

POSITIVITY EFFECT IN AN ETHIOPIAN SAMPLE: INSIGHTS FROM THE DOT-PROBE TASK

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Abstract

The positivity effect, or the tendency to attend more to positive than negative stimuli, has been widely reported in the literature among older adults, however, a few contradictory findings are also present. This concept is raising substantial interest from scholars as in this age group cognitive decline is evident, and surprisingly better emotional responses are present. Different theories try to explain this phenomenon without solid paradigms for investigation as it can be seen as a relatively new concept from the past 20 years. Furthermore, little is known about the positivity effect in non-Western populations. In this study, we aimed to explore the presence of the positivity effect in an Ethiopian population using the dot-probe task with facial emotional images as stimuli. This method is a pioneer in the positivity effect field consisting of a behavioral attentional task that relies on reaction time responses. A sample of 100 Ethiopian adults was divided into three age groups: young (18-30 years old), middle-aged (31-60 years old), and older (65+ years old) adults. All participants performed a dot-probe task on a computer where the stimuli were emotional images consisting of happy, angry, neutral, and sad faces. The results of the study did not show the presence of a positivity effect or a preference for any emotional image using this paradigm. These findings suggest that further research is needed to understand the factors that may influence the positivity effect in attention in different cultural contexts.

Keywords: *Aging, positivity effect, emotion, dot-probe.*

1. Introduction

The decline of cognitive abilities in older adults has been studied by scientists and psychologists over the years, transforming this topic into a common phenomenon. On the contrary, evidence supports an association between aging and improved emotional processing, which can reflect a favorable information preference on human attention and memory (Mather, 2016). This phenomenon is called Positivity Effect: older and younger individuals when receiving the same emotional information tend to respond differently, with older individuals attempting to facilitate positive information processing and suppressing negative ones, while younger individuals do the opposite (Carstensen & DeLiema, 2018; Mather & Carstensen, 2003).

The positivity effect has its foundation in the Socioemotional Selectivity Theory (SST) (Carstensen, et al., 1999), suggesting that older adults focus on positive information as they perceive time in life as limited, and tend to prioritize goals that are emotionally more meaningful. This theory posits that age is the source of this bias and that it is motivated by emotional satisfaction. In contrast, others try to explain this phenomenon, for instance, the dynamic integration theory (DIT), proposed by Labouvie-Vief (2003), has a strong influence on this topic. The DIT suggests that older adults process positive information faster and more automatically than negative ones due to the natural cognitive decline, and as the processing of emotional information becomes a combined cognitive-emotional construct over the years, and negative information is a more difficult and complex process (Baumeister et al., 2001), the positivity effect can be explained.

Research on this positive bias has primarily focused on visual and lexical stimuli, examining age differences in attentional shifts to positive and negative stimuli and memory (Gronchi et al., 2018; Reed et al., 2014). A study conducted by Grady and colleagues (2007) found that younger individuals recognized more negative images than positive ones compared to older adults. Another study has found attentional preference towards negative facial images among younger adults in an attentional task, while older participants showed attention to positive images (Gronchi et al., 2018).

Overall, evidence shows that the positivity effect has been found across various domains, especially memory, and attention (Reed et al., 2014). However, this effect is still discussed and can be controversial as a few studies do not corroborate its existence (Murphy & Isaacowitz, 2008). While there is a significant amount of literature on the positivity effect, there has also been a lack of research done to corroborate this theory using standardized paradigms in specific domains, as well as in different countries, especially, non-developed ones. Therefore, to introduce this research in a new country, in this case, Ethiopia, is wise to use a common and one of the earliest paradigms used to investigate positivity effect which is the dot-probe task, a traditional paradigm for studying emotional attention bias (Wirth & Wentura, 2020). In the dot-probe task, participants are presented with two stimuli, followed by a dot that appears on one side of the screen, after they must respond as quickly as possible after the dot appears. The stimuli are typically presented for a duration of 500 milliseconds during many trials.

Accordingly, in this study, we aim to explore the presence of the positivity effect in an Ethiopian population using the dot-probe task with facial emotional images as stimuli. According to previous findings, it is expected that older adults will display a preference for positive images compared to the younger sample based on reaction time responses.

2. Methods

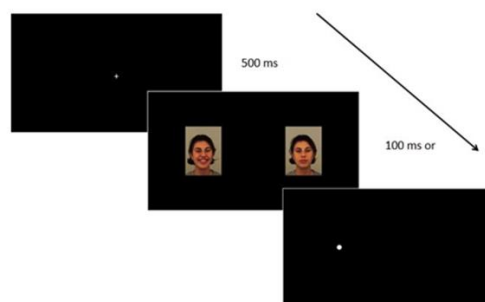
2.1. Participants

Participants were Ethiopians from the Somali region, aged between 18 and 84 years ($M=49.6$, $SD=19.42$). A total of 100 individuals took part in the study divided into 3 groups: younger adults (YA), middle adults (MA), and older adults (OA). Of the participants, 33 males and 17 females were in the older group (above 60 years old, $M=67$). Participants were included if they had normal or corrected to normal vision and be without any major health impairment that could prevent them from using a computer.

2.2. Measurements

The data was collected offline using a computer via PsyToolkit platform (Stoet, 2010, 2017). Upon agreeing to participate and following the instructions on the screen, participants are directed to demographic questions such as age, gender, education level, chronic illness, medication, and others. Subsequently, the dot-probe task (see Figure 1) starts with a cross-fixation point that appears on the screen and disappears after 500ms, followed by two picture pairs appearing on both sides of the fixation point. The experiment begins with three picture pairs for practice, followed by 140 real trials consisting of congruent (dot appearing after the emotional image) and incongruent pairs (dot appearing after the non-emotional image). These include happy-neutral, angry-neutral, and sad-neutral, congruent and incongruent face pairs, plus extra neutral-neutral image pair trials for baseline. All images were retrieved from the RADIATE database, a multiracial validated facial database for psychology experiments (Conley et al., 2018).

Figure 1. Illustration of a dot-probe task trial.



2.3. Data analysis

The main parameter used was the Reaction Time (RT) in all. Additionally, individual attentional bias (ABI) was assessed using the stimuli bias index developed by Mather and Carstensen (2003), which involved subtracting the RT of congruent trials from that of incongruent trials across all three emotional conditions to yield a score for each participant. A positive score indicated that participants spent longer RTs on incongruent trials (i.e., when the dot appeared after neutral images), indicating attention toward

the emotional image; a negative score indicated that participants spent longer RTs on congruent trials (i.e., when the dot appeared after emotional images), indicating attention away from the emotional image.

Log transformation from the RT responses was performed due to a slight skewness in the sample seeking a normal distribution of the data. To ensure a normal distribution of the data, a log transformation was applied to the RT responses. To eliminate invalid responses and reflex unwanted responses, values of RT that were below 200ms and above 2000ms were excluded from the dataset. The analysis was carried out using Jamovi 2.2.5 software. A repeated-measures ANOVA was performed to compare the mean RT for three emotional face conditions (happy, sad, and angry), and two levels of congruency (congruent and incongruent) among all groups. In order to analyze ABI scores among the groups one-way ANOVA was performed.

3. Results and discussion

Among the 3 groups, the mean ages of participants were $M_{YA}=23.4$ ($SD=3.69$, $n=24$), $M_{MA}=40.4$ ($SD=7.05$, $n=26$), and $M_{OA}=67$ ($SD=6.19$, $n=50$). The RTs of the groups showed similar responses among all conditions, without significant results (Table 1).

Table 1. Repeated Measures ANOVA analysis of the comparison between groups based on RTs of congruency and emotions.

Between Subjects Effects							
	Sum of Squares	df	Mean Square	F	p	η^2	η^2_p
Groups	0.0173	2	0.00864	0.963	0.386	0.015	0.019
Residual	0.8703	97	0.00897				

Note. Type 3 Sums of Squares

Regarding the ABI scores, which is the bias towards an emotional condition, again no significant result has been found as is possibly seen in Table 2, which means that all scores are similar among all emotional conditions. Covariates such as education, and gender did not reveal meaningful results in our analysis.

Table 2. One-way ANOVA analysis comparing the ABI scores between the groups.

One-Way ANOVA (Welch's)				
	F	df1	df2	p
ABI Happy	0.919	2	56.7	0.405
ABI SAD	0.459	2	49.1	0.635
ABI Angry	0.637	2	57.1	0.533

This study expected an attentional preference from older adults (OA) towards emotional faces as presented in other studies (Carstensen & DeLiema, 2018; Gronchi et al., 2018; Reed et al., 2014). However, there was not possible to identify a bias to any emotional image among the groups.

Numerous studies in neuroscience confirm the existence of the positivity effect, and research on this topic is increasing. As previously mentioned, some studies have failed to identify this effect (Murphy & Isaacowitz, 2008; Reed et al., 2014), and in the area of cognitive processing, particularly concerning attention to emotional stimuli, there are still unanswered questions, providing a motivational research gap for developing studies with different age group comparisons.

It is worth noting that there are many factors that can influence the presence or absence of the positivity effect in different studies, including the specific stimuli used, the age range of the participants, other methods used to measure attention, or even the population's social context. The set of stimuli can be evaluated as the RADIATE database has not been used for a study with this population. Additionally, the duration of the stimuli could be reevaluated and equally to one of the first experiments on this topic (Mather & Carstensen, 2003), aiming more attentional time to the images. However, the adoption of

500ms stimuli in the present study is a reflex of attentional controlled processing currently (Gronchi et al., 2018). The type of stimuli is also important to mention, as facial expressions may not have a higher level of valence in emotional images, suggesting that more complex stimuli could reproduce significant results, such as emotional situations and scenarios (Wirth & Wentura, 2020).

A contrary vision of the positivity effect posits that older adults are more likely to focus on negative information due to their motivation to avoid loss (Depping & Freund, 2013; Levin et al., 2021). This negative bias may be related to the lack of PE observed in some studies, including this. For example, Depping and Freund (2013) found that older adults showed a preference for negative information in memory decision-making experiments compared to younger adults. This may be because older adults need to remember negative information to avoid loss. Even though this negative bias has not been identified in the present research, it is important to reflect on other findings and theories to improve study designs for optimal findings.

While Gronchi and colleagues (2018) found evidence of PE using a similar experimental design, it is important to consider sociocultural factors that may influence how individuals attend to emotions. Fung and colleagues (2019) conducted a study comparing older adults in the United States and Hong Kong using an eye-gaze paradigm, and they found that older adults in the US demonstrated a preference for positive images compared to those in Hong Kong. It is possible that cultural differences may have played a role in the current study's lack of positivity effect findings, as it was conducted in Ethiopia, where the elderly care system in a collective society is worsening similarly to other developing countries, being associated with economic decline, social isolation, and limited access to basic services (Zelalem et al., 2020). According to Stewart and colleagues (2008), Somalis place great importance on family values and social support. Kinship is followed through generations in this culture, with elders serving as the main judges and mediators in the community, nonetheless, older adults are currently experiencing a reduction in perceived importance, likely due to significant changes in lifestyle and work environments (Noguchi, 2013).

These sociocultural aspects can influence emotional processing in older adults and may impact the current study's results. It is important to mention that the dot-probe paradigm is limited to a complex domain such as the positivity effect. And an explanation of emotional bias in aging in this specific population, which is completely different from where the current findings on this matter come from, needs a more complex approach. This study deserves to be further explored since it is the first study that investigates the positivity bias in Ethiopia.

4. Conclusion

In conclusion, our findings do not support the presence of positivity effect on an Ethiopian sample using the dot-probe task as a paradigm. This finding is in contrast to previous research that has demonstrated a bias towards positive information in older adults. The absence of the positivity effect in this sample could be attributed to cultural factors, such as differences in value systems and life experiences that influence attentional biases. Additionally, it could be possible that the dot-probe task used in this study was not sensitive enough to detect the positivity effect in older adults. Further research with larger samples and alternative methods to measure attentional biases is necessary to gain a deeper understanding of the factors that influence the positivity effect in older adults in different cultural contexts.

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