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Outbreak News Affects the Attention in Everyday Life: A Cross-sectional Study

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Abstract

Objective: Capture of attention occurs when a goal-irrelevant salient stimulus appears in the field of attention. The COVID-19 pandemic seems to be salient enough to capture a great proportion of one's attention resources. The purpose of this study was to explore how the novelty of outbreak news affects attention in everyday life.

Method: 162 participants were recruited using an online invitation and divided into two samples (early and late sections). The research variables were the salience of news, intrusive thoughts, endogenous attention, and knowledge of COVID-19, which were examined and compared between the two measurements using one-way MANOVA. Additionally, a correlation analysis was performed to reveal a model of relationships between variables.

Results: It was found that despite the increase in infected cases, intrusive thoughts and attentional capture decreased over time. To describe the relationship between the salience of news and attentional capture a conceptual model was presented.

Conclusion: In addition to the other physical properties of a stimulus, novelty also contributes to stimulus salience. In everyday life, novel situations can trigger intrusive thoughts and attentional capture. Nonetheless, it cannot be sustained after the novelty has worn off. The proposed model can be useful to understand further similar situations.

Keywords: Everyday Attention; Attentional Capture; Salience; COVID-19; Disease Outbreak.

Introduction

Since we are not able to perceive all the information around us, except when we intentionally select what to focus on, our attention automatically draws to the most perceptually salient stimuli (Weierich et al., 2008). According to bottom-up theories of attention, salient physical properties of stimulus lead to the capture of attention. Orienting to a salient stimulus is an effective process in attention and information processing (Laurens et al., 2005; Posner, 1980). On the other hand, unintentional orientations can be associated with negative consequences, such as the loss of goal-related stimuli (Asplund et al., 2010). Distraction to a set of goal-irrelevant stimuli due to the properties of the stimulus itself is known as attentional capture (Gibb et al., 2016; Öhman, 2007). Attentional capture is believed to occur more frequently when salience is increased (Hester et al., 2006; Theeuwes & Van der Burg, 2013). Mostly, in the literature on attention, salience refers to some distinct physical features associated with an object or with the relationship between an object and its environment (Michael & Gálvez-García, 2011). However, abrupt onset, distinct color, motion (Abrams & Christ, 2003; Franconeri & Simons, 2003; Sunny & von Mühlenen, 2013; Yantis & Hillstrom, 1994), and animacy (Pratt et al., 2010) may also capture the attention in a stimulus-driven manner. Yet a salient stimulus may be extreme, emotional, and rare (Fiske & Taylor, 2008). According to Bruce and Gaines, salient stimuli are in different categories

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than their physical or temporal neighbors (Byrne, 2017).

Previous studies have suggested novelty as a major aspect of stimulus salience (Brockmole & Henderson, 2005; Foley et al., 2014; Liao et al., 2011; Wittmann et al., 2008). Ghazizadeh, Griggs, and Hikosaka (2016), in their study on macaque monkeys, demonstrated that repeated exposure to novel objects is accompanied by a clear decrease in salience. Also, it has been shown that novelty captures attention even concerning physically low-salient stimuli (Ernst et al., 2020). In the literature on attention, the predictability of the situation had been considered before as an element that distinguishes bottom-up and top-down processes related to attentional capture (Fabio & Caprì, 2019). Here, the focus is on novelty as an emerging property of stimulus. Due to the unpredictability of being novel, we assume it is in the realm of bottom-up attentional capture.

COVID-19, as a novel phenomenon, is now a massive threat to the world community which can have economic and political subsequences. The disease may also end in irrecoverable health impairments commonly and cause death in a not-so-unlikely manner. Once the news of the novel coronavirus was spreading, a major concern emerged around the globe. Most individuals had an exaggerated understanding of the problem which was conceivable because the rate of diagnosed cases and death was exponentially growing and there were no reliable treatments.

Until today, many behavioral studies have been conducted on COVID-19, many of which have dealt with the Psycho-Neuro-pathological aspects of COVID-19 and its effects on cognitive functions (see Mazza et al., 2021 for a review). In the context of the impacts of the outbreak on cognitive functions, some findings indicate changes in the performance of attention and selective attention affected by the outbreak. In a study conducted on 298 UK-based adults, it was found that there is a positive and significant correlation between coronavirus anxiety and the attentional bias toward COVID-19-related stimuli. In other words, the more disease-related anxiety a person experiences, the more likely the attentional bias will be (Albery et al., 2021). Also, in another study conducted by Cannito et al. (2020) on 132 Italian adults, it was shown that health anxiety is associated with the attentional bias toward coronavirus-related information, and this relationship is mediated by the belief of contagion and by the consequences of contagion. In another study conducted on a sample of Chinese adults, it was found that physical and cognitive concerns play a mediating role in the relationship between attentional bias toward negative information and depression and anxiety. In such a way the negative attentional bias is associated with an increase in physical and cognitive concerns, which in turn is associated with an increase in depression and anxiety symptoms (Li & Li, 2022). Formerly, the relationship between attentional bias and depression and anxiety has been shown many times (see Mogg & Bradley, 2005 for a review).

According to the literature, as the physical salience of a threatening stimulus increases, it is more likely that involuntary attentional capture occurs. It also seems that as the stimulus gets older, it loses its ability to capture attention. However, studying this, outside of the laboratory setting is not something that has received much attention before. We assume that the construct of salience, in its broader sense, consists of two parts: physical salience and temporal salience. In this paper, we aimed to investigate the simultaneous effects of these two factors on attentional capture in a real-life situation related to the COVID-19 pandemic.

Method

Participants

A hundred and sixty-five participants (three excluded due to lack of information/outlier responses, n = 162; 54 males; age range: 15 – 65; age M = 33.06;

age SD = 9.95) have recruited through an online invitation. Because of the difficulty in access to the research sample (due to the COVID-19 pandemic), data collection has been accomplished through an online survey via a voluntary sampling method. All the participants were selected from the general population, and based on their reports had no specific mental disorders or neuropsychological conditions.

Ethical statement

This study followed all ethical considerations in accordance with the World Medical Association Declaration of Helsinki (World Medical Association, 2013) for human participants. Participation in the study was anonymous and voluntary. The participants were informed of the purpose of the study and signed a written informed consent form. It was informed that they could withdraw from the study whenever they wanted without any consequences regarding their care.

Measures

Thought Control Questionnaire (TCQ; subscale distraction): TCQ is a 30-item instrument introduced by Wells and Davies (1994) to assess the effectiveness of strategies individuals use to control unpleasant and unwanted thoughts. The questionnaire includes five subscales (distraction, social, worry, punishment, and re-appraisal). The items are scored on a four-point Likert scale (e.g. when I experience an unpleasant/unwanted thought: I do something that I enjoy; 1 = never; 2 = sometimes; 3 = often; and 4 = almost always). In this study, only the subscale of distraction has been used. The distraction score is an indicator of the ability to disengage attention from the goal-irrelevant stimulus endogenously. This subscale has been used as a measure of attentional capture. Its rationale was that the more one is biased toward an exogenous cue (threatening stimuli in the context of this study), the less he or she will distract his/her attention away from that stimulus. The internal consistency reliability of this subscale had an acceptable amount (α= 0.72) and the whole instrument had a great correlation with scores of a variety of other measures (Wells & Davies, 1994).

COVID-19-related knowledge: To measure individuals' knowledge about COVID-19, a 15-item questionnaire was used (Taghrir et al., 2020). In this questionnaire, three items were about the etiology of COVID-19, two about symptoms and incubation time, one about diagnosis, two about transmission, four about public prevention, one about medical professionals' prevention, one about treatment, and one about referring suspicious cases. A group of experts, including an infectious disease specialist, two epidemiologists, and two medical interns, evaluated the scale for its content validity. Correct answers were given 1 point and incorrect answers or 'I don't know' were given 0 points. Finally, scores are converted into percentile values. Scores above 75% are considered high, those between 50-75% moderate, and scores below 50% are considered low. According to Cronbach's alpha, the inter-item consistency in a pilot study (n = 30) and in the original study was 0.87 and 0.80, respectively. In the present study, raw scores were utilized.

The Explicit question of intrusive thought about COVID-19: To have a quantitative value of how much individuals think about COVID-19, a single-item scale was used ("On average, how much do you think about COVID-19 unintentionally throughout the day since the outbreak?"; 1 = low, 2 = medium, 3 = high).

Procedure

The first official observation of the coronavirus in Iran was reported on 2020 February 19, and the data collection for the present study began on 2020 March 14 and ended on 2021 April 13. In a cross-sectional design, the first ten days of the aforementioned period were considered the early and the last ten days as the late phases of data collection. Meanwhile, a one-year gap was considered to separate the two sections. We assumed that the participants in the early phase (n = 70), due to their proximity to the onset of the disease

outbreak may be in a different mental state than the participants in the late phase (n = 92).

In this study, physical salience, temporal salience, intrusive thoughts, knowledge about COVID-19, and endogenous attention, as study factors, were compared, and the relationships between them were examined. To compute physical salience, the cumulative frequency of COVID-19 cases per day (previously infected in addition to daily new cases) that was released by the Ministry of Health and Medical Education of Iran, was used. Also, days Elapsed since the government of Iran confirmed the first case of patients with COVID-19 (19 February 2020) was considered as a measure of temporal salience. The temporal salience was calculated from the inverse of the number of days since data collection had begun (e.g., 3rd day as 1⁄3). In addition, based on this measure, each participant has been placed on a categorical variable of early and late participation in the study.

Statistical analyses

All of the participants were divided into two sections (early and late) based on the date on which they participated in the study. Afterward, factors including physical salience, temporal salience, intrusive thoughts, knowledge about COVID-19, and endogenous attention, were compared between sections. SPSS software version 23 (SPSS Inc., Chicago, IL, USA) was used to analyze data at a significance level of < .05. Outliers was first omitted from all data sets. Shapiro Wilk statistic test ($p < .05$) and Levene's test ($p < .05$) were used to evaluate normality and homogeneity of variances, respectively. One-way MANOVA was used to compare the means, and Pearson correlation and Sobel mediation tests were performed to provide a model of relationships between the factors.

Results

The results of one-way MANOVA revealed that the main effect of between-groups comparison for the studied variables significantly differs between the early and late sections ($F (6, 155) = 739.26$; $p < .001$; $\eta p2 = .96$). The multivariate effect size was estimated at 0.96, which implies that about 96% of the variance in the canonically derived dependent variables could be attributed to groups. To test the hypothesis that after the first official announcement of COVID-19, by the days, the salience of stimulus decreases continually, the univariate analysis of variance showed that from the earliest observation of the early section to the latest observation of the late section, temporal salience had a descending order ($F (1, 160) = 436.55$; $p < .001$; $\eta p2 = .73$), and on the contrary, the physical salience had an ascending order ($F (1, 160) = 2431.70$; $p < .001$; $\eta p2 = .94$). Also, it was shown that intrusive thoughts ($F (1, 160) = 39.25$; $p < .001$; $\eta p2 = .20$) and endogenous attention ($F (1, 160) = 64.56$; $p < .001$; $\eta p2 = .29$) had significant differences between the two phases. However, knowledge about COVID-19 was not statistically significant ($F (1, 160) = 2.98$; $p = .086$; $\eta p2 = .02$).

According to the literature, a salient stimulus relies on both temporal and physical salience to capture attention (Foley et al., 2014). The following formula was developed to describe the simultaneous impacts of these two factors on attentional capture: TS is temporal salience, PS is physical salience, and ε is the error term.

Since temporal and physical salience had opposite patterns, we assumed that their simultaneous effect could be observed by multiplying them. According to the analysis of variance, stimulus salience was significantly different between the two phases of the study ($F (1, 160) = 312.91$; $p < .001$; $\eta p2 = .66$). Table 1 summarizes the results of univariate analyses.

Pearson's correlation coefficients between variables (Figure 1) showed that stimulus salience and intrusive thoughts had a positive and significant correlation relationship ($r = .37$, $p < .001$), and endogenous attention had significant but negative correlation relationship with both stimulus salience

Table 1. Results of univariate analyses of variance

Source	Variable	*df*	Mean Square	F	p	η_p^2
Group	Temporal Salience	1	3.502	436.550	.000*	.732
	Physical Salience	1	86938798873.057	2431.709	.000*	.938
	Intrusive Thoughts	1	15.925	39.247	.000*	.197
	Endogenous Attention	1	1378.420	64.563	.000*	.288
	Knowledge†	1	1.445	2.979	.086	.018
Error	Temporal Salience	160	.008			
	Physical Salience	160	35752136.007			
	Intrusive Thoughts	160	.406			
	Endogenous Attention	160	21.350			
	Knowledge	160	.485			

Note. * p < .001; † knowledge about COVID-19

and intrusive thoughts (r = -.45, p <.001; r = -0.58, p <.001, respectively).

Mediation analysis shows that stimulus salience had an indirect effect on endogenous attention through

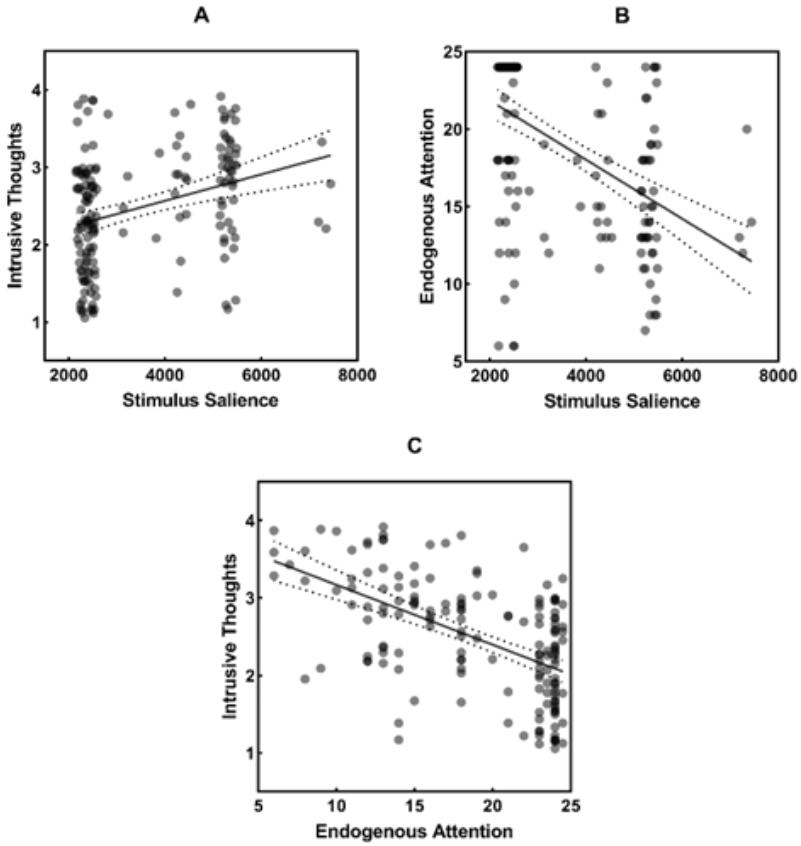

Figure 1. Partial correlation between pairs of variables

Note. A. Pearson correlation test shows a positive significant relationship between stimulus salience and intrusive thoughts; B. negative significant relationship between stimulus salience and endogenous attention; C. as well as endogenous attention and intrusive thoughts.

intrusive thoughts (z = -4.21, p < .001). More precisely, it could be said as the stimulus salience decreases, endogenous attention will increase (Figure 2).

Discussion

As it has been found in this study, there is a considerable difference between the early and late phases of the study in terms of physical salience and temporal salience. It means that over time, the total number of patients and the novelty of the situation has increased and decreased, respectively. These results confirm the way we decided to separate sections. Prior knowledge as a top-down process is an influential factor in capturing attention (Kim & Rehder, 2011). The measurement of knowledge about COVID-19 was used as a control variable. It has been found that the level of knowledge had no differences between the two sections. Therefore, the results of this study are not influenced by the level of knowledge individuals had about COVID-19. The differences between the samples of individuals who participated in the early and late phases were significant in terms of how long they used to think about COVID-19 and how much they could distract themselves from that subject (endogenous attention). According to the results, over time, people had less intrusive thoughts about the current situation, and they have been more capable of orienting their attention to the subjects of interest in a controlled manner. This finding is in line with other research findings, according to which information related to the outbreak is associated with attentional capture (Albery et al., 2021; Cannito et al., 2020; Li & Li, 2022). However, the current study, considering selective attention from an ecological point of view, has concluded that the news related to Outbreak, due to its novelty, leads to the capture of attention from relevant information/goals in everyday life.

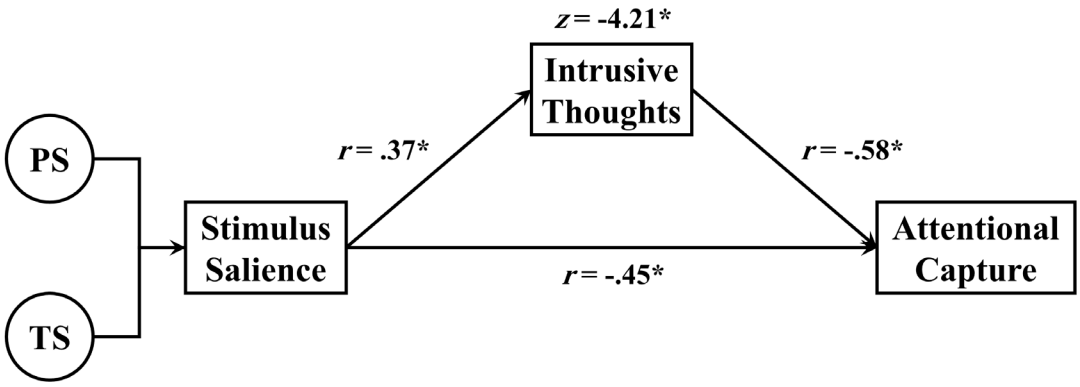

Figure 2. Conceptual model for relationships between stimulus salience and attentional capture as mediated by intrusive thoughts

Abbreviations: PS, physical salience; TS, temporal salience.

Note. * p < .001

Studies on novel threatening stimuli have shown that recent life-threatening events are more likely to change people's behavior than the same sorts of events that have happened in the distant past. For instance, it has been found that right after an earthquake, the purchase rate of earthquake insurance increases dramatically. But after a while, purchases decrease steadily. It is also reported that immediately after the September 11 attacks, people had been less interested in air travel. However, they gradually resumed their use of airplanes like before. Presumably, that is because, at first, the news is so novel that people overestimate the probability of an earthquake occurring near their hometown or being on a hijacked plane (see Vasiljevic et al., 2013 for a review). A well-established opinion posits that

endogenous and exogenous systems compete over the orientation of the focus of attention (Corbetta et al., 2008). It has been suggested that familiarity with the novel stimuli ends in more control over attention (Ghazizadeh et al., 2016; Vecera et al., 2014).

To provide a model of attentional capture through salient stimuli, at first, the construct of stimulus salience was made from physical salience and temporal salience. The comparison of stimulus salience between the early and late phases of the study shows a significant difference. That, despite the increase in physical salience, the decrease in temporal salience leads to an overall decrease in stimulus salience.

In the following, correlations between the components of the model were examined. It has been found that there is a high correlation between stimulus salience and attentional capture. Accordingly, as the salience of stimulus increases, attentional capture shows a clear increase. Also, the mediation analysis showed a mediatory role for intrusive thoughts between stimulus salience and attentional capture. Therefore, as a model, physical salience, and temporal salience together form the stimulus salience. Stimulus salience can lead to attentional capture either directly or through intrusive thoughts.

It seems that individuals tend to disengage their attention from COVID-19 and this ignorance increases by the day since the initial release of the news. Therefore, the negative threatening news at first leads to the capture of attention and intrusive thoughts, but after it gets to lose its novelty, both attentional capture and intrusive thoughts start to diminish gradually. this is while the physical salience of news is still increasing. In this situation, one is faced with the news that is growing in importance but becoming old.

It may be a problem for us to think too much about a single issue for a long period. Because overthinking, in the long term is not cognitively economic (Kaiser et al., 2015), the whole cognitive system has a certain and limited resource for the maintenance and manipulation of intrusive thoughts. This is the reason why after a while, one tends to reduce the perceived importance of the risk even though the problem is worsening. So, the solution is in being released the persistent intrusive thoughts as soon as possible. Gradual decrement of stimulus salience provides a way to take control over the attention. That is how one can think about other important subjects as well. We suggest that the findings of this study are not just about the current pandemic disease, but can be generalized to all future similar situations. Also, regarding any other real-life related salient stimuli (news, events, etc.) it would be discussable.

Following are some suggestions for researchers interested in studying attentional capture during pandemics or other sudden local/global adversities (e.g., wars): Further studies are needed to determine how physical and temporal salience independently influence stimulus salience. Utilizing both behavioral and neurological studies in controlled experimental settings may provide more reliable evidence of other similar phenomena. Because of the relationship between anxiety and capture of attention (Aktar et al., 2019; Bar-haim et al., 2007), it is also suggested for subsequent studies take the level of anxiety into account as another influential factor.

Conclusion

With an ecological perspective on selective attention after exposure to pandemic news, the current study concluded that the novelty of the news disengages attention from relevant information/goals in daily life. Physical salience alone cannot determine the amount of salience of a threatening stimulus. Temporal salience should also be noticed as a major determinant of attentional capture.

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Conflict of interest

The authors did not receive any grants for this project

and declare that there are no conflicts of interest to disclose.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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