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# Affective Norms for 720 French words rated by children and adolescents (FANchild)

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**Affective Norms for 720 French words rated by children and adolescents (FANchild)**

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FANchild database	

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2  
3 **Title: Affective Norms for 720 French words rated by children and adolescents**  
4 **(FANchild).**  
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**Abstract**

This study provides norms of valence and arousal for a large corpus of French words ( $N = 720$ ) rated by 674 French children (aged 7, 9 and 11) and 234 adolescents (aged 13). The ratings were made using the Self-Assessment Manikin (Lang, 1980). Because it combines evaluations of arousal and valence and includes ratings provided by 7-, 9-, 11- and 13-year-old children, this database complements and extends existing French-language databases. Good response reliability was observed in each of the four age groups. Comparing children and adolescents evaluations revealed age differences in both valence and arousal ratings. The perception of the emotional content of a word changes with age and is partly linked to sex. This age- and sex-related database will enable French-speaking researchers to study how the character of emotional words influences their cognitive processing and how this influence evolves with age. FAN child is available as an online downloadable supplement to this article.

**Keywords:** affective norms, French words, valence, arousal, age differences

## Introduction

In the field of emotion and cognition, a wide range of studies have examined how emotional words are processed by comparing them to neutral words. These studies have used various experimental paradigms, including the emotional Stroop task (e.g., Dresler, Mériaux, Heekeren, & van der Meer, 2009; Koven, Heller, Banich., & Miller, 2003), the lexical decision task (e.g., Kuchinke, Võ, Hofmann, & Jacobs, 2007; Syssau & Laxén, 2012; Windmann, Daum, & Güntürkün, 2002), immediate serial recall (Majerus & D'Argembeau, 2011; Monnier & Syssau, 2008; Tse & Altarriba, 2009), and the directed-forgetting paradigm (Korfine & Hooley, 2000; Minnema & Knowlton, 2008). However, these studies would not have been possible without the efforts of researchers to establish norms for the emotional characteristics of words.

In 1999, Bradley and Lang published the now-authoritative Affective Norms for English Words (ANEW) database. This database was developed within the dimensional theory of emotions, in line with Osgood's semantic differential theory (Osgood, Suci, & Tannebaum, 1957). This view posits that emotional meaning can be described by two main dimensions, valence and arousal, and a third less strongly-related dimension, dominance or control. Emotional valence and arousal can be represented in a bidimensional framework called the affective space. The ANEW database provides valence, arousal, and dominance norms for 1,034 English words compiled from Self-Assessment Manikin evaluations (SAM; Lang, 1980). SAM is a picture-based instrument, in which each dimension is represented graphically (with a character) on a 9-point scale. For the valence dimension, the SAM scale ranges from a happy-looking, smiling character on the left to a frowning, sad-faced character on the right. For the arousal dimension, the character on the left is wide-eyed and looks excited, while the character on the right has his eyes closed and looks calm and sleepy. For the dominance dimension, the character on the left is small to show that it is dominated, and the character on

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2  
3 the right is large to show maximum control. The ANEW database provides means and  
4  
5 standard deviations for valence, arousal and dominance ratings averaged across all  
6  
7 participants, then averaged across both male and female participants.  
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9  
10 The ANEW American database has been adapted to other languages, such as Spanish  
11  
12 (Redondo, Fraga, Padrón, & Comesaña, 2007), Portuguese (Soares, Comesaña, Pinheiro,  
13  
14 Simões, & Frade, 2012), and Italian (Montefineses, Mabrosini, Fairfield, & Mammarella,  
15  
16 2013). These works have clearly demonstrated that the emotional meaning of words varies  
17  
18 with languages and cultures. This finding underlines the need for specific tools in every  
19  
20 language. In French, FAN provides valence and arousal for 1,031 words rated by young adults  
21  
22 with the standard Self-Assessment Manikin (Monnier & Syssau, 2014).  
23

24  
25 Another factor of variability of the emotional meaning of words seems to be sex.  
26  
27 Although some studies have found no difference between the affective ratings made by males  
28  
29 and females (e.g., Redondo et al., 2007), or only minimal sex-related differences (e.g.,  
30  
31 Stevenson, Mikels, & James, 2007), other studies have shown that levels of reactivity to  
32  
33 emotional words were higher for females than for males (e.g., Monnier & Syssau, 2014;  
34  
35 Montefineses et al., 2013). Therefore, since sex may be a differentiating factor in word  
36  
37 evaluations and, thusly, participant performance in a wide range of cognitive tasks,  
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39 researchers need a tool that would allow them to take into account sex-related differences.  
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43 In addition to language and sex differences, the emotional meaning of words also seems  
44  
45 to vary with age. Age-related differences in emotional content have been evidenced when  
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47 words were rated by young and older adults (Gilet, Grünh, Studer, & Labouvie-Vief, 2012;  
48  
49 Grünh & Smith, 2008; Keil & Freund, 2009). Grünh and Smith (2008) developed the AGE  
50  
51 database (Age-Dependent Evaluations of German Adjectives) which was compiled with  
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53 ratings of 200 German adjectives by young (20-30 years of age) and older adults (65-76 years  
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55 of age). Age-related differences were observed for 31% of the adjectives in valence ratings  
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3 and for 21% of the adjectives in arousal ratings. Furthermore, positive adjectives were more  
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5 positive and more arousing for older adults than for young ones. In contrast, negative  
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7 adjectives were evaluated as less arousing by older adults than by young ones. At the other  
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9 end of the age range, Syssau and Monnier (2009) found that the emotional meaning of words  
10  
11 changed substantially between the ages of 5 and 9 years. The number of neutral words  
12  
13 increased between 5 and 7 years, whereas the number of positive words decreased between 5  
14  
15 and 9 years. Only the number of negative words remained stable with age. From a purely  
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17 quantitative point of view, there was a significant change in valence with age for 5% of the  
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19 words evaluated by the children. Such findings underline the importance of providing age-  
20  
21 adapted tools to researchers so they may examine, from a developmental point of view, how  
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23 emotional words are processed.  
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27         Studies interested in how emotional stimuli are processed by children remain scarce, but  
28  
29 a significant increase in their number is noticeable. For instance, recent studies have focused  
30  
31 on the cost effects associated with processing emotional distractors in children and  
32  
33 adolescents (Heim, Ihssen, Hasselhorn, & Keil, 2013; Cohen-Gilbert & Thomas, 2013),  
34  
35 emotional reactions to facial emotional expression during childhood (Mancini, Agnoli,  
36  
37 Baldaro, Ricci Bitti, & Surcinelli, 2013), affective reactions in anxious children (Kotta &  
38  
39 Szamosközi, 2012), attentional or memory bias for emotional information in both child and  
40  
41 adolescent emotionally disordered samples (Moradi, Taghavi, Neshat-Doost, Yule, &  
42  
43 Dalgleish, 2000; Neshat-Doost, Moradi, Taghavi, Yule, & Dalgleish, 2000), false memory  
44  
45 (Brainerd, Holliday, Reyna, Yang, & Toglia, 2010; Howe, Candel, Otgaar, Malone, &  
46  
47 Wimmer, 2010), and the influence of emotional valence on children's recall (Syssau &  
48  
49 Monnier, 2012; Van Bergen, Wall, & Salmon, 2014). Despite the increasing interest in  
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51 emotional word processing within a developmental perspective, few norms providing  
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53 children's or adolescents' emotional ratings have been published yet (Syssau & Monnier,  
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3 2009 in French; Vasa, Carlino, London, & Min, 2006 in English; Ho, Mak, Yeung, Duan,  
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5 Tang, Yeung, & Ching, 2015 in Chinese). In Syssau and Monnier (2009), we collected  
6  
7 valence ratings of 200 words at age 5, 588 words at age 7 and 600 words at age 9 using a 3-  
8  
9 point pictorial scale of face drawings with a sad mouth for negative valence, a straight mouth  
10  
11 for neutral valence, and a smiling mouth for positive valence. Vasa et al. (2006) provided  
12  
13 valence ratings for a preselected list of 81 words from three emotional categories (*threat*,  
14  
15 *positive*, and *neutral*) rated by children 9, 10, and 11 years of age using the SAM scale  
16  
17 reduced to five points. Ho et al. (2015) collected ratings of valence, arousal and threat for 160  
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19 Chinese words among adolescents aged between 12 and 17 years. To date, these databases are  
20  
21 still underused in this domain of research; this is probably due to the facts that a) two of them  
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23 provide valence but not arousal ratings, and b) the number of words rated by children was  
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25 rather small. Though researchers have not specifically used children norms to carry out their  
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27 studies, they have usually selected emotional stimuli on the basis of pilot studies in which  
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29 another sample of children rated material on emotional characteristics (i.e., Syssau &  
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31 Monnier, 2012). Occasionally, researchers selected the experimental words on the basis of  
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33 valence and arousal ratings collected from adults rather than children (i.e., Brainerd et al.,  
34  
35 2010). This kind of strategy raises questions. Indeed, Kensinger, Brierley, Medford,  
36  
37 Growdon, and Corkin (2002) observed that the effects of age on recall of positive and  
38  
39 negative words could depend on the criteria used for word selection. When the positive and  
40  
41 negative words were categorized on the basis of how they were evaluated by young and older  
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43 adults, older adults recalled more negative words than positive ones, whereas young adults  
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45 recalled more positive words than negative ones. Conversely, when the positive and negative  
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47 words were categorized on the basis of the evaluations included in the ANEW, both older and  
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49 younger adults recalled more positive words than negative ones. Consequently, it is important  
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3 to systematically verify that the emotional words selected for a study are suited to the  
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5 participants' age.  
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7 The objective of our work was to provide French-speaking researchers with a tool  
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9 which would allow them to more closely examine how a word's emotional characteristics  
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11 influence its processing in children and adolescents. Our database provides emotional  
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13 evaluations obtained from four different age groups (7-, 9-, 11-year-old children and 13-year-  
14  
15 old adolescents). This age range allowed us to determine whether the perception of word's  
16  
17 emotional signification changes with age. Our database provides both valence and arousal  
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19 evaluations: Researchers will thusly be able to manipulate and/or control both of these  
20  
21 dimensions in children and adolescents. The Self-Assessment Manikin (SAM, Lang, 1980)  
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23 was used to assess valence and arousal. Since this scale is a nonverbal, pictographic self-  
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25 report measure, it can easily be implemented with children.  
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## 32 **Method**

### 33 *Participants*

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35 We recruited 908 participants for the study. All were native speakers of French. Our  
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37 sample included 674 children and 234 adolescents. Of the 674 children, 208 were second-  
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39 graders (109 girls; mean age = 7 years 7 months; range = 7 years 1 month-8 years 1 month;  
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41  $SD = 4$  months), 204 were fourth-graders (107 girls; mean age = 9 years 7 months; range = 9  
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43 years 1 month-10 years 1 month;  $SD = 4$  months) and 262 were sixth-graders (126 girls; mean  
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45 age = 11 years 7 months; range = 11 years-12 years 2 months;  $SD = 4$  months). The  
46  
47 adolescents sample comprised 234 eighth-graders (119 girls; mean age = 13 years 8 months;  
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49 range = 12 years 8 months-14 years 2 months;  $SD = 4$  months). The entire sample was  
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51 recruited from a number of elementary and middle schools located in or around the cities of  
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53 Arles and Montpellier in the south of France. These areas include a broad range of  
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3 socioeconomic strata. Parental informed consent was obtained for all children and adolescents  
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5 who participated voluntarily to the study.  
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### 8 9 *Materials and procedure*

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11 The stimulus set contained 720 French nouns drawn from the FAN emotion database  
12  
13 compiled by Monnier and Syssau (2014). The 720-word corpus was selected on the basis of  
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15 age of acquisition (7 years) as defined in Ferrand, Grainger, and New (2003), Lachaud (2007),  
16  
17 and Niedenthal, Auxiette, Nugier, Dalle, Bonin, and Fayol (2004). We divided the entire  
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19 corpus into 12 questionnaires of 60 words and developed two versions of a questionnaire with  
20  
21 the same words arranged in two different randomized orders.  
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25 The 60 words in each questionnaire were printed in an 8-page (A4 size) test booklet. The  
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27 front page included a section in which participants gave personal information (first name, sex,  
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29 date of birth and school) and presented two practice words. Pages two to seven contained nine  
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31 words and page eight contained six words. Each word was printed in the center of the page in  
32  
33 Times 14-point font. The valence and arousal scales from the paper and pencil version of the  
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35 9-point SAM scale (Lang, 1980) were printed under each word, with the valence scale on the  
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37 left and the arousal scale on the right(see FAN, Monnier & Syssau, 2014).  
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41 We followed identical procedures for the 7- and 9-year-old children, who were tested in  
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43 groups in a quiet room at their school. Each child rated two questionnaires of 60 words each  
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45 in two separate sessions, carried out within a period ranging from one day to one week. The  
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47 first session lasted approximately 45 minutes; the second session lasted approximately 30  
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49 minutes. The instructions were adapted from Lang, Bradley and Cuthbert (2008, instructions  
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51 for child participants). The experimenter first described the valence and arousal scales, and  
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53 explained how to use both scales to evaluate personal feelings. The booklets were then given  
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55 out and the children were asked to fill in their personal information. Next, the two practice  
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3 words were reviewed. The experimenter and the children read each word aloud together and  
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5 the children were instructed to put an X above the picture of the manikin that best described  
6  
7 their initial feeling upon hearing the word. They were told to do this first for the valence scale  
8  
9 and then for the arousal scale. The aim of the practice trials was two-fold: first, we wanted to  
10  
11 ascertain that the children perfectly understood the instructions; second, we meant to show  
12  
13 that many answers were possible, i.e., that there were no right or wrong answers. After the  
14  
15 two practice trials, the experimenter read aloud the first word of the questionnaire and asked  
16  
17 the children to fill in the valence and arousal scales. Once the children had done so, the next  
18  
19 word was read aloud. If any of the children needed more time, testing was paused so they  
20  
21 could be helped. A similar procedure was used for the second testing session, except that the  
22  
23 children did not rate any practice words.  
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27 The 11-year-old children and the adolescents were tested in groups in a quiet room at their  
28  
29 middle school. Each participant rated two booklets of 60 words each in a single session  
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31 lasting approximately 45 minutes. The instructions were adapted from Lang et al. (2008,  
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33 instructions for adults participants). After listening to the instructions and rating the two  
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35 practice words, the participants read each word silently and rated it on the valence and arousal  
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37 scales, proceeding at their own pace.  
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## 43 **Results and discussion**

### 44 *Description of FAN child*

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47 Each word was rated by at least 31 seven year-old children, 27 nine-year-old children, 40  
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49 eleven-year-old children and 36thirteen-year-old adolescents. For each word, we calculated  
50  
51 mean valence and mean arousal scores for each age group and sex, and compiled the affective  
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53 ratings into a database. The database lists the mean valence and arousal ratings for each word  
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55 according to age group and sex. Column 1 of the database lists the 720 words in alphabetical  
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3 order. An English translation is given in column 2. Although our materials consisted of words,  
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5 column 3 lists picture sources (when available: “AF” for Alario & Ferrand, 1999; “B” for  
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7 Bonin, Peereman, et al., 2003); this information may prove helpful in future studies,  
8  
9 especially those involving children. Column 4 indicates the number assigned to each picture.  
10  
11 Columns 5 to 52 show the valence and arousal mean ratings (*Mean*) and standard deviations  
12  
13 (*SD*) for each of the 720 words. For each age group, these data are given for the total sample  
14  
15 (*All*) and for the girl and boy samples separately.

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17  
18 Descriptive statistics for both valence and arousal ratings and for each age group are  
19  
20 reported in Table 1.

21  
22  
23 (Table 1 about here)

#### 24 25 26 27 *Words with the highest and lowest emotional scores*

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29  
30 In order to examine whether the participants understood the rating procedure, we  
31  
32 analyzed the three words with the highest and lowest valence and arousal scores for each  
33  
34 group of participants, as determined by age and sex (Table 2). For the valence dimension,  
35  
36 words generally associated with positive emotions obtained an average score close to 9 on the  
37  
38 valence scale (e.g., *present, happiness*), whereas words associated with negative emotions  
39  
40 obtained low valence scores (e.g., *sadness, illness*). For the arousal dimension, words  
41  
42 generally associated with a high degree of excitement were given high arousal ratings (e.g.,  
43  
44 *party, surprise*), whereas words suggesting a feeling of calm (e.g., *quietness, tiredness*) or  
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46 words connoting little or no excitement (e.g., *furniture, leek*) were given low arousal ratings.  
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48 Thus, the general direction of the participants’ responses was as expected and demonstrated  
49  
50 that the rating procedure employed had been correctly understood. However, it is also  
51  
52 interesting to note that responses varied with age. Specifically, only 3 of the most positive  
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54 words (out of 12) were shared by two age groups (*laughter, party* and *present*). Four of the  
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3 most negative words (out of 12) were shared by only two age groups (*grief, illness, pain* and  
4  
5 *sadness*). For the words with the highest arousal ratings, only 2 words (out of 12) were shared  
6  
7 by three age groups (*party* and *surprise*). Finally, the 12 words with the lowest arousal ratings  
8  
9 were never the same for the various age groups.  
10

11 (Table 2 about here)  
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13

#### 14 15 16 *Reliability of valence and arousal ratings*

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18 In order to estimate inter-rater reliability, we formed two subgroups of participants  
19  
20 within each of the four age groups (odd and even participants) and calculated the mean ratings  
21  
22 for each word. We then correlated the mean ratings from both odd and even participants for  
23  
24 the two affective dimensions (i.e., valence and arousal). The adjusted correlation coefficients  
25  
26 (Spearman-Brown formula) were all positive and highly significant, ranging from .89 at age 7  
27  
28 to .94 at age 13 for emotional valence, and from .73 at age 7 to .88 at age 11 for the arousal  
29  
30 affective dimension ( $ps < .05$ ). It is also worth noting that, although we found high inter-rater  
31  
32 reliability for both valence and arousal for the four age groups, word assessments seemed to  
33  
34 be more consensual on the positive-negative continuum than on the calm-excited continuum.  
35  
36 These findings are in line with previous ones (e. g., Hinojora, Martínez-García et al., 2015;  
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38 Montefinese et al., 2013; Moors, De Houwer et al., 2013).  
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#### 45 *Consistency of present and previous ratings*

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47 To further test the generalizability of our ratings, we compared them with those  
48  
49 collected from children in our previous study (Syssau & Monnier, 2009). The present study's  
50  
51 corpus included 565 words from that our previous work. The comparison focused on the  
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53 ratings shared by the two studies, i.e., valence ratings collected from 7- and 9-year-old  
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55 children. We obtained significant Pearson correlations between the words tested in both  
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3 studies at ages 7 and 9,  $r = .79$  and  $r = .83$ , respectively,  $ps < .001$ . The similarities between  
4  
5 our present results and our previous ones suggest that the words elicited similar emotional  
6  
7 reactions despite the use of different scales to assess the valence dimension.  
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#### 10 11 *Associations between valence and arousal dimensions*

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14 Figure 1 shows the location of each word in a two-dimensional affective space defined  
15  
16 by the mean valence and mean arousal ratings of each word at ages 7, 9, 11 and 13. In order to  
17  
18 examine the relationship between the valence and arousal dimensions, we carried out a series  
19  
20 of regression analyses with emotional valence as the independent factor and arousal as the  
21  
22 dependent factor for each of the four age groups taken separately. We observed that both the  
23  
24 quadratic and linear relations between valence and arousal ratings were significant for all four  
25  
26 age groups. At age 7, the quadratic relation explained 55% of the variance, whereas the linear  
27  
28 relation accounted for 48% of the variance ( $R = .74$ ,  $p < .001$  and  $R = .69$ ,  $p < .001$ ,  
29  
30 respectively). At age 9, 65% of the variance was explained by the quadratic relationship and  
31  
32 53% of the variance was explained by the linear relationship ( $R = .80$ ,  $p < .001$  and  $R = .73$ ,  $p$   
33  
34  $< .001$ , respectively). At age 11, the quadratic and the linear functions explained respectively  
35  
36 57% and 50% of the variance ( $R = .75$ ,  $p < .001$  for the quadratic function and  $R = .71$ ,  $p <$   
37  
38  $.001$  for the linear function). Finally, at age 13, the quadratic relation explained 37% of the  
39  
40 variance, whereas the linear relation accounted for 32% of the variance ( $R = .61$ ,  $p < .001$  and  
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42  $R = .56$ ,  $p < .001$ , respectively).  
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48 The finding that words rated as highly pleasant or highly unpleasant are also rated as  
49  
50 more arousing, and that words rated as neutral are rated as less arousing is classic in the  
51  
52 literature on adults (Eilola & Havelka, 2010; Redondo et al., 2007; Soares et al., 2012; Vö,  
53  
54 Conrad et al., 2009). Studies on children have generally used pictures (i.e., photographs)  
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56 instead of words. McManis, Bradley, Berg, Cuthbert, and Lang (2001, Experiment 1) and  
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3 Sharp, van Goozen, & Goodyer (2006) asked children aged between 7 and 11 years to  
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5 evaluate pictures selected from the IAPS (Lang, Bradley, & Cuthbert, 1999). Based on the  
6  
7 results, these authors reported a quadratic relation between valence and arousal. On the other  
8  
9 hand, whereas McManis et al. (2001, Experiment 1, n=60 pictures) reported that the valence  
10  
11 and arousal dimensions were linearly independent for children, Sharp et al. (2006, n=27  
12  
13 pictures) found, as we did in the present study, that the relationship between valence and  
14  
15 arousal ratings was both linear and quadratic, with the quadratic model explaining more of the  
16  
17 variance than the linear model. This result also parallels the results of Keil and Freund's study  
18  
19 (2009) at the other end of the life continuum. These authors asked young, middle-aged and  
20  
21 older participants to evaluate the valence and arousal dimensions of 90 German verbs. They  
22  
23 found that the relationship between valence and arousal ratings was clearly quadratic for  
24  
25 young adults (the linear model being nonsignificant), and that both quadratic and linear  
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27 relations were observed for middle-aged and older groups. However, the linear relation  
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29 accounted for less of the variance than the quadratic relation, which is not the case in our  
30  
31 study. One potential reason for the inconsistency between those findings may be rooted in the  
32  
33 characteristics of our corpus: Indeed, the latter contained few negative words (i.e., 47 negative  
34  
35 words at age 7, 70 at age 9, 71 at age 11 and 66 at age 13 when a criterion of mean valence  
36  
37 ratings  $< 4$  was adopted). As mentioned above, our 720-word corpus was selected from the  
38  
39 FAN emotional database on the basis of age of acquisition ( $< 7$ ), and recent evidence has  
40  
41 suggested that words learned early in life are perceived as more positive, whereas words  
42  
43 acquired later are perceived as more negative (e.g., Bonin, Méot et al., 2003; Citron, Weekes  
44  
45 & Ferstl, 2009; Moors et al., 2013).

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52 Thusly, from a developmental point of view, our study provides evidence for age-  
53  
54 related changes in the affective space between 7- and 13-year-old children. However, the  
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3 number of negative words should be increased in order to better understand the affective  
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5 space and how it changes with age.  
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7 (Figure 1 about here)  
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### 10 11 *Impact of age and sex on emotional evaluations* 12

13  
14 In order to compare valence and arousal ratings across the age and sex dimensions, we  
15  
16 first examined the associations between the ratings of 7-, 9-, 11- and 13-year-olds, and  
17  
18 between those of girls and boys within each of the four age groups. Tables 3 and 4 give  
19  
20 Pearson correlations between the evaluations of children and adolescents, and between those  
21  
22 of girls and boys (values on the diagonal) for both the valence and the arousal dimensions.  
23  
24 Valence ratings for 7-, 9-, 11- and 13-year-olds were significantly correlated ( $.81 \leq r \leq .93$ ),  
25  
26 suggesting a general consensus among age groups on which words are considered more  
27  
28 positive and which more negative. Correlations between girls' and boys' valence ratings  
29  
30 within each of the four age groups were also significant ( $.62 \leq r \leq .79$ ), indicating that girls  
31  
32 and boys generally agreed on the words' rankings in the valence dimension. Arousal ratings  
33  
34 for 7-, 9-, 11- and 13-year-olds were significantly correlated, but the correlations were more  
35  
36 modest than those of the valence ratings ( $.54 \leq r \leq .84$ ). Hence, participants in the four age  
37  
38 groups showed a degree of consensus upon which words were slightly, moderately or highly  
39  
40 arousing. Nevertheless, there were also significant differences between their evaluations. A  
41  
42 similar phenomenon was observed when comparing the two sexes: The correlation between  
43  
44 the arousal ratings made by girls and those made by boys was only moderate, suggesting a  
45  
46 rather weak consensus on arousal evaluations ( $.35 \leq r \leq .74$ ).  
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52 Thus, perceptions of the valence of words and their positions on the positive-negative  
53  
54 continuum were relatively similar between children and adolescents, and between girls and  
55  
56 boys. In contrast, agreement between ages and sexes on the arousal dimension was weaker,  
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3 indicating differences in the way children vs. adolescents and girls vs. boys perceived words on  
4  
5 the calm-excited continuum.  
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10 (Tables 3 and 4 about here)

11 We further addressed the question of age and sex differences in emotional ratings by  
12  
13 classifying the whole set of words as either negative ( $M_{\text{valence}} < 4$ ), neutral ( $4 \leq M_{\text{valence}} \leq 6$ ), or  
14  
15 positive ( $M_{\text{valence}} > 6$ ) on the basis of their overall valence scores (combined across 7-, 9-, 11-  
16  
17 and 13-year-olds). The criteria used to classify the words were the same as those used by  
18  
19 Ferré, Guasch, Moldovan, and Sánchez-Casas (2012). This procedure resulted in 53 negative  
20  
21 (7.4% of the database), 385 neutral (53.5%), and 282 positive words (39.1%).  
22  
23

24  
25 Mean valence and arousal ratings across the entire corpus and for each valence category  
26  
27 are reported by age and by sex in Table 5. A mixed three-way ANOVA with age (age 7 vs.  
28  
29 age 9 vs. age 11 vs. age 13) and sex (girls vs. boys) as within-words factors and valence  
30  
31 category (negative vs. positive vs. neutral) as a between-words factor was carried out on  
32  
33 valence ratings. This analysis revealed main effects of valence category,  $F(2,717) = 1381.1, p$   
34  
35  $< .001, \eta^2_p = .79$ , age group,  $F(3,2151) = 68.7, p < .001, \eta^2_p = .08$ , and sex,  $F(1,717) = 17.6, p$   
36  
37  $< .001, \eta^2_p = .02$ , and significant interactions between age group and valence category,  
38  
39  $F(6,2151) = 5.8, p < .001, \eta^2_p = .01$ , sex and valence category,  $F(2,717) = 39.9, p < .001, \eta^2_p =$   
40  
41  $.10$ , age group and sex,  $F(3,2151) = 10.5, p < .001, \eta^2_p = .01$ . There was also a significant  
42  
43 three-way interaction of Age Group X Sex X Valence Category,  $F(6,2151) = 2.7, p < .05, \eta^2_p$   
44  
45  $= .01$ . To examine this three-way interaction, three separate ANOVAs were conducted, one  
46  
47 for each valence category, with the factors of age and sex. For the negative words, there was a  
48  
49 main effect of age group,  $F(3,156) = 3.3, p < .05, \eta^2_p = .06$ . Further post hoc analysis (Tukey  
50  
51 Test) showed that 7-year-olds rated negative words as less negative than 13-year-olds,  $p <$   
52  
53  $.05$ . The main effect of sex was also significant,  $F(1,52) = 59.5, p < .001, \eta^2_p = .53$ , and was  
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 3 due to the fact that girls rated negative words as more negative than boys did ( $M_{\text{girls}} = 2.78$ ,  
 4  
 5  $SD_{\text{girls}} = .85$ ;  $M_{\text{boys}} = 3.49$ ,  $SD_{\text{boys}} = .95$ ). The interaction between age and sex was not  
 6  
 7 significant,  $F(3,156) = .37$ ,  $p = .77$ . For the positive words, the ANOVA showed main effects  
 8  
 9 of both age group,  $F(3,843) = 70.9$ ,  $p < .001$ ,  $\eta^2_p = .20$ , due to a significant decrease in  
 10  
 11 valence ratings between 7- and 11-year-old-children ( $ps < .001$ ), and sex,  $F(1,281) = 36.2$ ,  $p <$   
 12  
 13  $.001$ ,  $\eta^2_p = .11$  with girls rating positive words as more positive than boys did ( $M_{\text{girls}} = 7.05$ ,  
 14  
 15  $SD_{\text{girls}} = .93$ ;  $M_{\text{boys}} = 6.77$ ,  $SD_{\text{boys}} = .91$ ). These main effects were qualified by a significant  
 16  
 17 interaction,  $F(3,843) = 19.0$ ,  $p < .001$ ,  $\eta^2_p = .06$ . Post hoc analyses (Tukey Test) indicated that  
 18  
 19 boys rated positive words as less positive with increasing age ( $ps < .001$ ) – except at ages 9  
 20  
 21 and 11, when the difference did not reach significance. With regard to girls, valence ratings of  
 22  
 23 positive words significantly decreased between 9- and 11-year-old children,  $p < .001$ .  
 24  
 25 Nonsignificant differences in valence ratings of positive words were observed between 7- and  
 26  
 27 9-year-olds and between 11- and 13-year-olds. Moreover, girls rated positive words as more  
 28  
 29 positive than boys did at ages 7, 9 and 13,  $ps < .001$ . For the neutral words, the ANOVA  
 30  
 31 revealed main effects of both age group,  $F(3, 1152) = 132.4$ ,  $p < .001$ ,  $\eta^2_p = .25$ , due to a  
 32  
 33 significant decrease in valence ratings between 7- and 11-year-old-children ( $ps < .001$ ) and  
 34  
 35 sex,  $F(1, 384) = 5.77$ ,  $p < .05$ ,  $\eta^2_p = .01$ , with girls providing lower valence ratings than boys  
 36  
 37 ( $M_{\text{girls}} = 5.06$ ,  $SD_{\text{girls}} = .92$ ;  $M_{\text{boys}} = 5.16$ ,  $SD_{\text{boys}} = .84$ ); and a significant age group by sex  
 38  
 39 interaction,  $F(3, 1152) = 16.23$ ,  $p < .001$ ,  $\eta^2_p = .04$ . Further post hoc analyses showed that, for  
 40  
 41 boys, valence ratings of neutral words significantly decreased with increasing age between  
 42  
 43 age 7 and age 11 ( $ps < .001$ ); the 11-year-olds' valence ratings tended to be superior to those  
 44  
 45 of the 13-year-olds ( $p = .09$ ). The same pattern of results was observed for girls (i.e., a  
 46  
 47 decrease of valence ratings with increasing age,  $ps < .01$ ), except that 13-year-old girls  
 48  
 49 provided significantly higher ratings than 11-year-olds,  $p < .001$ . Moreover, girls provided  
 50  
 51 significantly lower valence ratings than boys at both ages 7 and 11,  $ps < .001$ .  
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Hence, valence judgments varied according to both age and word valence categories. Although judgments of negative words were rather similar across the four age groups, positive words were judged as less pleasant with increasing age and neutral words gradually moved to the middle point of the scale. These results support our previous ones, reported in Syssau and Monnier (2009), in which we asked 5-, 7- and 9-year-old children to evaluate the valence of words on a 3-point scale (positive, neutral, negative). We found that the ratings of 5- to 9-year-old children tend to shift from the positive to the neutral area of the valence scale. Although the number of negative words remained stable with age, the number of positive words decreased and the number of neutral words increased. From a developmental point of view, it is interesting to note that the effect of age on valence judgments continues after childhood. In this respect, Grühn and Smith (2008) demonstrated an effect of age on valence evaluations of positive words, with older adults evaluating positive words more positively than young adults. In the same vein, Keil and Freund (2009) showed an effect of age on valence ratings of negative words, with older adults making more negative judgments than young adults. Valence ratings also differed according to sex, with girls providing more extreme valence judgments than boys for both negative and positive words. This phenomenon was observed in the four age groups – except at age 11 – for positive words. It supports the results reported by Vasa et al. (2006) for 9- to 11-year-old children in a study using words, and by McManis et al. (2001, Experiment 2) for 7- to 10-year-old children in a study using pictures. Sharp et al. (2006), whose participants were children between 7- and 10-years-old, only found sex-related differences when using negative pictures. The results are also consistent with previous studies on young adults (e.g., Bellezza, Greenwald & Banaji, 1986; Soares et al., 2012).

(Table 5 about here)

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 3 A mixed three-way ANOVA with age (age 7 vs. age 9 vs. age 11 vs. age 13) and sex (girls  
 4 vs. boys) as within-words factors and valence category (negative vs. positive vs. neutral) as a  
 5 between-words factor was carried out on arousal ratings. It revealed main effects of valence  
 6 category,  $F(2, 717) = 270.7, p < .001, \eta^2_p = .43$ , age group,  $F(3, 2151) = 49.9, p < .001, \eta^2_p =$   
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A mixed three-way ANOVA with age (age 7 vs. age 9 vs. age 11 vs. age 13) and sex (girls vs. boys) as within-words factors and valence category (negative vs. positive vs. neutral) as a between-words factor was carried out on arousal ratings. It revealed main effects of valence category,  $F(2, 717) = 270.7, p < .001, \eta^2_p = .43$ , age group,  $F(3, 2151) = 49.9, p < .001, \eta^2_p = .06$ , and sex,  $F(1, 717) = 35.7, p < .001, \eta^2_p = .04$ , and significant interactions between age group and valence category,  $F(6, 2151) = 18.9, p < .001, \eta^2_p = .05$ , sex and valence category,  $F(2, 717) = 6.9, p < .01, \eta^2_p = .01$ , and age group and sex,  $F(3, 2151) = 43.2, p < .001, \eta^2_p = .05$ . There was also a significant three-way interaction of Age Group X Sex X Valence Category,  $F(6, 2151) = 8.7, p < .001, \eta^2_p = .02$ . To examine this three-way interaction, three separate ANOVAs were conducted, one for each valence category, with the factors of age and sex. For the negative words, the ANOVA showed main effects of both age group,  $F(3, 156) = 5.2, p < .01, \eta^2_p = .09$  and sex,  $F(1, 52) = 9.3, p < .01, \eta^2_p = .15$ . However, these main effects were qualified by a significant interaction,  $F(3, 156) = 14.9, p < .001, \eta^2_p = .22$ . Post hoc analyses (Tukey Test) indicated that, according to age, there were no differences in arousal ratings of negative words for boys. The same pattern of results was observed for girls, except that 13-year-old girls rated negative words as more arousing than 7-, 9-, and 11-year-old girls,  $ps < .001$ . Moreover, 7-, 9-, and 11-year-old boys evaluated negative words as more arousing than 7-, 9-, and 11-year-old girls, whereas girls judged negative words as more arousing than boys at age 13,  $ps < .05$ . For the positive words, the ANOVA revealed main effects of both age group,  $F(3, 843) = 40.5, p < .001, \eta^2_p = .12$  and sex,  $F(1, 281) = 4.93, p < .05, \eta^2_p = .01$ , as well as a significant age group by sex interaction,  $F(3, 843) = 19.49, p < .001, \eta^2_p = .06$ . Further post hoc analyses showed a significant decrease in arousal ratings of positive words for boys ( $ps < .001$ ), except between age 9 and age 11, where the difference was not significant. For girls, there were no differences in arousal ratings of positive words between ages 9, 11 and 13. But 7-year-old girls judged positive words more arousing than girls in the

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3 other age groups,  $ps < .001$ . Moreover, boys provided higher arousal ratings for positive  
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5 words than girls both at ages 9 and 11,  $ps < .05$ . For the neutral words, the ANOVA showed  
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7 main effects of both age group,  $F(3, 1152) = 137.9, p < .001, \eta^2_p = .26$  and sex,  $F(1, 384) =$   
8  
9  $83.7, p < .001, \eta^2_p = .18$ . These main effects were qualified by a significant interaction,  $F(3,$   
10  
11  $1152) = 36.0, p < .001, \eta^2_p = .08$ . Post hoc analyses (Tukey Test) indicated that 7-year-old  
12  
13 boys rated neutral words as more arousing than 9-year-old boys, and that 11-year-old boys  
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15 judged neutral words as more arousing than 9-year-old boys did ( $ps < .001$ ), with no arousal  
16  
17 rating difference between age 11 and age 13. For girls, the post hoc analyses revealed that  
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19 arousal ratings were higher at age 7 than at age 9, and that the arousal ratings significantly  
20  
21 increased with age,  $ps < .001$ . Moreover, boys evaluated neutral words as more arousing than  
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23 girls of any age did ( $p < .001$ ) – except at age 13, where no significant difference was  
24  
25 observed between boys and girls.  
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29  
30 With respect to changes in arousal ratings with age for each valence category, we found a  
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32 tendency for positive words to be evaluated as less arousing with increasing age. This  
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34 tendency was particularly true for boys. Arousal ratings of negative words did not really  
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36 change with age, except at age 13 for girls, with whom a peak was observed. Neutral words  
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38 were evaluated as more arousing by 7- than 9-year-olds; the opposite trend was observed  
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40 between ages 9 and 13 for girls, who showed an increase in arousal ratings. These findings are  
41  
42 in line with those reported by Sharp et al. (2006) for evaluations of pictures by 7- to 11-year-  
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44 old children. From a lifespan point of view, Keil and Freund (2009) showed that arousal  
45  
46 ratings for negative words increase during adulthood. Grühn and Smith (2008) showed that  
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48 older adults judged positive words as more arousing than young adults did. In terms of  
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50 changes in arousal ratings by sex, boys generally rated words as more arousing than girls.  
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52 This was true for negative words at ages 7 and 9, positive words at ages 9 and 11 and neutral  
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54 words at ages 7, 9 and 11. The only exception concerned 13-year-old adolescents, among  
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3 whom girls rated negative words as more arousing than boys did. These results deserve  
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5 further investigation as they contrast with previous ones. In fact, McManis et al. (2001,  
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7 Experiment 2) and Sharp et al. (2006) reported no effect of sex on 7- to 11-year-old children's  
8  
9 arousal ratings of pictures, and the literature on adults classically reports no effect of sex (e.g.,  
10  
11 Redondo et al., 2007) or more extreme arousal ratings by women than by men (e.g., Soares et  
12  
13 al., 2012), i.e., the opposite of what we found for children.  
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## 18 **Conclusion**

19  
20 The objective of this work was to provide French researchers with valence and arousal  
21  
22 norms for a corpus of words rated by 7-, 9-, 11-year-old children and 13-year-old adolescents  
23  
24 as a function of sex. To do this, we asked participants in these four age groups to evaluate,  
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26 using the paper-and-pencil version of the SAM (Lang, 1980), the valence and arousal of 720  
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28 words acquired by age 7 years. The resulting data were used to develop the FAN child  
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30 database.  
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34 This work goes further than our previous French language study of children's emotional  
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36 ratings (Syssau & Monnier, 2009) in two main ways. First, we obtained ratings for both  
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38 arousal and valence; future French studies with children and adolescents will therefore be able  
39  
40 to select emotional words on the basis of both dimensions. Second, we obtained ratings from  
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42 both children and adolescents, thereby extending the developmental period for which  
43  
44 emotional data will be available. In line with McManis et al. (2001), our study confirms that,  
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46 from the age of 7 years on, children are able to use the pictorial 9-point SAM scale to rate  
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48 words on the valence and arousal dimensions. Despite the significant correlations between the  
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50 four age groups' ratings (i.e., age 7, age 9, age 11, and age 13), we found age-related  
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52 differences. Although judgments of negative words were rather similar across the four age  
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54 groups, positive words were judged as less pleasant and less arousing with increasing age, and  
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56 neutral words gradually moved to the middle point of the scale. These differences show that  
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3 the emotional perception of words may change with age. Therefore, it is important to  
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5 systematically check that the emotional words selected for a study are suited to the age of the  
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7 participants.  
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10 In future work, we plan to expand the FAN child database to include a larger number of  
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12 words, particularly negative words (only 7.4% of the words in the current database are  
13  
14 negative). In order to provide experimental material suitable for studies involving children as  
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16 young as 7 years, we were careful to choose only words that have been acquired at this age.  
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18 This constraint indirectly led us to select a much greater number of positive and neutral words  
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20 than negative words. In fact, several studies have found that most of the words children learn  
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22 at a young age are perceived as positive (Bonin, Méot et al., 2003; Citron et al., 2009; Moors  
23  
24 et al., 2013).  
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27  
28 In addition, it would be desirable to include ratings from other age groups between the  
29  
30 ages of 13 years and adulthood. Obtaining valence and arousal evaluations for different  
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32 periods of children's development would allow comparisons to be made with populations of  
33  
34 children with emotional disorders. The FAN child database could also be extended to older  
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36 adults, as emotional evaluations of words change throughout life.  
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39 To conclude, we hope that the FAN child database enables researchers to use emotional  
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41 words suited to the age and the sex of their studies' participants, and to more reliably  
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43 investigate the development of the relationship between emotion and cognition.  
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Table 1. Descriptive statistics for both valence and arousal ratings for 7-, 9-, 11- and 13-year-olds.

	Valence				Arousal			
	Age 7	Age 9	Age 11	Age13	Age 7	Age 9	Age 11	Age13
Mean	6.05	5.69	5.48	5.45	5.29	4.66	4.77	4.87
SD	1.36	1.38	1.32	1.28	0.97	1.20	1.06	1.00
Minimum	1.51	1.41	1.67	1.32	2.91	2.21	2.64	2.50
Maximum	8.77	8.63	8.70	8.57	8.39	8.21	8.33	8.14
Range	7.26	7.22	7.03	7.25	5.48	6.00	5.69	5.64

Table 2. Words with the highest and lowest valence and arousal scores for each age group, according to total sample (*All*), girls and boys.

		Valence				Arousal			
		WHS		WLS		WHS		WLS	
7 all	dolphin	8.77	misfortune	1.51	party	8.39	quietness	2.91	
	television	8.61	temperature	2.07	surprise	7.91	furniture	2.94	
	present	8.60	grief	2.12	present	7.86	distress	2.97	
7 boys	spaghetti	9.00	misfortune	1.81	tiger	8.44	basin	2.69	
	top	9.00	dress	1.88	surprise	8.25	illness	2.70	
	sandwich	8.94	grief	2.15	sandwich	8.06	tiredness	2.75	
7 girls	present	9.00	misfortune	1.26	party	8.87	man	1.94	
	surprise	9.00	lie	1.26	snow	8.39	tear	1.94	
	dolphin	8.89	nightmare	1.53	money	8.22	bird cage	2.00	
9 all	party	8.63	sadness	1.41	medal	8.21	beard	2.21	
	present	8.56	mistake	1.53	party	8.07	gas	2.21	
	circus	8.56	badness	2.25	circus	7.97	screw	2.22	
9 boys	money	8.69	sadness	1.57	ski	8.86	sadness	1.57	
	circus	8.57	mistake	1.64	dragon	8.47	eyelid	1.94	
	father	8.57	tear	2.14	medal	8.43	yesterday	2.00	
9 girls	happiness	9.00	nightmare	1.20	dog	9.00	cap	1.10	
	party	9.00	sadness	1.28	party	8.60	pencil	1.50	
	kindness	9.00	mistake	1.44	horse	8.33	screw	1.50	
11 all	party	8.70	sadness	1.67	surprise	8.33	dust pan	2.64	
	laughter	8.69	illness	1.73	party	8.09	sadness	2.76	
	joy	8.69	pain	1.76	ski	7.91	illness	2.80	
11 boys	laughter	8.91	illness	1.50	surprise	8.77	sadness	2.10	
	surprise	8.86	sadness	1.67	joy	8.73	quietness	2.33	
	pancake	8.68	cigarette	1.73	laughter	8.41	illness	2.50	
11 girls	present	8.93	pain	1.35	present	8.19	nap	1.85	
	party	8.86	misfortune	1.47	party	8.13	leek	2.00	
	friend	8.79	suffering	1.53	dementia	8.00	tiredness	2.14	
13 all	laughter	8.57	illness	1.32	laughter	8.14	tiredness	2.50	
	pancake	8.35	grief	1.54	surprise	8.03	nap	2.72	
	mother	8.32	pain	1.65	joy	7.78	boredom	2.76	
13 boys	laughter	8.25	illness	1.45	sport	8.21	distress	1.94	
	pleasure	8.23	badness	1.50	surprise	8.20	leek	2.25	
	dream	8.21	sadness	1.50	laughter	7.90	nap	2.27	
13 girls	pancake	8.94	illness	1.18	beach	8.41	tiredness	2.18	
	laughter	8.94	mosquito	1.18	laughter	8.41	sleep	2.65	
	beach	8.88	pain	1.24	joy	8.12	boredom	2.86	

Table 3. Correlations between valence ratings for 7-, 9-, 11- and 13-year-olds.

Age	Age			
	7-year-olds	9-year-olds	11-year-olds	13-year-olds
7-year-olds	<b>.62*</b>	.82*	.83*	.81*
9-year-olds	.82*	<b>.68*</b>	.85*	.84*
11-year-olds	.83*	.85*	<b>.78*</b>	.93*
13-year-olds	.81*	.84*	.93*	<b>.79*</b>

*Note.* Values on the diagonal are correlations between valence ratings for girls and boys. \* $p < .01$ .

For Review Only

Table 4. Correlations between arousal ratings for 7-, 9-, 11- and 13-year-olds.

Age	Age			
	7-year-olds	9-year-olds	11-year-olds	13-year-olds
7-year-olds	<b>.35*</b>	.62*	.65*	.59*
9-year-olds	.62*	<b>.64*</b>	.74*	.54*
11-year-olds	.65*	.74*	<b>.74*</b>	.84*
13-year-olds	.59*	.54*	.84*	<b>.73*</b>

*Note.* Values on the diagonal are correlations between arousal ratings for girls and boys. \* $p < .01$ .

For Review Only

Table 5. Mean valence and arousal ratings (and standard deviations) for the entire corpus and for subgroups of 53 negative, 385 neutral and 282 positive words. At each age level, data are given for the total sample (*All*) and for the girls and boys samples separately.

	7-year-olds			9-year-olds			11-year-olds			13-year-olds		
	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All	Boys	Girls	All
Valence ratings												
Entire corpus	6.1 (1.4)	6.0 (1.6)	6.1 (1.4)	5.7 (1.4)	5.7 (1.6)	5.7 (1.4)	5.6 (1.3)	5.4 (1.5)	5.4 (1.3)	5.4 (1.2)	5.5 (1.5)	5.5 (1.3)
Negative	3.7 (1.0)	3.0 (1.0)	3.3 (0.8)	3.4 (0.8)	2.8 (0.9)	3.1 (0.7)	3.5 (1.0)	2.7 (0.8)	3.1 (0.8)	3.4 (1.0)	2.7 (0.8)	3.0 (0.7)
Neutral	5.7 (1.0)	5.4 (1.2)	5.6 (0.8)	5.1 (0.9)	5.1 (1.0)	5.1 (0.7)	4.9 (0.7)	4.7 (0.8)	4.9 (0.6)	4.8 (0.7)	4.9 (0.8)	4.9 (0.6)
Positive	7.1 (0.9)	7.3 (0.9)	7.2 (0.7)	6.8 (1.0)	7.2 (0.9)	7.0 (0.8)	6.8 (0.9)	6.8 (1.0)	6.8 (0.8)	6.5 (0.9)	6.9 (0.9)	6.7 (0.8)
Arousal ratings												
Entire corpus	5.4 (1.1)	5.2 (1.3)	5.3 (1.0)	4.8 (1.3)	4.5 (1.3)	4.7 (1.2)	5.0 (1.2)	4.6 (1.1)	4.8 (1.1)	4.8 (1.1)	4.9 (1.0)	4.9 (1.0)
Negative	4.7 (1.0)	4.0 (1.0)	4.4 (0.8)	4.3 (1.3)	3.8 (1.0)	4.1 (1.0)	4.3 (1.0)	3.9 (0.9)	4.1 (0.9)	4.1 (1.1)	4.7 (1.1)	4.4 (1.0)
Neutral	5.1 (0.9)	4.7 (1.1)	4.9 (0.8)	4.3 (1.0)	3.8 (0.9)	4.1 (0.8)	4.5 (0.9)	4.1 (0.8)	4.3 (0.7)	4.4 (1.0)	4.5 (0.8)	4.5 (0.8)
Positive	5.9 (1.0)	6.0 (1.0)	6.0 (0.8)	5.7 (1.2)	5.5 (1.2)	5.6 (1.1)	5.7 (1.1)	5.3 (1.1)	5.6 (1.0)	5.4 (1.1)	5.5 (1.0)	5.4 (1.0)

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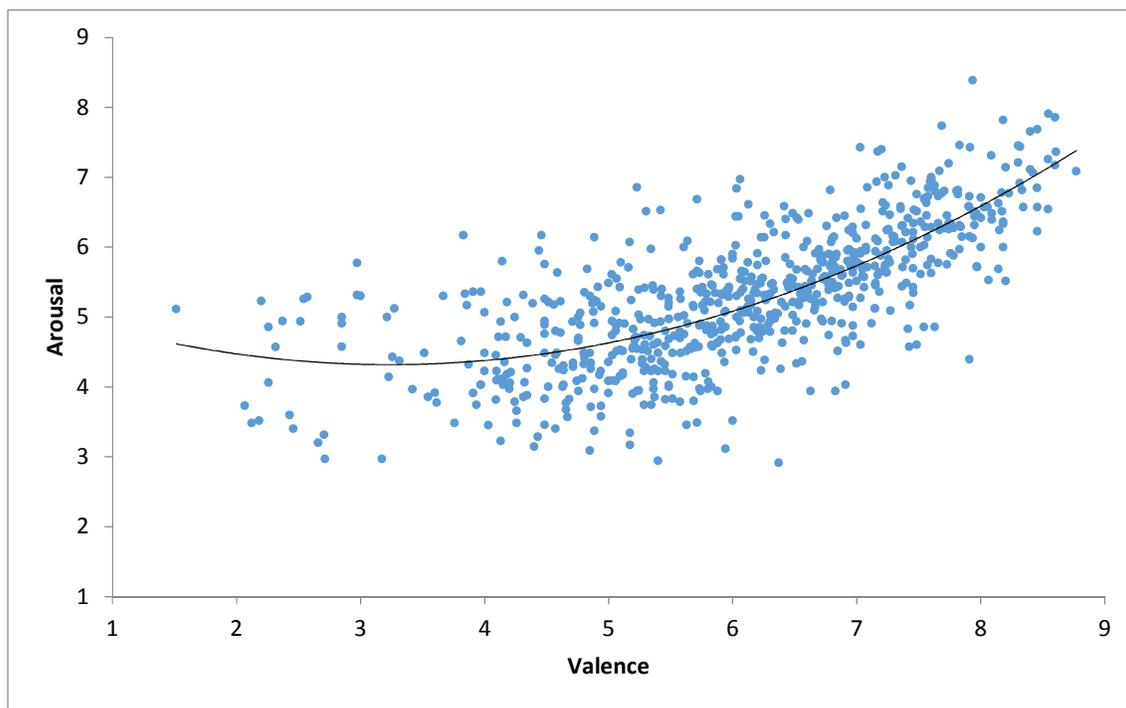
Figure caption

Figure 1

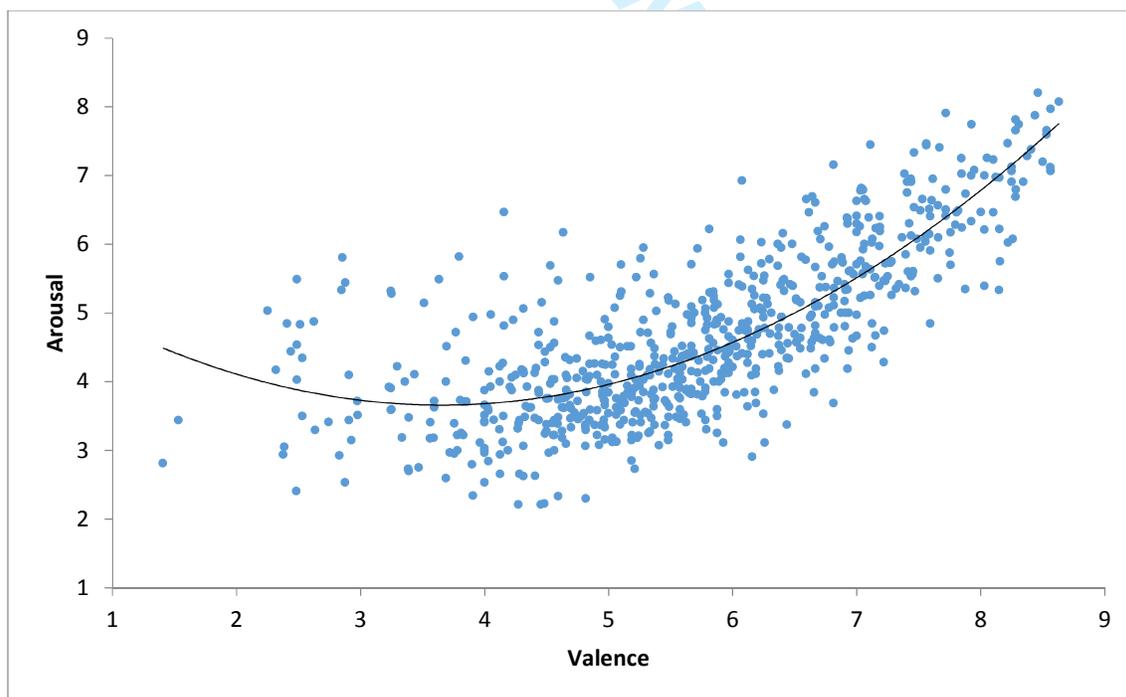
Distribution of the 720 word ratings in the affective space defined by the valence and arousal dimensions for 7-, 9-, 11- and 13-year-old children (top to bottom). The quadratic relation between valence and arousal ratings is shown by a solid line.

For Review Only

Age 7

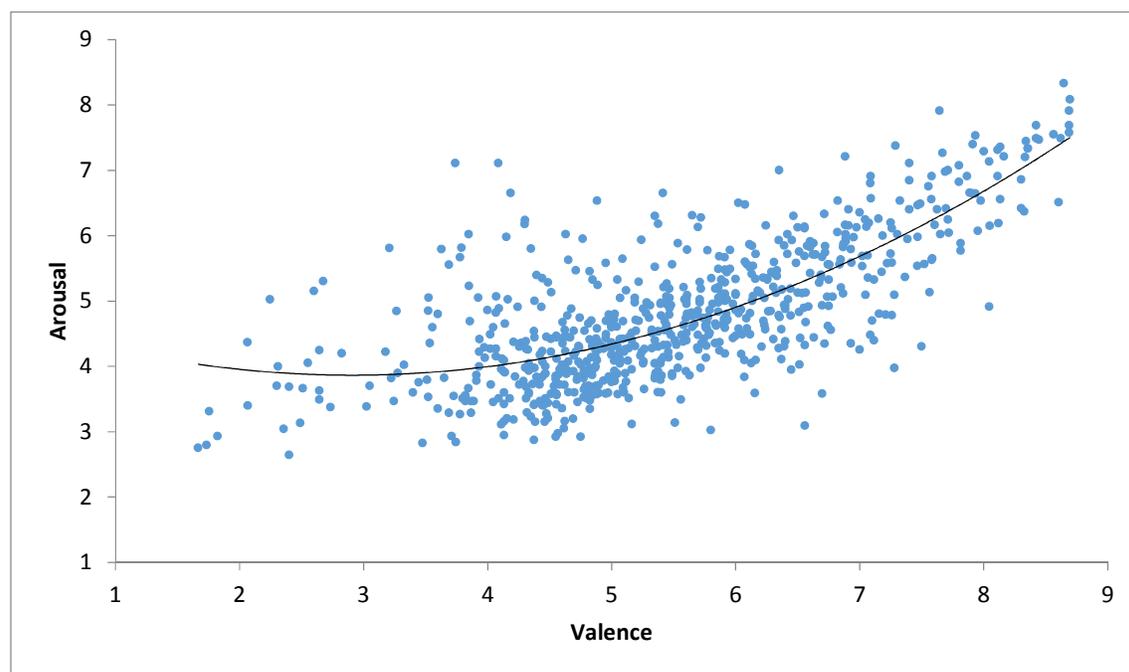


Age 9



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Age 11



Age 13

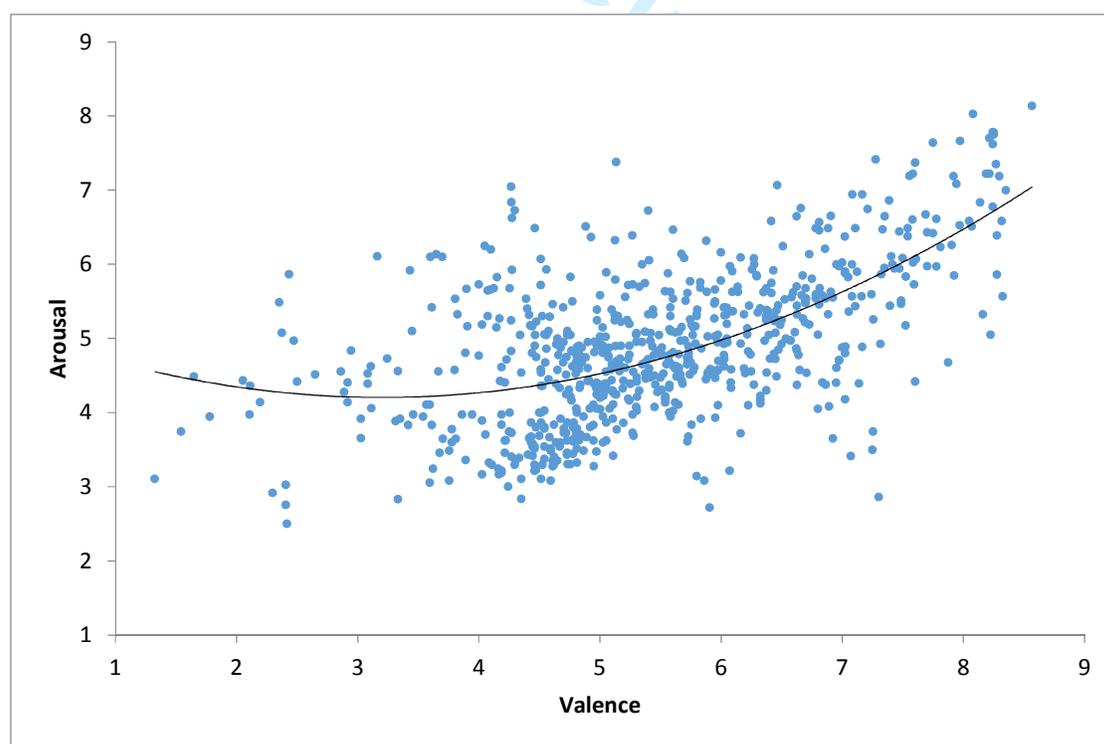


Figure 1