



Task-related modulation of visual neglect in cancellation tasks

Margarita Sarri^{a,*}, Richard Greenwood^b, Lalit Kalra^c, Jon Driver^a

^a UCL Institute of Cognitive Neuroscience, University College London, 17 Queen Square, London WC1N 3AR, UK

^b Regional Neurological Rehabilitation Unit, Homerton University Hospital, London, UK

^c Department of Diabetes, Endocrinology and Internal Medicine, Guy's, King's and St. Thomas' School of Medicine, Denmark Hill Campus, London, UK

ARTICLE INFO

Article history:

Received 2 April 2008

Received in revised form 22 July 2008

Accepted 14 August 2008

Available online 26 August 2008

Keywords:

Visual neglect

Cancellation

Spatial attention

Top-down

Stroke

Spatial exploration

ABSTRACT

Unilateral neglect involves deficits of spatial exploration and awareness that do not always affect a fixed portion of extrapersonal space, but may vary with current stimulation and possibly with task demands. Here, we assessed any 'top-down', task-related influences on visual neglect, with novel experimental variants of the cancellation test. Many different versions of the cancellation test are used clinically, and can differ in the extent of neglect revealed, though the exact factors determining this are not fully understood. Few cancellation studies have isolated the influence of top-down factors, as typically the stimuli are changed also when comparing different tests. Within each of three cancellation studies here, we manipulated task factors, while keeping visual displays identical across conditions to equate purely bottom-up factors. Our results show that top-down task demands can significantly modulate neglect as revealed by cancellation on the same displays. Varying the target/non-target discrimination required for identical displays has a significant impact. Varying the judgement required can also have an impact on neglect even when all items are targets, so that non-targets no longer need filtering out. Requiring local versus global aspects of shape to be judged for the same displays also has a substantial impact, but the nature of discrimination required by the task still matters even when local/global level is held constant (e.g. for different colour discriminations on the same stimuli). Finally, an exploratory analysis of lesions among our neglect patients suggested that top-down task-related influences on neglect, as revealed by the new cancellation experiments here, might potentially depend on right superior temporal gyrus surviving the lesion.

© 2008 Elsevier Ltd. All rights reserved.

1. Introduction

Cancellation tests have long been used in neuropsychological assessment, as a bedside measure of spatial exploration and awareness, and as a simple diagnostic measure for unilateral spatial neglect (e.g. Albert, 1973; Gauthier, Dehaut, & Joanette, 1989; Halligan, Wilson, & Cockburn, 1990; Weintraub & Mesulam, 1985). Cancellation is often administered as a paper-and-pencil test, assessing ability to search visually for targets and mark with a pen all such target items within the array, under free vision. In most clinical cancellation tasks, patients typically have to locate and manually 'cancel' (i.e. mark) multiple targets in a display, with performance assessed primarily in terms of omissions, i.e. missed targets. Patients presenting with unilateral spatial neglect, most commonly after right-hemisphere lesions, typically perform poorly in these tasks, omitting to cancel targets on the contralesional (usually left) side of the page (Albert, 1973). Moreover, unlike

healthy controls who often start from the top left, patients with left neglect often start from the top right of the cancellation page (Chatterjee, Menneer, & Heilman, 1992; Gauthier et al., 1989; Mark & Heilman, 1997).

Cancellation tests are widely used in clinical practice, and are increasingly regarded as the most sensitive paper-and-pencil measure for assessment of spatial neglect, in terms of relation to real-life deficits (Azouvi et al., 2002; Ferber & Karnath, 2001). Azouvi et al. (2002) tested 206 subacute right-hemisphere stroke patients and concluded that, among several paper-and-pencil tests, omissions in the Bells cancellation test (Fig. 1C) was the most sensitive screening measure. Ferber and Karnath (2001) compared line bisection and cancellation, and reported that whereas line bisection missed 40% of the putative neglect cases identified by clinical observation in daily routines cancellation tests missed only 6%.

Despite their wide use, striking differences in sensitivity may also exist between different versions of the cancellation tests (e.g. see Fig. 1 for an illustration of dramatically different outcomes with the same patient on three different versions of the cancellation task), for reasons that have not yet been fully characterised. The simplest version of cancellation introduced by Albert (1973)

* Corresponding author. Tel.: +44 2076791123; fax: +44 2079168517.
E-mail address: m.sarri@ucl.ac.uk (M. Sarri).

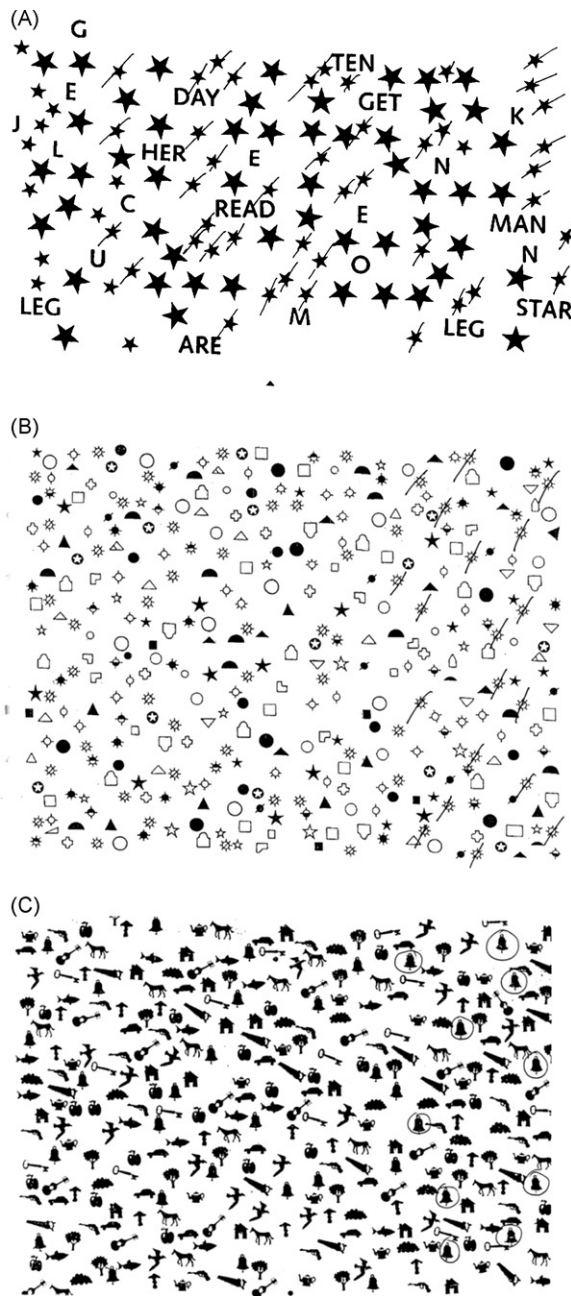


Fig. 1. Example of performance of one neglect patient (case N13) in three different cancellation tests that are commonly used in clinical practice, demonstrating a clear difference in test sensitivity, with a remarkable increase of omissions in tests (B) (Weintraub and Mesulam's shape cancellation test, 1985) and (C) (The Bells test; Gauthier et al., 1989), as compared to (A) (Star Cancellation test; Halligan et al., 1990).

comprising short lines randomly placed on a sheet of paper, all of which should be cancelled, has been reported as relatively insensitive (in detecting mild/moderate neglect), compared to more complex versions of the cancellation test such as the Star (Halligan et al., 1990), Bells (Gauthier et al., 1989), Mesulam (Weintraub & Mesulam, 1985) and others; see Fig. 1. The Star, Bells and Mesulam versions notably comprise target items embedded among many distractors that are similar in visual appearance (see also Ferber & Karnath, 2001; Vanier et al., 1990).

The different extent of omissions in different versions of the cancellation test illustrates that neglect does not invariably affect just

a fixed portion of space, but may vary with the current situation due to stimulus and/or task-related factors. But the exact determining factors remain incompletely understood for cancellation measures. Each version of the cancellation test in common clinical use typically differs in numerous respects from others, rather than just in one factor. Although there has been some recent growth in more experimental studies, examining which particular factors might affect cancellation performance by neglect patients (e.g. see Aglioti, Smania, Barbieri, & Corbetta, 1997; Bottini & Tordolo, 2003; Chatterjee et al., 1992; Gauthier et al., 1989; Husain & Kennard, 1997; Kaplan et al., 1991; Manly, Woldt, Watson, & Warburton, 2002; Mark, Kooistra, & Heilman, 1988; Mennemeier, Rapcsak, Dillon, & Vezev, 1998; Parton et al., 2006; Rapcsak, Verfaellie, Fleet, & Heilman, 1989; Robertson & North, 1993), typically most of these studies have altered some aspect of the bottom-up stimulus display, rather than just top-down task requirements, across different conditions; or may have unwittingly involved some subtle stimulus change when varying the task (see below). Hence, the issue of whether purely task-related factors can impact on cancellation performance by neglect patients remains largely unresolved, as explained further in our brief summary of the literature here.

Numerous studies investigated potential display/stimulus factors in relation to cancellation tests. Several reported that presence of distractors can induce more neglect in cancellation (e.g. Gauthier et al., 1989; Husain & Kennard, 1997; Rapcsak et al., 1989) and also that more neglect may be revealed when the similarity between targets and non-targets increases (e.g. Rapcsak et al., 1989; see also Duncan & Humphreys, 1989, for effects on normal search performance). Target saliency has also been considered important. Using a texture-segmentation paradigm, with single-feature or feature-conjunction cancellation tasks, Aglioti et al. (1997) reported that neglect patients made disproportionately more omission errors in a demanding conjunction task than an easier feature task, as compared to healthy controls, left-hemisphere patients and right-hemisphere patients without neglect. This was taken to suggest that performance of neglect patients may be particularly impaired when serial search is required, as induced by increased target-distractor similarity (see also Mennemeier, Morris, & Heilman, 2004). Further stimulus-related factors known to affect neglect performance in cancellation include: the absolute number of targets (Chatterjee et al., 1992; Mennemeier et al., 1998); the ratio of targets and distractors (Kaplan et al., 1991); the similarity between different kinds of distractors (Riddoch & Humphreys, 1987) and the spatial structure of the display (Weintraub and Mesulam, 1988).

We note that in all the studies considered above, the experimental manipulations involved changes in the displays between different conditions. Adding distractors, making targets and non-targets more physically similar, or decreasing target saliency, for example, changes not only the task-related discrimination requirement between conditions, but also the actual displays themselves, thus making it unclear whether the observed effects in these studies reflect the changed display appearance, the changed task requirements, or both. Task effects per se, in the absence of any stimulus change whatsoever, were not isolated in these studies.

Some studies, albeit fewer, have explicitly sought to investigate effects of task manipulation on cancellation by neglect patients, producing several interesting results. But even these can be hard to interpret as pure task effects, when the visual displays also differ between the tasks used. For instance, Mark et al. (1988) and Parton et al. (2006) found that having neglect patients erase rather than cross-out targets can lead to improvements in performance. This has been attributed to erasure of ipsilesional targets making it easier for patients to "disengage" their attention (Posner, Walker, Friedrich, & Rafal, 1984) from those ipsilesional items that might otherwise have captured their attention. But note that the

Download English Version:

<https://daneshyari.com/en/article/945203>

Download Persian Version:

<https://daneshyari.com/article/945203>

[Daneshyari.com](https://daneshyari.com)