The Digital Clock Drawing Test (dCDT) - IV: Total clock drawing and inter-stroke latencies, or *information revealed between the lines*

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BACKGROUND

Clock drawing test performance can differentiate Alzheimer's disease (AD) from other dementias. Past research suggests that in AD, clock drawing improves from command to copy. Latency (seconds) prior to placing the first clock hand (PFH-L) and total clock drawing time (TCDT) will differentiate AD from amnesic Mild Cognitive Impairment (aMCI) and Healthy Controls (HC).

SUBJECTS AND METHODS

Subjects were consented per IRB approved protocol. AD=18, aMCI (Petersen et al., 1999) =32, and HC=27 were tested. Some AD patients omitted hands on the command (n=4) and copy (n=2) conditions, reducing subject numbers for the PFH-L comparison (PFH-L command n=14, copy=16). No HC or aMCI subjects omitted hands.

Subjects were administered the MMSE and the dCDT. All aMCI subjects obtained MMSE scores of $\leq$ 24. MMSE scores for all groups differed ($p < .001$) in the expected direction (HC x=29$\pm$1.2; AD x=21.9$\pm$5.2). HCs were significantly younger than other groups ($p < .001$). AD patients were marginally less educated ($p < .025$) than HCs and aMCI (AD x=12.8$\pm$1.6; HC x=15.6$\pm$2.8; aMCI x=14.8$\pm$2.5).

Subjects were instructed to draw a clock, put in the numbers and set the time for 10 after 11. The copy condition immediately followed the command condition. Repetition of instructions was allowed only if explicitly requested by the subject and no examiner cuing was permitted.

Figure 1. Command Pre First Hand Latency differntiates aMCI from AD (p<.02)

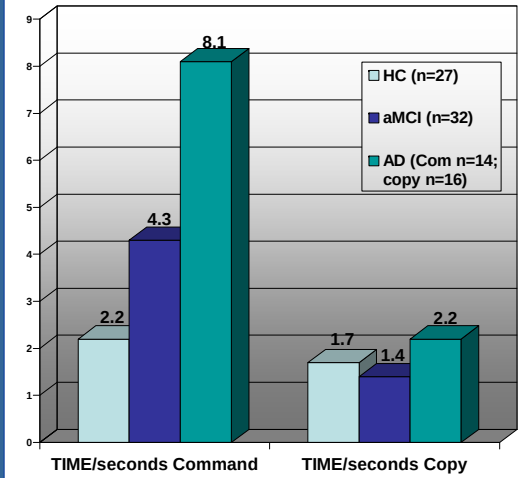
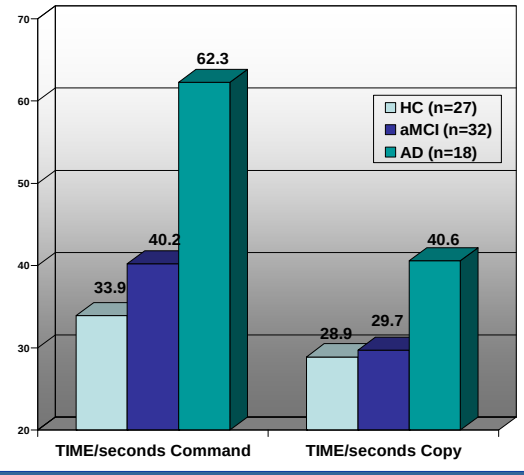


Figure 2. Total dCDT time differentiates aMCI from AD p<.02



RESULTS

Between-group command PFH-L was longer in AD (8.06$\pm$7.54) vs. HC (2.15$\pm$1.76, $p < .001$) and AD vs. aMCI (4.27$\pm$4.27, $p < .025$). Between-group copy PFH-Ls did not differ. PFH-L improvement from command to copy analyses found no difference for HC. PFH-L latencies shorten in both aMCI ($p < .001$) and AD ($p < .025$). Between-group command TCDT was longer for AD (62.29$\pm$37.35) vs. HC (33.94$\pm$15.65; $p < .001$) and aMCI (40.19$\pm$20.17, $p < .009$). Between-group copy TCDT was also longer for AD (40.59$\pm$22.27) vs. HC (28.99$\pm$10.93, $p < .023$ and between AD vs. aMCI (29.70$\pm$10.08, $p < .028$). TCDT improvement from command to copy analyses continued to find shorter latencies only for aMCI ($p < .001$) and AD ($p < .008$) groups.

CONCLUSIONS

Clock drawing TCDT and PFH-L have previously been unobtainable. These measures of response time differentiate between-groups. Consistent with prior research, AD patients improve from command to copy. This finding is now extended to patients with aMCI.

The cognitive correlates of clock drawing latencies will be the subject of further research with emphasis on developing early diagnostic markers based on *information revealed between the lines*.

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