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Measuring individual differences in internal versus external attention: The attentional style questionnaire

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ABSTRACT

Attentional capacity can vary amongst individuals, along several dimensions. Currently available questionnaires confound distinct dimensions of attention, such as top-down versus bottom-up attentional processes, and the orientation of these processes towards internal versus external objects of attention. This study proposes a novel questionnaire that measures the attentional style of an individual by taking into account both the type and orientation of attention. The structure of the questionnaire was first explored in an exploratory factor analysis, which yielded two factors representing externally and internally oriented attention. This factor structure was validated in a second study using confirmatory factor analysis, and its construct was validated in a third study using attention-related questionnaires. This study proposes a new questionnaire allowing to characterize an individual's attentional style according to top-down/bottom-up and internal/external dimensions of attention, and provides further insights into the subdivisions of functionally relevant attentional dimensions.

1. Introduction

Stimulation coming from the external and internal world can be overwhelming. Attention helps us to process the huge amount of information we are confronted with, and enables us to selectively focus on the information that is relevant to our goals (Chun, 2011; Desimone & Duncan, 1995; Pashler, Johnston, & Ruthruff, 2001). This attentional capacity is driven by at least two antagonistic processes which have been labelled top-down and bottom-up attention. Top-down attention correspond to goal-directed, controlled attentional processes, while bottom-up attention is characterized by the spontaneous attraction of attention towards novel, salient, and unexpected stimuli (Corbetta & Shulman, 2002; Steve Majerus et al., 2012). Studies have shown that when top-down attentional processes are challenged, as is the case for example in a high-load short-term memory condition, bottom-up attentional processes decrease, as reflected by a decreased sensitivity towards task-irrelevant distractor stimuli (Steve Majerus et al., 2012; Shulman, Astafiev, McAvoy, D'Avossa, & Corbetta, 2007; Todd, Fougnie, & Marois, 2005).

Top-down and bottom-up attentional processes can both be externally (exogenous) or internally (endogenous) oriented (Posner, 1980). Externally oriented top-down attention refers to deliberate, goal-directed processing of the external environment, while internally oriented top-down cognition is involved in deliberate and goal-directed internal mentation (Christoff, 2012; Gilbert, Simons, Frith, & Burgess, 2006). Bottom-up external attention involves the sudden and unexpected attentional capture of stimuli in the immediate environment (e.g., suddenly hearing the neighbour start the engine of his lawnmower). Importantly, bottom-up attention can also be oriented internally, for example when attention is captured by an intrusive thought, such as suddenly thinking about a forthcoming appointment you had completely forgotten. Intrusive thoughts are unintended, often interfere with ongoing activity, and are difficult to control (Clark & Purdon, 1995). It is important to note that the internal versus external orientation and top-down versus bottom-up nature of attention can interact in different ways. For example, while performing a visual detection task (external top-down attention), a person can be distracted by a sudden noise (external bottom-up attention) or an intrusive thought (internal bottom-up attention). Similarly, when intentionally planning the future (internal top-down attention), we can be distracted by a sudden noise or an intrusive thought.

Despite the potential importance of these different attentional dimensions for understanding everyday human cognition, there are currently very few instruments available to measure individual differences

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Table 1
Items and properties of the first version of the Attentional Style Questionnaire (17 items).

	Item	Attention	Orientation	Questionnaire
1.	J'ai des difficultés à me concentrer lorsqu'il y a du mouvement dans la pièce. (*I have trouble concentrating when there is movement in the Froom I am in*)	+	E	ASQ
2.	En général, je garde le contrôle sur mes pensées et je ne me laisse pas distraire par des pensées intrusives. (*In general, I stay in control of my thoughts and do not let myself get distracted by interfering thoughts*)	−	I	ESQ
3.	Je suis facilement attiré(e) par des stimuli nouveaux (par exemple, les voix de personnes qui passent, un bruit dans la maison, …) et qui n'ont rien à voir avec la tâche que je suis en train d'effectuer. (*I am easily drawn to new stimuli (for example, voices of people passing by, a sound in the house, …) that are not relevant to a task I am doing.)*	+	E	ESQ
4.	Je suis souvent tellement absorbé(e) par un flot de pensées que je deviens plus ou moins inconscient(e) de ce qui m'entoure. (*I can be so absorbed by a line of thoughts that I become more or less unaware of my surroundings*)	−	E	ESQ
5.	Lorsque je réalise une tâche, je suis souvent tellement concentré(e) que je ne remarque rien d'autre autour de moi. (*When I am doing a task, I am often so focused I do not notice my surroundings.*)	−	E	ASQ
6.	Je n'ai pas de difficultés à travailler tout en écoutant de la musique. (*I do not have difficulties to work while listening to music.*)	−	E	TAS
7.	Il m'est. difficile de faire une seule activité durant une heure. (*It is hard for me to stay on one activity for a whole hour.*)	+	I	ASQ
8.	Souvent, des pensées et des images sans lien avec l'activité en cours me viennent à l'esprit. (*During an activity, unrelated mental images and thoughts come to my mind.*)	+	I	TAS
9.	Il m'arrive fréquemment d'interrompre une activité en cours pour en démarrer/continuer une autre parce que je viens d'y penser. (*I often put hold to an activity because I suddenly think about another one I have to start or continue.*)	+	I	ASQ
10.	Je reste généralement concentré(e) sur une seule tâche jusqu'à ce qu'elle soit terminée. (*I generally stay focused on a single task until it is finished.*)	−	I	ASQ
11.	Je peux facilement ignorer l'environnement qui m'entoure. (*I can easily ignore my surroundings.*)	−	E	ASQ
12.	Il m'arrive d'interrompre une activité pour vérifier un détail qui n'est. pas en lien avec cette activité. (*Sometimes I interrupt an activity to check an unrelated detail.*)	+	I	ASQ
13.	Quand je travaille sur mon ordinateur, il m'arrive souvent d'aller sur internet pour consulter des sites sans lien avec mon travail. (*When I am working on my computer, I often go on the internet to visit websites that are unrelated to my work.*)	+	I	ASQ
14.	Je peux facilement me concentrer sur une tâche, même si il y a du mouvement ou du bruit dans la pièce où je me trouve. (*I can easily concentrate on a task, even when there is movement in the room I am in.*)	−	E	ASQ
15.	Je peux passer plusieurs minutes sur une question et essayer de la décortiquer. (*I can spend several minutes on a question and try to dissect it.*)	−	I	ASQ
16.	J'ai des difficultés à penser lorsqu'il y a des bruits, même s'ils sont peu intenses. (*I have trouble thinking when there are noises, even if these noises are not intense.*)	+	E	ASQ
17.	Je suis souvent le premier/la première à remarquer un changement dans une pièce. (*I am often the first one to notice something has changed in a room.*)	+	E	ASQ

Attention depicts the bottom-up oriented (+) or top-down oriented (−) nature of the item. Orientation states the external (E) or internal (I) orientation of attention. Questionnaire states the provenance of inspiration of the item. ASQ = Attentional Style Questionnaire, TAS = Tellegen Absorption Scale (Tellegen & Atkinson, 1974), ESQ = Encoding Style Questionnaire (Billieux et al., 2009).

in these dimensions. The most widespread questionnaire that attempts to assess individual differences in attention (mostly in the context of psychopathology) is the Attentional Control Scale (Derryberry & Reed, 2002). The Attentional Control Scale (ACS) results from the merging of two questionnaires measuring attentional focus and attentional shifting (Derryberry & Rothbart, 1988). This scale mainly measures externally oriented top-down attentional control capacity, but lacks the dimension of internally oriented top-down attentional control. The aim of the present study is to propose a more exhaustive attentional style questionnaire that takes both the top-down versus bottom-up and the external versus internal dimensions of attention into account. Because of the antagonistic nature of bottom-up and top-down attentional states, we designed items to reflect a continuum between both attentional states. A low score would thus reflect low bottom-up attention and high top-down attention, whereas a high score would indicate high bottom-up attention and low top-down attention. The measure (the individual's score) is considered to reflect the capacity of an individual to maintain attention on task-related stimuli and not to be distracted by interfering stimuli.

The first study presents the development of the Attentional Style Questionnaire (ASQ) and determines its structure via exploratory factor analysis. In a second study, we test the robustness of the factorial structure of the ASQ using confirmatory factor analysis on a new independent sample of participants (Schreiber, Nora, Stage, Barlow, & King, 2006). Finally, in a third study, we assess the questionnaire's construct validity by investigating its relation with existing questionnaires assessing various phenomena involving top-down or bottom-up attentional processes such as the occurrence of daydreaming, ruminations, and cognitive failure.

2. Study 1

2.1. Method

2.1.1. Participants

206 French speaking participants between 18 and 45 years of age (M = 23.25, SD = 5.2) with at least a high school degree were invited to fill out the Attentional Style Questionnaire (ASQ) using Google Forms, providing data for the exploratory factor analysis. Participants were recruited via advertisements posted on student forums, via announcements sent via emails to students, and via postings on student social media groups; the advertising texts included a link to the online survey. A first screen mentioned general information about the study (including the requirement of being a French-speaker for participating to the study), contact information of the researcher responsible for the study, and an ethical statement of the rights of the participant (guarantee of anonymity, ability to interrupt participation at any time without any need to provide a justification, and the right to receive results of the study). The participants were also asked to provide information about their age and gender. They had to check a box in order to confirm that the provided information had been fully read, understood, and that they agreed to participate to this survey. If this checkbox was not checked, or any information was missing, the participant was not able to continue to the next screen. Participants were