analyze the validity and reliability of our new measure.

Methods

- **Participants:** FIU undergraduates \(N = 862; 715\) female) recruited via FIU SONA Systems. Data was collected online using Qualtrics.
- **Home Handedness Questionnaire (HHQ):** 30 actions per skill type: unimanual actions using one hand (Figure 1a), and RDBM actions where one hand stabilizes an object for the other hand's manipulation (Figure 1b). Participants performed each action twice and self-reported which hand they used per action.
- **Edinburgh Handedness Inventory (EHI):** Includes 10 activities that mix unimanual and RDBM actions.\(^4\)
- **Handedness Index (HI) for the HHQ:** HI scores were computed for HHQ-unimanual and HHQ-RDBM subscales using \([HI]=(R-L)/(R+L)]\). Hand preference was determined using binomial z-scores where \(z < -1.96 = \text{left preference}, z > 1.96 = \text{right preference},\) and all other z-scores = no preference.
- **Handedness Index (HI) for the EHI:** \([HI]=100x(R-L)/(R+L)]\) was used in conjunction with cut-off scores: \(>0 = \text{right preference}, \text{scores} <0 = \text{left preference}, \text{and} 0 = \text{no preference}\) according to standard practice.
- **Analyses:** One-sample t-tests were performed on HHQ-HI and EHI-HI scores to assess population-level bias for hand use. To test convergent validity, correlations between HI scores for HHQ-unimanual and HHQ-RDBM to EHI scores were conducted. To test internal reliability of the HHQ, a Kuder-Richardson-20 (KR-20) analysis was performed.

Results and Discussion

**One Sample T-Test Results**

- A significant right-hand preference for HHQ-unimanual actions was found, \(t(861) = 43.04, p < .001\).
- There was also a significant right-hand preference for HHQ-RDBM, \(t(861)=36.18, p < .001\).
- A significant right-hand preference on the EHI was found, \(t(861) = 31.56, p < .001\).
- See Figure 2 for a distribution of hand preferences by measure.

**HHQ Validity and Reliability Results**

- Significant positive correlation for HHQ-unimanual and EHI, \(r = .574, p < .001\).
- EHI scores and HHQ-RDBM scores were positively correlated \(r=.500, p<.001\).
- HHQ-unimanual and HHQ-RDBM scores were also correlated \(r=.671, p<.001\).
- High internal reliability was found for the full HHQ \((KR_{20} = .95)\), and within each sub scale (HHQ-unimanual: \(KR_{20} = .91\); HHQ-RDBM: \(KR_{20} = .94\)).

**Figure 1a: Unimanual action 1b: RDBM action**

**Figure 2. Hand preference percentages per measure**

**Take-Home Points:**

✓ The HHQ demonstrated validity with the EHI, high internal reliability and replicated previous findings.
✓ The HHQ distinguishes between unimanual and RDBM actions, while utilizing statistical cut offs for hand preference instead of arbitrary separations used by EHI.
✓ Future directions: Test the utility of the HHQ across different ages to answer developmental questions about hand preferences for different manual skills and their relation to cognition.

References and Acknowledgements

4. Edlin et al., (2015), DOI: 10.1016/j.bandc.2015.01.003

We would like to thank the participants for their time. For more information about our studies visit hands.fiu.edu

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\[\text{Figure 1a: Unimanual action 1b: RDBM action}\]

\[\text{Figure 2. Hand preference percentages per measure}\]