



ORIGINAL ARTICLE

Effect of age and pop out distracter on attended field of view



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KEYWORDS

Attention;
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Abstract

Purpose: To investigate the functional field of view (FFOV) of younger and older individuals using the attended field of view (AFOV), a method which allows for eye and head movement. The impact of a pop out distracter and a dual task on the FFOV measure was also investigated. **Methods:** Nine young adult (25 ± 6 years) and 9 older participants (72 ± 4 years) took part in the experiment. The AFOV test involved the binocular detection and localization of a white target (Landolt-C) in a field of 24 white rings (distracters). The further AFOV tests were modified to include the presence of a pop out distracter, a dual task condition, and a combination of the two.

Results: Older observers had lower viewing efficiency ($\log [1/\text{presentation time}]$) in all conditions (pooled mean across conditions: older: 0.05 ± 0.02 ; younger: 0.48 ± 0.04) than the younger group. The addition of dual or a pop out distracter did not affect the older group (mean difference $\sim 104 \pm 150$ ms and $\sim 124 \pm 122$ ms respectively) but the additional pop out distracter reduced the efficiency of the younger group for targets near fixation (mean difference $\sim 68 \pm 35$ ms).

Conclusion: Better viewing efficiency was observed in younger individuals compared to older individuals. Difficulty in disregarding irrelevant stimuli and thereby resorting to inefficient search strategy is proposed as the reason for the differences. The finding that both older and younger individuals are not affected significantly by the presence of the irrelevant pop out distracter has implications in situations such as driving or hazard avoidance. In such scenarios, search performance is likely not impaired beyond what is found with distracters (visual clutter) in the environment.

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PALABRAS CLAVE

Atención;
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 Edad;
 Campo visual
 funcional;
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 sobresalientes

Efecto de la edad y distracciones repentinas sobre el campo visual esperado**Resumen**

Objetivo: Investigar el campo visual funcional en pacientes jóvenes y mayores, utilizando el campo visual esperado: un método que permite el movimiento de los ojos y de la cabeza. También se investigó el impacto de una distracción repentina y de una doble tarea sobre la medición del campo visual funcional.

Métodos: Se incluyó en el experimento a nueve jóvenes (25 ± 6 años) y 9 mayores (72 ± 4 años). La prueba del campo visual esperado incluyó la detección y localización binocular de un objetivo blanco (C de Landolt) en un campo de veinticuatro anillos blancos (distracciones). Se modificaron posteriormente las pruebas del campo visual esperado para incluir la presencia de una distracción repentina, una situación de doble tarea, y una combinación de las dos pruebas.

Resultados: Los observadores de más edad reflejaron una menor eficiencia visual ($\log [1/\text{tiempo de presentación}]$) en todas las situaciones, (media conjunta de todas las situaciones: Mayores: $0,05 \pm 0,02$; Jóvenes: $0,48 \pm 0,04$) que el grupo de menor edad. La adición de una tarea dual o una distracción repentina no afectó al grupo de mayor edad (diferencia media $\sim 104 \text{ mseg} \pm 150 \text{ mseg}$ y $\sim 124 \text{ mseg} \pm 122 \text{ mseg}$ respectivamente), aunque el distractor sobresaliente adicional redujo la eficacia del grupo más joven para los objetivos cercanos a la fijación (diferencia media $\sim 68 \text{ mseg} \pm 35 \text{ mseg}$).

Conclusión: Se observó una mejor eficiencia visual en los pacientes más jóvenes, en comparación a los mayores. La dificultad de ignorar los estímulos irrelevantes, y por tanto, de recurrir a una estrategia de búsqueda ineficaz, se propone como motivo de las diferencias. El hallazgo de que tanto los pacientes jóvenes como los mayores no se ven afectados en demasía por la presencia de una distracción repentina irrelevante tiene implicaciones para situaciones tales como la conducción o evitar peligros. En tales escenarios, no es probable que dicho desempeño de búsqueda se vea afectado más allá de los hallazgos obtenidos con las distracciones (desorden visual) en el entorno.

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Attention influences performance in driving. Driver inattention (due to fatigue, drowsiness, etc.) and distraction can result in automobile crashes.¹ Distraction can be due to a variety of causes such as an activity outside the vehicle, a person in the car, or devices such as cell phones, radios or other gadgets. It results in delayed recognition of necessary information, and shifts attention from the primary task of driving.^{1,2} The effect of distraction can also be observed in other situations requiring hazard avoidance such as walking.³ Older individuals have been shown to be more detrimentally influenced by distraction while walking than younger adults.^{4,5} It has been suggested that distraction effects are due to a filtering problem where the individual finds it difficult to inhibit the processing of less important stimuli, resulting in a greater processing load.^{6,7} The inhibitory mechanism which suppresses the processing of distracting information is affected by increasing age, resulting in overall longer processing times with age.^{6,7} Kramer et al.,⁸ however, found that the onset of a task irrelevant distracter in the search display affected the visual search times of both younger and older individuals almost equally. Understanding how performance varies in attention demanding situations such as in presence of multiple distracters/clutter and also during abrupt onset of targets is important because of its relevance to dynamic tasks such as walking and driving.

One of the methods to study performance in an attention demanding situation is the functional field of view. The functional field of view (FFOV) is defined by Mackworth⁹ as

“the area around the fixation point from which information is briefly stored and read aloud during a visual task” (p. 67). Ball and associates^{10,11} describe the FFOV as the total visual field area from which information can be extracted without eye and head movements in situations of dual tasking and/or visual clutter and refer to it as the “Useful field Of View” (UFOV®). Many research groups have used the UFOV® or similar tests, wherein a target has to be localized, with or without distracters.¹¹⁻¹³ The presentation time is brief so that responses must be made in the absence of eye movements. Coeckelbergh and associates^{14,15} used a paradigm to measure FFOV that allows the use of eye and head movements. They call this the Attended Field Of View (AFOV). The rationale for creating the AFOV test was that, in real life, people seldom perform visual search without moving their head and/or eyes.

The UFOV®^{16,17} and similar FFOV tasks¹⁸ can include a dual task condition with or without the distracters mentioned above. In the dual task condition, participants are required to count or make judgments about central targets, while simultaneously detecting the location of a target in their peripheral visual field. In our study, an AFOV test was used to measure the functional field of view and the effect of eccentricity. We also introduced an additional irrelevant distracter in the AFOV test. The additional distracter was dissimilar in one feature, namely color, from all the other distracters. Our hypothesis was that the irrelevant pop out distracter would attract more attention than the target, making target

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