

DIFFERENCES IN CHILDREN EMOTIONAL VALENCE RATINGS OF WORDS AND PICTURES

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Abstract

Words and pictures stimuli are often used in study of perception, language, and memory. More and more studies are being done on how emotional words or pictures influence different cognitive processing. However, the emotional rating process of these stimuli has rarely been studied in young children. Especially, no study has investigated emotional rating process on pre-schoolers. This research examines how young children process emotional words and pictures stimuli. More precisely, we measured age (4, 5, and 6-years-old) and sex differences (girls and boys) in emotional valence rating of pictures and words. A corpus of 90 words and 90 pictures was selected from among the emotional databases compiled by Alario & Ferrand (1999), Bonin et al. (2003), Cannard et al. (2006) Syssau & Monnier (2009). This corpus was rated by 92 French children (28 four-years-old children, 16 girls and 12 boys; 34 five-years-old children, 14 girls and 20 boys; and 30 six-years-old children, 13 girls and 17 boys). These ratings were made using a three points emotional valence rating scale (negative, neutral, and positive) based on AEJE scale (Largy, 2018). To keep the rating task simple for the children, the scale labels were using drawings of faces. The 90 Words and 90 pictures were divided in sets of 15 stimuli. Each child rated all sets of stimuli in separate sessions. These sessions were in a random order between words and pictures stimuli sets. Good response reliability was observed in the three age groups. We assessed age differences in the valence ratings: Four-year-old children shown lower mean scores in valence rating (positive, neutral, and negative) than did five-year-old ones who shown lower mean scores in valence rating than did six-year-old ones. Despite a lack of consensus in the literature, we found sex differences in the valence ratings. Girls in each age groups shown higher mean scores in valence rating than did boys. Moreover, results shown a significant difference between pictures and words ratings. Children better rated words than pictures in each age group and sex. Besides, analyses revealed significant differences in emotional valence rating between negative, neutral, and positive words and pictures stimuli. Positive words and pictures stimuli were better rated by children than negative ones which were better rated than neutral ones. Future research will compile this corpus in a database, and it could become a worthwhile tool to control emotional verbal and visual stimuli in experimental design for children.

Keywords: *Emotional rating, emotional valence, emotional pictures stimuli, emotional words stimuli.*

1. Introduction

More and more studies are being done on how emotional words or pictures influence different cognitive processes. Literature highlights influences of emotional words or pictures on a various of cognitive processes: For instance, emotional words and pictures modulated attention (Sutton & Lutz, 2018), are better remembered (Talmi & Moscovitch, 2004). But what is an emotional word or an emotional picture? According to Lang, Bradley and Cuthbert (1997) *dimensional theory*, emotional stimulus can be characterized by two main fundamental dimensions: valence (pleasant vs. unpleasant) which determines the polarity of emotional activation and arousal (calming vs. exciting) which determines its intensity. If influence of emotional words and pictures on complex cognitive processes is becoming a widely research' topic, only few studies examined emotional valence rating process itself. Especially, no study has investigated emotional valence rating process on pre-schoolers. Currently, only few studies established emotional words or pictures stimuli databases for older children. These databases indicated age or sex differences in emotional valence rating process of words and pictures.

For words, three studies investigated the differences between age or sex in children's emotional ratings in English and French languages. In English language, Vasa et al. (2006) provided emotional valence ranges for 81 words rated by 174 children (9-, 10- and 11-year-old). In French language, two

databases provided emotional valence ranges for 600 to 1031 words rated by 5-, 7-, 9-, 11- and 13-year-old children (Monnier & Syssau, 2009; FANChild; Monnier & Syssau, 2017, Monnier, Syssau et al., 2021). For age, Vasa et al. observed that children's emotional ratings were similar across the 3 age groups (9-, 10-, and 11-year-old). In contrary, Monnier and Syssau (2009, 2017, Monnier, Syssau et al., 2021) showed that with increasing age, the percentage of words rated positive decreased, and the neutral ones increased while negative ones remained stable (5-, 7-, 9-year-old). Moreover, with older children (7-, 9-, 11-, 13-year-old), the same findings are observed: the tendency to judge words positively decreased with age (Monnier, Syssau et al., 2021). For sex, Vasa et al. (2006) reported that girls provided more extreme valence ratings than did boys. However, Monnier and Syssau (2009, 2017, Monnier, Syssau et al., 2021) designs did not reveal sex differences in emotional valence ratings.

For pictures, three studies investigated age or sex differences on children's emotional ratings. For age, Zamora, et al. (2020) did not observed significant age-related differences in valence ratings between 8- to 10-year-old children and 10- to 12-year-old ones. McManis et al. (2001), observed that children (7- to 11-year-old) and teenagers (12- to 14-year-old) showed similar valence ratings of pictures than adults did. However, their results showed that younger children aged 7 rated negative valence pictures more positively and with less arousal than teenagers and adults. Cordon et al. (DAPS; 2013) showed age-related differences between children aged 7- to 9-year-old and young adults on valence ratings of pictures. Children tended to rate positive and neutral pictures more positive and arousing than did adults. No age differences were found for negative or aversive pictures. For sex, McManis et al. (2001) design indicated sex differences for children, girls were more reactive than boys to unpleasant material. No sex differences were assessed in the two other study.

There was a lack of consensus in the literature concerning age or sex differences in children's emotional valence rating process of words and pictures. Also, no published studies examined words and pictures influence on emotional valence rating in pre-schoolers aged 4- to 6-year-old. So, we anticipated a need of data for early childhood in the area.

2. Objectives

This research examines how young children process emotional words and pictures stimuli. More precisely, we measured age (4, 5, and 6-year-old) and sex differences (girls and boys) in emotional valence rating of pictures and words. We tested the hypothesis that age will influence valence rating and that no sex differences will occur according to Monnier and Syssau (2009) previous work on French children around the ages of the current study (5-, 7-, and 9-year-old).

3. Methods

3.1. Participants

92 French children participated in the study: 28 four-years-old children (16 girls and 12 boys, mean age: 4-year-old and 7 months, $SD=0.35$); 34 five-years-old children (14 girls and 20 boys, mean age: 5-year-old and 8 months, $SD=0.32$) and 30 six-years-old children (13 girls and 17 boys, mean age: 6-year-old and 6 months, $SD=0.38$). The children were recruited from a variety of school located in Region Centre Val de Loire in France. This area included a broad range of socioeconomics strata. All children were native French speakers.

3.2. Materials

The emotional valence rating test contained a set of 90 words and 90 pictures corresponding. These words and pictures sets were divided into three emotional valences (i.e., 30 negatives, 30 neutrals and 30 positives for both words and pictures stimuli). Words were selected on the basis of age of acquisition (0- to 4-year-old) defined by Alario & Ferrand (1999) and subjective frequency defined by Bonin et al. (2003). Pictures were selected from among the emotional databases compiled by Bonin, Méot, Aubert, Malardier, Niedenthal and Capelle-Toczec (2003), Bonin, Peerman, Malardier, Méot and Chalard (2003), and from the identification and denomination norms (3-year-old) developed by Cannard, Bonthoux, Blaye, Scheuner, Schreiber and Trinquart (2006).

3.3. Rating scale

The most widely used emotional valence rating scale in the field is the Self-Assessment Manikin and its updates (SAM; Lang, 1980). This non-verbal tool using drawn characters consisted in a 9 points scale (very unpleasant to very pleasant). For young children, the number of points in the scale has to be chosen according to the age and development specificities. Following the procedure developed by Syssau

and Font (2005), a 3 points scale (i.e., negative, neutral, and positive) was used. To keep the rating task simple for the young children, the 3 points scale were labelled, using drawn faces showing respectively: sad mouth and eyes, a straight mouth and eyes and a smiling mouth and eyes. Drawn faces were selected from AEJE scale (Largy, 2018). AEJE scale is a French tool adapted specifically to the understanding of young children and non-readers ones.

3.4. Procedure

Words and pictures stimuli sets were divided into 12 sets of 15 stimuli. Each child rated all sets of stimuli in twelve separate sessions. Children were asking to finger point on the 3 points scale the face that best describe their initial feeling upon the stimulus presentation. The children were tested individually in a quiet room in their school. Each session lasted approximatively 2 minutes. Around two sessions for each child were conducted over a period of time ranging from 1 hour to 1 day. At the first rating testing session, the experimenter showed the drawn faces and said “This person is sulking, is unhappy”, “This person doesn’t care, is indifferent” and “This person is smiling, is happy”. Then three practice items were reviewed. A correct discrimination of the stimulus ‘emotional valence scores 1 point, an incorrect discrimination or a lack of response score 0 point.

4. Results

4.1. Children’s ratings reliability

In order to assess the reliability of the assignment of words and pictures to the three different emotional valence, tests of internal consistency were conducted on the rating data. In each modality (i.e., words or pictures), and for each kind of emotional valence (i.e., negative or neutral or positive), correlations were all significant ($p < .05$). The stimuli are correlated with a significant level ($\alpha = .82$). More precisely, negative stimuli were correlated with an alpha level of .76, neutral ones were correlated with an alpha level of .094 and the positive ones with an alpha level of .72. These fairly high and significant correlations indicated a good level of internal coherence in the three age groups. These results validated our categorization of stimuli sets in the three different emotional valences.

4.2. Children’s emotional valence ratings

First, mean scores from the three emotional valences (max. = 30) were computed for each stimulus modality (i.e., words or pictures) for each age (4-, 5- and 6-year-old) and each sex (boys and girls). The Table 1 presented children’s mean scores of emotional valence rating for each stimulus modality (i.e., words and pictures), age (4-, 5-, 6-year-old) and sex (boys and girls). Second, mean scores were analysed using repeated measures (General Linear) that included age group (4- vs. 5- vs. 6-year-old) and sex (boys vs. girls) as a between-subjects factor, and stimulus modality (words vs. pictures), and valence (negatives vs. neutral vs. positive) as within-subject factors. As expected, we observed age differences in the valence ratings [(F(2,87) = 12,518; $p < .000$)], ($\eta^2 = 0,22$): Four-years-old children shown lower mean scores in valence rating (positive, neutral, and negative) than did five-years-old ones ($p < .00$) who shown lower mean scores in valence rating than did six-years-old ones ($p < .00$). Despite a lack of consensus in the literature, we found sex differences in the valence ratings. Girls shown higher mean scores in valence rating than did boys [(F(1,87) = 22,69; $p < .000$)], ($\eta^2 = 0,20$). Moreover, results shown a significant difference between pictures and words ratings. Children better identified words valence than pictures valence in each age groups and sex [(F(1,87) = 4,61; $p < .03$)], ($\eta^2 = 0,05$). Besides, analyses revealed significant differences in emotional valence rating between negative, neutral, and positive words and pictures stimuli [(F(2,17) = 231,84; $p < .000$)], ($\eta^2 = 0,72$). Positive words and pictures stimuli were better identified by children than negative ones ($p < .00$) which were better identified than neutral ones ($p < .00$).

Table 1. Children's mean scores of emotional valence ratings for each stimulus modality (i.e., words and pictures), valence (i.e., negative, neutral, and positive) age (i.e., 4-, 5-, and 6-year-old) and sex (i.e., boys and girls).

Stimulus modality	Age	Sex	Negative (Mean. SD)	Neutral (Mean. SD)	Positive (Mean. SD)
Words	4 ans	Boys	19 (3)	7 (6)	26 (3)
		Girls	22 (4)	4 (4)	29 (1)
	5 ans	Boys	19 (5)	8 (8)	27 (4)
		Girls	22 (4)	11 (7)	28 (4)
	6 ans	Boys	20 (4)	12 (8)	26 (3)
		Girls	22 (3)	17 (9)	27 (2)
Pictures	4 ans	Boys	20 (5)	4 (6)	28 (2)
		Girls	22 (5)	2 (4)	29 (2)
	5 ans	Boys	17 (6)	7 (9)	25 (5)
		Girls	22 (3)	14 (9)	27 (2)
	6 ans	Boys	19 (6)	10 (9)	26 (4)
		Girls	21 (2)	20 (7)	27 (3)

5. Discussion and conclusion

Experimental paradigms are widely spread to study the relationships between cognitive processes and emotional stimuli. This is the first study to examine pre-schoolers' emotional valence discrimination of negative, neutral, and positive words, and pictures. Our work highlights that emotional valence discrimination is influenced by both individual (age, sex) and material (modality of the stimulus, kind of emotional valence) factors.

First, we observed as expected an effect of age on emotional valence ratings. Attribution of an emotional valence for a word or a picture increased with age from 4- to 6-year-old. This result indicates a crucial developmental period at these ages of emotional valence discrimination for words and pictures stimuli. In fact, Syssau & Monnier (2009) also report a period of change and instability in children valence discrimination of words between 5-, 7- and 9-year-old. Our results extending this period of age. On contrary to Zamora et al. (2020) and Cordon et al (2013) studies which did not report age-related differences, our study suggests a development of emotional valence discrimination also for pictures. In addition, our results indicated that emotional valence discrimination is modulated by the modality of the stimulus (i.e., words or pictures) and the kind of emotional valence to process (i.e., negative or neutral or positive). The modality of stimulus has an influence on 4- to 6-year-old children emotional valence ratings. Indeed, children better rated words than pictures. This may be explained by a dominance of the auditory modality in young children. More precisely the auditory stimuli are more salient than visual one for young children aged 4-year-old (Soultsky & Napolitano, 2003).

Second, we observed a sex difference in emotional valence ratings. Girls in each age groups and each modality of stimulus showed higher mean scores than did boys. This finding is in accordance with previous studies that show a better sensitivity of girls to emotional words or pictures (McManis, et al., 2001; Vasa et al., 2006).

Then, we observed significant differences in children's means scores for negative, neutral and positive stimuli. Positive words and pictures were better identified than negative and neutral ones. These results confirm that young children tend to be influenced by a positive bias while they identify emotional valence of words or pictures. This positive bias has been observed with children aged 5- to 7-year-old in processing emotional valence of words, and with children aged 7 in processing emotional valence of pictures (McManis et al., 2001; Monnier & Syssau, 2009). If attribution of positive valence is an easy task for young children, attribution of a neutral one seems to be difficult. Indeed, results indicated that neutral words and pictures are the most failed in the emotional valence rating test. Attribution of a neutral valence to a stimulus is age dependant. In their designs, Monnier and Syssau (2009) showed that attribution of neutral emotional valence for words especially increased between 7- and 9-year-old. Our work also indicates an increase of neutral valence attribution across 4- to 6-year-old for both words and pictures.

Our work opens perspectives in understanding emotional valence discrimination of verbal and visual stimuli in pre-schoolers. Future research will compile this corpus of words and pictures in a database, and it could become a worthwhile tool to control emotional verbal and visual stimuli in experimental design for children.

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