Neural responses to natural visual motion are spatially selective across the visual field, with selectivity differing across brain areas and task

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Manuscript Source: https://www.biorxiv.org/content/10.1101/2021.03.05.434148v1
Manuscript Authors: Jason J Ki, Jacek P Dmochowski, Jonathan Touryan & Lucas C Parra

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Research Paper Sections:

The sections of the research paper input text parsed in this audit.

Section No.	Headings	Sentences
Section: 1	Abstract	10
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N/A	--- --- --- --- --- --- ---	0
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Title **Neural responses to natural visual motion are spatially selective across the visual field, with selectivity differing across brain areas and task**

S1 [001] Abstract

S1 [002]   It is well established that neural responses to visual stimuli are enhanced at select locations in the visual field.

> It is well established ...
> ... that neural responses ...
> ... to visual stimuli are enhanced ...
> ... at select locations ...
> ... in the visual field.

S1 [003]   While spatial selectivity and the effects of spatial attention are well-understood for discrete tasks (e.g., visual cueing paradigms), little is known about neural response during a naturalistic visual experience that involves complex dynamic visual stimuli, for instance, driving.

> While spatial selectivity ...
> ... and the effects ...
> ... of spatial attention are well-understood ...
> ... for discrete tasks ...
> ... (e.g., visual cueing paradigms), ...
> ... little is known ...
> ... about neural response ...
> ... during a naturalistic visual experience ...
> ... that involves complex dynamic visual stimuli, ...
> ... for instance, ...
> ... driving.

S1 [004]   In this study, we assess the strength of neural responses across the visual space during a kart race video game.

> In this study, ...
> ... we assess the strength ...
> ... of neural responses ...
> ... across the visual space ...
> ... during a kart race video game.

S1 [005]   Specifically, we measure the correlation strength of scalp evoked potentials with optical flow magnitude at individual locations on the screen.

> Specifically, ...
> ... we measure the correlation strength ...
> ... of scalp evoked potentials ...
> ... with optical flow magnitude ...
> ... at individual locations ...

... on the screen.

S1 [006]   We find the strongest neural responses for task-relevant locations in visual space, selectively extending to areas beyond the focus of overt attention: while the driver's gaze is directed upon the heading direction at the center of the screen, we observe robust neural evoked responses also to peripheral areas such as the road and surrounding buildings.

> We find the strongest neural responses ...
>
> ... for task-relevant locations ...
>
> ... in visual space, ...
>
> ... selectively extending ...
>
> ... to areas ...
>
> ... beyond the focus ...
>
> ... of overt attention: ...
>
> ... while the driver's gaze is directed ...
>
> ... upon the heading direction ...
>
> ... at the center ...
>
> ... of the screen, ...
>
> ... we observe robust neural evoked responses also ...
>
> ... to peripheral areas ...
>
> ... such as the road ...
>
> ... and surrounding buildings.

S1 [007]   Importantly, this spatial selectivity of neural responses differs across scalp locations.

> Importantly, ...
>
> ... this spatial selectivity ...
>
> ... of neural responses differs ...
>
> ... across scalp locations.

S1 [008]   Moreover, during active gameplay, the strength of the spatially-selective neural responses are enhanced compared to passive viewing.

> Moreover, ...
>
> ... during active gameplay, ...
>
> ... the strength ...
>
> ... of the spatially-selective neural responses are enhanced compared ...
>
> ... to passive viewing.

S1 [009]   Spatially selective neural gains have previously been interpreted as an attentional gain mechanism.

> Spatially selective neural gains have previously been interpreted ...
>
> ... as an attentional gain mechanism.

S1 [010]   In this view, the present data suggest that different brain areas focus attention on different task-relevant portions of the visual field, reaching beyond the focus of overt attention.

> In this view, ...
>
> ... the present data suggest ...
>
> ... that different brain areas focus attention ...
>
> ... on different task-relevant portions ...
>
> ... of the visual field, ...
>
> ... reaching ...

... beyond the focus ...

... of overt attention.

S2 [011] Introduction

S2 [012] Traditional studies of visual perception employ tightly controlled experimental paradigms.

Traditional studies ...

... of visual perception employ tightly controlled experimental paradigms.

S2 [013] For instance, classic behavioral studies on visual attention present discrete stimuli and attention cues at select areas in the visual field and measure accuracy or response times as a function of location and cues (Posner, 1980).

For instance, ...

... classic behavioral studies ...

... on visual attention present discrete stimuli ...

... and attention cues ...

... at select areas ...

... in the visual field ...

... and measure accuracy ...

... or response times ...

... as a function ...

... of location ...

... and cues ...

... (Posner, 1980).

S2 [014] These studies have established a clear difference between overt attention, defined as the location of observable gaze position, and covert attention, which manifests as a performance gain when subjects are given a cue directing their attention to a location different from their gaze position (Moran and Desimone, 1985; Spitzer et al., 1988).

These studies have established a clear difference ...

... between overt attention, ...

... defined ...

... as the location ...

... of observable gaze position, ...

... and covert attention, ...

... which manifests ...

... as a performance gain ...

... when subjects are given a cue directing their attention ...

... to a location different ...

... from their gaze position ...

... (Moran ...

... and Desimone, 1985; ...

... Spitzer et al., 1988).

S2 [015]   Studies on the effects of covert attention on neural response often present discrete stimuli at specific locations in the visual field and evaluate the effect of attentional cues on neural activity (McAdams and Maunsell, 1999; Motter, 1993).

> Studies ...
>
> ... on the effects ...
>
> ... of covert attention ...
>
> ... on neural response often present discrete stimuli ...
>
> ... at specific locations ...
>
> ... in the visual field ...
>
> ... and evaluate the effect ...
>
> ... of attentional cues ...
>
> ... on neural activity ...
>
> ... (McAdams ...
>
> ... and Maunsell, 1999; ...
>
> ... Motter, 1993).

S2 [016]   Using intracranial recordings, animal and human studies have established that neuronal firing to visual stimuli is selectively enhanced for attended locations in the visual field (Luck et al., 1997; Moore, 1999; Self et al., 2016).

> Using intracranial recordings, ...
>
> ... animal ...
>
> ... and human studies have established ...
>
> ... that neuronal firing ...
>
> ... to visual stimuli is selectively enhanced ...
>
> ... for attended locations ...
>
> ... in the visual field ...
>
> ... (Luck et al., 1997; ...
>
> ... Moore, 1999; ...
>
> ... Self et al., 2016).

S2 [017]   Similarly, location-dependent neuronal gains have been found for attended locations with scalp recordings in humans.

> Similarly, ...
>
> ... location-dependent neuronal gains have been found ...
>
> ... for attended locations ...
>
> ... with scalp recordings ...
>
> ... in humans.

S2 [018]   For instance, discrete visual stimuli produce robust contralateral responses when covertly attending to a selected visual hemisphere (Hillyard and Anllo-Vento, 1998; Luck et al., 1990; Mangun, 1995).

> For instance, ...
>
> ... discrete visual stimuli produce robust contralateral responses ...
>
> ... when covertly attending ...
>
> ... to a selected visual hemisphere ...
>
> ... (Hillyard ...
>
> ... and Anllo-Vento, 1998; ...
>
> ... Luck et al., 1990; ...
>
> ... Mangun, 1995).

End of Sample Audit