The RevArte Visual Search Task: a Pilot Study

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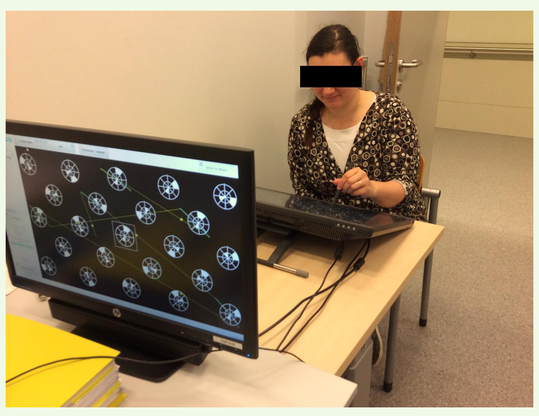
Objective

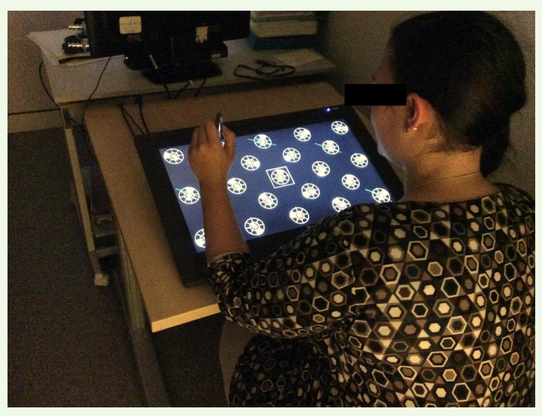
- A computerized visual scanning test, the RevArte Visual Search Task (RVST) was developed, intended to assess subjects' visual attention abilities and their visuo-motor exploration of peri-personal space
- Our main objective was to further improve the analysis of visual search performance as well as to enhance sensitivity for visual attentional disturbances, by including new indices compared to standard paper-and-pencil tests

Method

- Across several trials, participants are instructed to search for the presence of some predefined target pattern in a visual array surrounded by many distracter-stimuli. Reaction times and spatial co-ordinates of the touched patterns are registered, enabling the calculation of various accuracy and temporal measures (see below)

- Test design:
- 3 practice trials, followed by 14 test trials
- Test trials are divided into 10 '*real*' trials and 4 '*fake*' trials. Fake trials are excluded from further analyses
- Test trials show 23 stimuli in a symmetrical fashion. 'Real' trials contain 6 targets, equally distributed over the left and right half of the display. 'Fake' trials contain more or less than 6 targets





Participants

A pilot study was performed in brain-damaged and control subjects:

- Patients with right hemisphere lesions with neglect (R-USN+) (n=12)
- Patients with right hemisphere lesions without neglect (R-USN-) (n=11)
- Patients with left brain damage without neglect (L-USN) (n=17)
- Patients with mild traumatic brain injury (MTBI) (n=26)
- Age-matched control subjects (n=19)

Measures

Following spatio-temporal measures were recorded on every trial:

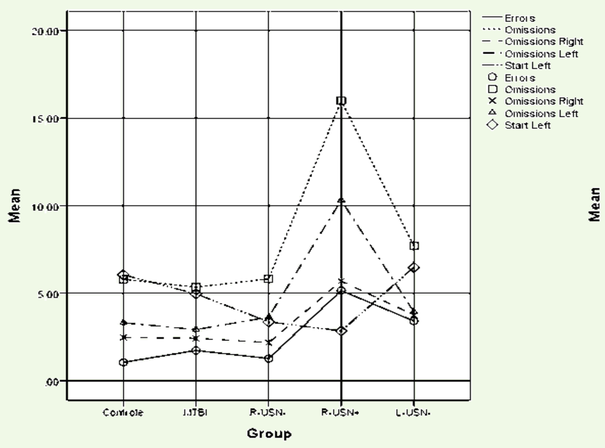
- Number of target omissions (Total/Left/Right)
- Number of errors
- Number of search starts on left half of the display
- Time to detect first target (T1)
- Mean latency time (Total/Left/Right)
- Q-score: $\frac{\text{Number of touched correct targets}}{\text{Total number of targets}} \times \frac{\text{Number of touched correct targets}}{\text{Time until completion}}$

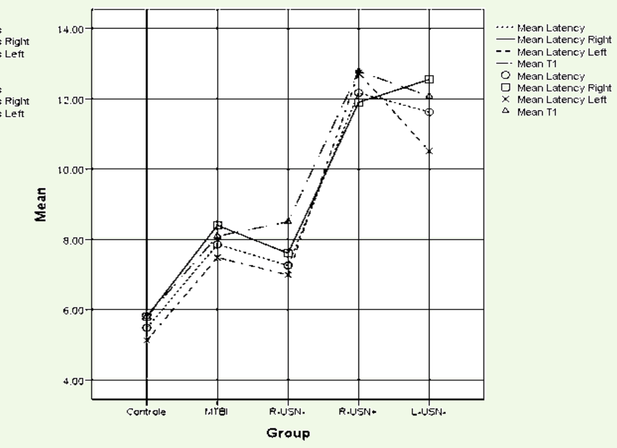
Conclusion Preliminary data reveal that the RVST allows to differentiate between healthy controls and some patient groups. Also, exploratory analyses suggest that the task shows promise of being sensitive to detect even subtle forms of visual attention difficulties, though some presumptions in this regard could not yet be confirmed on a statistically significant level. In general, the RVST is capable of measuring multiple aspects of visual search ability, worthy of further research in the future.

Results

Contrasts below reached statistical significance:

- Total number of target omissions: R-USN+ > control, MTBI and R-USN-
- Number of left target omissions: R-USN+ > all other subgroups
- Number of errors: R-USN+ > control, MTBI
- Overall latency: R-USN+ and L-USN- > all other subgroups
- Time to detect first target: R-USN+ and L-USN- > all other subgroups
- Latency right targets: L-USN- > control, MTBI and R-USN-
- Q-score: R-USN+ and L-USN- < all other subgroups
- Starts left half of display: R-USN+ and R-USN- < controls, L-USN-





- R-USN+ and R-USN- : omissions left > omissions right
- L-USN-: latency right hemifield > latency left hemifield
- MTBI: Spearman correlation (test duration, target omissions) > 0

Discussion

Valuable aid in diagnosing the cognitive sequelae of MTBI?

- Although MTBI patients showed a similar outcome accuracy as healthy controls, they did appear to perform slower, suggesting a speed-accuracy trade-off in this group only
- The quality of MTBI subjects' visual scanning performance seemed to be restricted on the same level as patients with objectively confirmed structural brain damage
- Only in the MTBI group we found a significant positive correlation between test duration and target omissions (possibly reflecting their subjective complaints of mental fatigue?)

- **The RVST's temporal measures and Q-score show promise of being able to uncover the subtle functional impairments in MTBI patients**

However…

- Most findings concerning MTBI subjects mentioned above could not yet be retained on a statistically significant level. Although a number of test parameters was able to distinguish the L-USN- and R-USN+ patients from the other subpopulations, no significant differences were noted between R-USN-, MTBI and the controls on any of the variables

- **Low statistical power due to small sample sizes may have limited the statistical significance of the comparisons**

Promising results

- Neglect patients scored significantly impaired on various RVST measures
- Subjects who displayed normal scores on conventional paper-and-pencil assessments did in fact demonstrate some mild lateralized attentional disturbances on the RVST
- Only in L-USN- participants, a significant increase in intercancellation times was found as they moved towards the contralesional side of visual space
- R-USN- subjects on the other hand, had a strong tendency to originate their search process on the right-hand side of the screen, compared to L-USN- patients and controls. A lateralization bias in target omissions was also clearly present in these patients (left > right)

- **The RVST appears to be a sensitive measure for detecting the presence of neglect. Above, it seems to be capable of revealing subtle manifestations of hemispatial inattention, not evidenced by conventional paper-and-pencil tasks**

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