



HAL
open science

Framing the area for avoiding visual interference and optimizing visual search in adolescents and adults

Sabrina Bouhassoun, Christian Gerlach, Grégoire Borst, Nicolas Poirel

► To cite this version:

Sabrina Bouhassoun, Christian Gerlach, Grégoire Borst, Nicolas Poirel. Framing the area for avoiding visual interference and optimizing visual search in adolescents and adults. FLUX, Sep 2022, Paris, France. . hal-04043209

HAL Id: hal-04043209

<https://cnrs.hal.science/hal-04043209>

Submitted on 23 Mar 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

FRAMING THE AREA FOR AVOIDING VISUAL INTERFERENCE AND OPTIMIZING VISUAL SEARCH IN ADOLESCENTS AND ADULTS

Sabrina Bouhassoun^{a,b,✉}, Christian Gerlach^c, Grégoire Borst^{a,d}, Nicolas Poirel^{a,b,d}



Université Paris Cité



BACKGROUND

Visual distractions as a key factor during visual search

Because of our limited attentional capacity (Desimone & Duncan, 1995), searching for relevant information frequently induces attentional competition between relevant and distracting information.

Handling with visual distractors plays a key role during effective visual search and depends, at least in part, on the target and distractors attributes (e.g., Duncan & Humphreys, 1989).

Ignoring visual distractors is critical to ensure optimal working memory performance through lifespan (e.g., Zanto & Gazzaley, 2009).

The use of compound stimuli has proven helpful in teasing apart the effects of global and local properties of visual stimuli on both object recognition (Gerlach & Poirel, 2018) and visual search tasks (Kimchi et al., 2005).

Searching for details in our visual environment frequently requires cognitive resources (Poirel et al., 2014; see also Navon, 2003; Poirel et al., 2008).

During visual search task, participants require more time to identify a target at the local level as the number of distractors increases (e.g., Krakowski et al., 2015).

AIMS OF THE STUDY

We investigated the developmental impact of a frame that delimits a portion of a screen during visual search, and how the frame can prevent the processing of irrelevant stimuli located outside of it during a demanding detail-local oriented attentional task

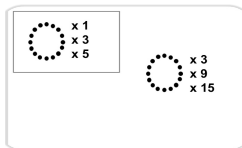
METHODS

Target :



Local-oriented trial

Inside-frame and outside-frame distractor conditions



Sample

- Adolescents: n=41 (M = 12.4 years, SD = 0.6) with normal or corrected-to-normal visual acuity.

- Frame group : n=21 (M= 12.6 years, SD = 0.5)

- No-frame group : n=20 (M= 12.3 years, SD = 0.7)

- Adults:

- Frame group : n=46 (M = 22.5 years, SD = 5.0) with normal or corrected-to-normal visual acuity.

Stimuli All the stimuli were hierarchical Navon-like figures (Navon, 1977). Target stimuli contained a square at the target level (local or global level) and circles at the irrelevant level

Frame group procedure The frame appeared at one of five possible positions on the screen (upper right, upper left, lower right, lower left, or center)

- Target-present trials (50%) : The target was located inside a gray frame with one or more inside and outside distractors.

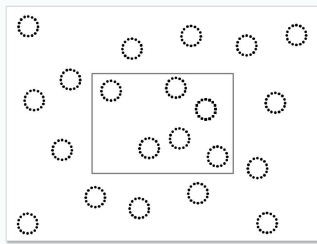
- Target-absent trials (50%) : Trials were matched with each target-present trial by replacing the target stimulus with a non-target.

No-frame group procedure: The exact same items were used, except that the frame was absent.

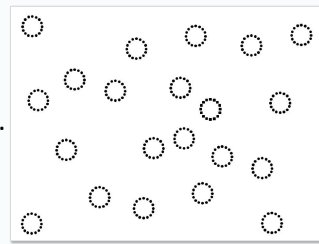
ADOLESCENTS :

There was a **significant target level x group x number of outside-frame distractor interaction effect** ($p < .001$, $\eta_p^2 = .64$).

Frame group:



No-frame group:



The RTs **were not affected by the increasing of outside-frame distractors** during the local visual search task.

The RTs **were affected by the increasing number of distractors** during local target processing (all $ps < .001$).

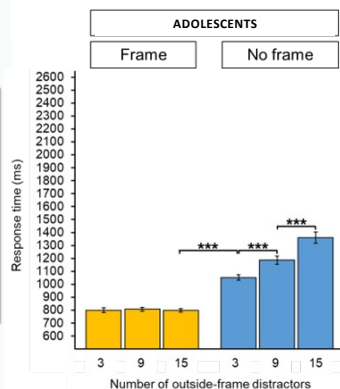
ADULTS :

There was **no main effect of the number of outside-frame distractors** ($p = .246$) and **no significant target level x number of outside-frame distractors interaction x trials interaction** ($p = .351$), reflecting the lack of influence of the outside-frame distractors on RTs when searching for a target (present or absent-target) at both the global and local levels.

Developmental trajectory of the effect of physical framing :

Adults were faster during the local visual search task with the frame compared to adolescents ($p < .001$, $\eta_p^2 = .62$).

There was **non-significant interaction with age group** (adolescents ; adults) (all $p's > .10$).



RESULTS

These results suggest that a frame presented on a visual display **can prevent attentional resources from being caught by irrelevant stimuli presented outside of the frame** (Bouhassoun et al., 2021).

The present results suggest that:

(1) Using a frame that delimits a topographical visual area is a concrete and efficient approach for **optimizing the allocation of attention during visual search in both middle-school adolescents and adults.**

(2) **This effect of physical framing on visual search performance is found in both adults and adolescents**, although adults are faster, which probably reflects a better executive control with age related to the maturation of the prefrontal cortex (e.g., Gogtay et al., 2004).

Our findings also provide evidence that **local details processing can be improved without modifying the structure of the stimulus** (Bouhassoun et al., 2021).

These findings afford a **better understanding of the deployment of attention during visual search and hold implications for daily real-world situations** such as academic/learning situations that require visual attention to be maintained over long periods of time.

DISCUSSION

TAKE HOME MESSAGE

When a frame delimits a restricted topographical visual area, it refrains the influence of an increasing number of outside-frame distractors for both adolescents and adults.

REFERENCES

Bouhassoun, S., Gerlach, C., Borst, G., & Poirel, N. (2021). Quarterly Journal of Experimental Psychology.



Desimone, R., & Duncan, J. (1995). *Annual Review of Neuroscience*.
Duncan, J., & Humphreys, G. W. (1989). *Psychological Review*.
Gerlach, C., & Poirel, N. (2018). *Scientific Reports*.
Gogtay, N. et al., (2004). *Proceedings of the National Academy of Sciences*.
Krakowski, C. S., Borst, G., Pineau, A., Houdé, O., & Poirel, N. (2015). *Acta Psychologica*.
Navon, D. (2003). *Acta Psychologica*.
Poirel, N., Pineau, A., & Mellet, E. (2008). *Acta Psychologica*.
Poirel, N., Krakowski, C. S., Sayah, S., Pineau, A., Houdé, O., & Borst, G. (2014). *Experimental Psychology*.
Zanto, T. P., & Gazzaley, A. (2009). *Journal of Neuroscience*.

^a LaPsyDÉ, UMR CNRS 8240, Université Paris Cité, Paris, France

^b GIP Cycleron, Caen, France

^c Department of Psychology, University of Southern Denmark, Denmark

^d Institut Universitaire de France (IUF), Paris, France

✉ brina.bouhassoun@gmail.com