Context matters: Changes in the affective representation of a word in younger and older adults

Li-Chuan Ku[1, 2] & Vicky Tzuyin Lai[1, 2]
[1] Department of Psychology & [2] Cognitive Science program, University of Arizona

Do younger and older adults differ in their processing of positive or negative meanings in language [1]? Based on the automatic vigilance hypothesis (AVH) [2], humans of all ages attend to negative information, a.k.a. 'negativity bias', as it threatens perceivers' well-being. However, based on the socioemotional selectivity theory (SST) [3], such preference changes into 'positivity bias', as people age and re-prioritize positive information for their emotional well-being. Gaps in knowledge are that most studies focused on single words [4], their absolute valence values, and younger adults [5, 6]. Here we investigated whether younger (YAs) and older adults (OAs) update the affective representations of a (same) word in negatively and positively valenced context fluently, using EEG. We hypothesized that if the AVH holds, negative contexts should lead to more negative evaluations of all target words. In contrast, if the SST holds, positive contexts should lead to more positive evaluations of all target words. If neither holds, the very same word before and after the emotional contexts should show the same neural representations.

We conducted an online (Exp 1: N_{YA}=60, N_{OA}=43) and an ERP study (Exp 2: N_{YA}=41, N_{OA}=23 and ongoing). Stimuli consisted of 320 three-sentence vignettes with positive/negative target words and positive/negative contexts (=adjectives in 2nd sentence; Table 1). Target words were all low-arousing, as our prior data on single words indicated that positivity bias in OAs was revealed in low-arousing words. Word valence ratings were obtained from both YAs and OAs based on affective norms. Word properties (length, frequency, concreteness) were matched between conditions for target words and for contexts/adjectives. Exp 1 participants read the first two sentences in each vignette and rated the valence of the target word from 1 (very negative) to 9 (very positive). Exp 2 participants read each vignette word-by-word and did a valence judgment task (Figure 1).

Participants with high depression scores, cognitive impairment, program error, or excessive alpha were excluded. For Exp 1 (N_{YA}=36, M_{age}=19.7; N_{OA}=36, M_{age}=65.4), participants' age, cognitive ability (Wisconsin Card Sorting Task; Digit-Symbol Substitution Task), and affect scores (PANAS-trait) were entered in a regression model as predictors of the valence ratings. For Exp 2 (N_{YA}=24, M_{age}=18.9; N_{OA}=14, M_{age}=68.9), changes in the affective representations are reflected by the ERP differences between the 1st and 2nd occurrences of the target words (ERP effects hereafter).

In Exp 1, increasing age (β_{Age}=.342, p=.026) and positive affect (β_{PA}=.314, p=.014) separately predicted more positive evaluation for positive target words in positive contexts (Figure 2), consistent with 'positivity bias'. In Exp 2, in YAs, P2 effects (180-300 ms) were reduced for positive targets (p=.048), suggesting automatic attention to negative targets (Figure 3). Also in YAs, LPP effects (600-800 ms) were enhanced for target words in negative contexts (p=.008), suggesting sustained attention to negative contexts. In OAs, there was no interaction, but simple comparison supported an enhanced P2/LPP effect for positive words in positive contexts.

Altogether, YAs support the AVH, as first reflected by a reduced P2 effect to positive targets, and then an enhanced LPP effect to negative contexts. While there is no robust support of the SST, OAs show steady reactions to positive words in positive contexts, in P2/LPP effects first, and then Exp 1 valence ratings.

Table 1. Stimulus examples

	Positive target (in green)	Negative target (in red)
Positive context (in bold)	The pianist had a new performance. Her skills were **remarkable**. The pianist practiced every day.	The dentist often worked with children. They found him **trustworthy**. The dentist cared about them.
Negative context (in bold)	The pianist had a new performance. Her skills were **rusty**. The pianist practiced every day.	The dentist often worked with children. They found him **formidable**. The dentist cared about them.

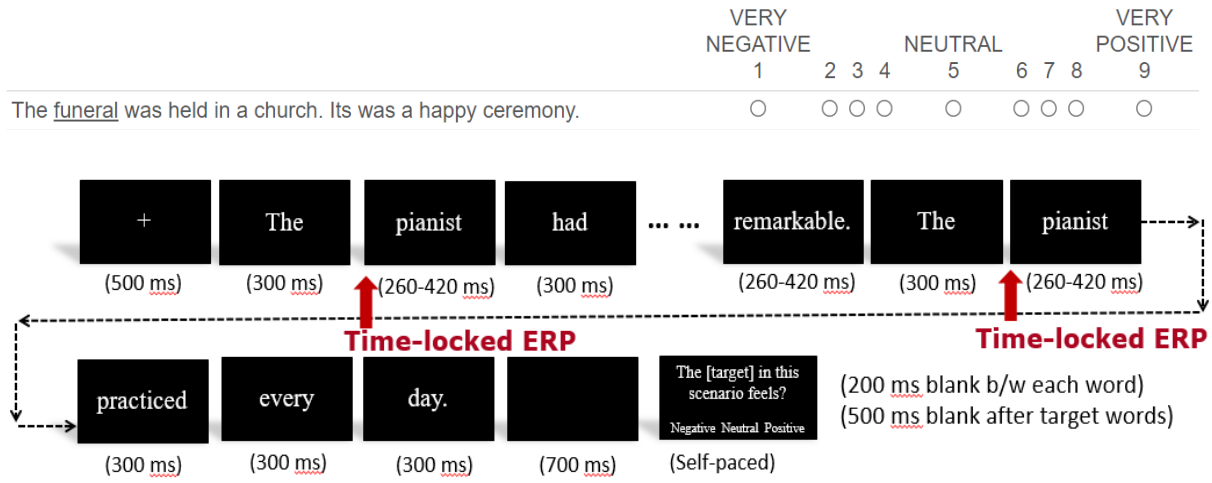

Figure 1. An example of a trial in Experiment 1 (top) and Experiment 2 (bottom)

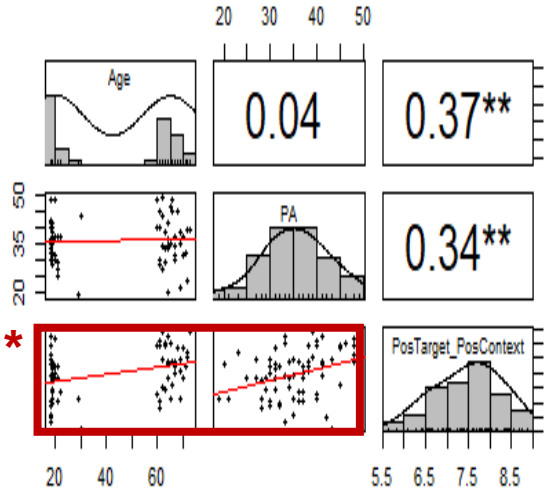

Figure 2. Exp 1: Correlation plots between age, positive affect (PA), and the valence ratings on positive targets in positive contexts (PosTarget_PosContext)

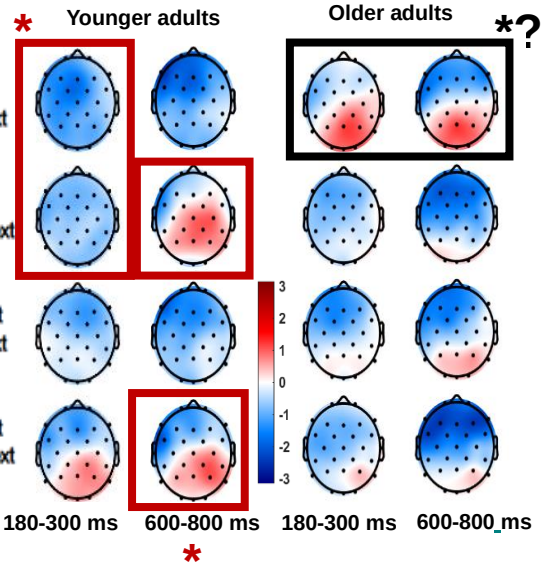

Figure 3. Exp 2: Scalp topography of difference amplitudes between the 2nd and 1st occurrences of the target words[1]

References. [1] Kauschke et al., 2019. *Frontiers in Psychology*. [2] Estes & Adelman, 2006. *Emotion*. [3] Carstensen, 2006. *Science*. [4] Ku et al., 2020. *Cognitive, Affective, & Behavioral Neuroscience*. [5] Delaney-Busch & Kuperberg, 2013. *Cognitive, Affective, & Behavioral Neuroscience*. [6] Lüdtke & Jacobs, 2015. *Frontiers in Psychology*.

[1] Data collection for older adults is still ongoing due to delay caused by Covid-19 pandemic.