

# Psychological Implications of Nostalgic Scents of Childhood

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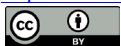
**How to cite this paper:** Petratos, E., Paradisi, N., Diamantis, O., & Stalikas, A. (2020). Psychological Implications of Nostalgic Scents of Childhood. *Psychology*, 11, 2066-2080.  
<https://doi.org/10.4236/psych.2020.1112129>

**Received:** November 27, 2020

**Accepted:** December 28, 2020

**Published:** December 31, 2020

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## Abstract

There is wide-ranging literature on the emotional effects of odors but, so far, little focus on scents that evoke nostalgia and their psychological functions. This study examines the effects of nostalgia-induced scents, more specifically what are the psychological implications of scents from childhood that evoke nostalgia. The test participants sampled five childhood scents, rating each scent as to the extent to which they were familiar and elicited nostalgia and positive emotions. The study found that one of the tested childhood scents, bubblegum, was considered the most familiar but also the most nostalgic, eliciting higher self-esteem, social connection, optimism, and inspiration. Our research findings on olfaction contribute to the existing small body of experimental research on olfactory nostalgia and facilitate the understanding of the psychological implications, triggers and affective response linked with nostalgia-induced scents.

## Keywords

Positive Psychology, Nostalgia, Childhood Scents, Senses, Positive Emotions

“Most of our childhood is stored not in photos, but in certain biscuits, lights of day, smells, textures of carpet.” Alain de Botton, Twitter (2014)

## 1. Introduction

Scents are powerful triggers of a vast array of emotions and feelings and can evoke particular memories such as childhood memories. As a matter of fact, there are scents that are strongly linked with autobiographical childhood memories and these odor-evoked memories are highly emotional (Laird, 1935; Hurz & Cupchik, 1992; Herz et al., 2004). Several studies in the lab have demonstrated that scent-evoked memories are more emotional than memories triggered by

other sensory modalities (i.e. vision, verbal etc.; Herz and Cupchik, 1995; Herz, 1996, 1998b; Herz et al., 2004; Chu & Downes, 2002). These emotional experiences serve basic psychological functions (Chrea, Delplanque, Grandjean, Cayeux, Le Calvé, Margot, Velazco, Sander, & Scherer, 2007) and can vary depending on the qualitative features of each scent (Chrea et al., 2007). For example, research has shown that sweet odors elicit happiness and wellbeing and heavy odors provoke disgust and irritation (Chrea et al., 2007).

The so-called Proust phenomenon or Proust memory is a folk wisdom evidence that smells are powerful autobiographical memory cues (Chu & Downes, 2002, 2000). Research has revealed that not only do smells have this power to unlock memories, but they can also trigger older memories than memories cued by other sensory modalities such as words and pictures (Willander & Larsson, 2006). For example, the study showed that most odor-cued memories were linked with the first decade of life (<10 years), whereas memories associated with verbal and visual cues peaked in early adulthood (11 - 20 years) (Willander & Larsson, 2006). Research exploring the strong bond between olfaction, memory and emotions has indicated that a key reason behind the unique ability of odors to vividly trigger the evocation of emotional experiences is the anatomic and functional relation between olfaction and emotion (Soudry, Lemogne, Malinvaud, Consoli, & Bonfils, 2011). Olfactory cues activate the amygdala, while scent-cued memories are associated with greater limbic and temporal lobe activity, which is involved in positive memory processing (Royet, Zald, Versace, Costes, Lavenne, Koenig, & Gervais, 2000).

The current study focuses on nostalgia, specifically, scent-evoked nostalgia and its psychological functions. Nostalgia is considered a bitter-sweet emotion and is constituted by happy feelings of positive memories of the past and negative feelings that derive mainly from strong longing for the past (Sedikides, Wildschut, Arndt, & Routledge, 2006, 2008). Nostalgia is strongly linked with olfactory experiences and memories (Reid, Green, Wildschut, & Sedikides, 2015). Research has shown that odors that evoke nostalgia have a positive impact on self-esteem, self-continuity, optimism, social connectedness, and life meaning (Reid et al., 2015).

Most research in nostalgia has been done by inducing nostalgia through narrative tasks, song lyrics and music (Reid et al., 2015). In these cases, nostalgia has been induced through reflection of nostalgic memories (Routledge, Arndt, Sedikides, & Wildschut, 2008), through reading the lyrics of a song that was previously identified as personally nostalgic (Cheung, Wildschut, Sedikides, Hepper, Arndt, & Vingerhoets, 2013) or through listening to a variety of brief musical excerpts (Barrett, Grimm, Robins, Wildschut, Sedikides, & Janata, 2010).

Scent-induced nostalgia has received very few attention. A fundamental study linking scents with nostalgia was conducted with participants from several countries with the aim to develop an Emotion and Odor Scales (EOSs) instrument that will allow the measurement of affective feelings in response to several

odors ranging from pleasant to unpleasant (Ferdenzi, Delplanque, Barbosa, Court, Guinard, Guo, Carig, Schirmer, Porcherot, Cayeux, Sander, & Grandjean, 2013). Another example is a study conducted to investigate the psychological implications of nostalgia evoked by scents (Reid, Green, Wildschut, & Sedikides, 2015). The study findings showed that participants higher in nostalgia proneness reported more scent-evoked nostalgia and scents that elicited higher nostalgia were more arousing, familiar and autobiographically relevant. Also, scent-evoked nostalgia predicted higher levels of positive affect, self-esteem, self-continuity, optimism, social connectedness and meaning in life (Reid et al., 2015).

## 2. Present Study

The purpose of the present study is to explore olfactory nostalgia and its psychological functions. Specifically, the aim is to test nostalgic scents from childhood and explore their psychological implications to young adults. The hypothesis is that the scent(s) that evoke(s) the highest nostalgia will evoke higher levels of 1) olfactory memory, 2) optimism, 3) self-esteem, 4) social connection, 5) life meaning and 6) inspiration. The research questions of this study are as follows:

- 1) Is there a childhood scent that triggers the highest nostalgia? Research shows that certain scents evoke higher nostalgia (Reid et al., 2015; Chrea et al., 2007).
- 2) What are the psychological implications of scents from childhood that evoke nostalgia? Research reveals that scents from childhood can have psychological implications (Reid et al., 2015; Chrea et al., 2007).
- 3) Is scent-evoked nostalgia correlated with a) olfactory memory, b) optimism, c) self-esteem, d) social connection, e) life meaning and f) inspiration? (Reid et al., 2015; Chrea et al., 2007).

## 3. Method

### 3.1. Participants, Material and Procedure

**Participants:** Initially, we recruited undergraduate students from psychology within the age range of 18 - 25 years ( $N = 139$ ; 114 women, 24 men;  $M_{age} = 21$ ); they were instructed to answer to the Greek version of the Southampton Nostalgia Proneness (SNS) questionnaire (Petratou, Pezirkianidis, & Stalikas, 2019) a month approximately prior to the olfactory test. The objective at this stage was to select the participants that would demonstrate moderate levels of nostalgia proneness (acceptable middle range of the 1 - 7 SNS scale:  $\approx 4$ ) to participate in the odor test. Upon completion of the first phase, we finally selected participants of moderate nostalgia proneness and age range of 18 - 25 years ( $N = 72$ ; 62 women, 10 men;  $M_{age} = 21$ ).

**Material:** 5 scents in the form of scented oils (chocolate, bubblegum, cotton candy, popcorn, butter caramel) corresponding to childhood were selected cov-

ering a basic range of the *sweets and treats* category. These scents were chosen in order to have a congruent category of scents (sweets and treats) that have references to childhood—so they could evoke nostalgia—without being affected by factors such as place of origin [e.g. nostalgia that could be caused by the smell of flowers or fruits could be related to the frequency of exposure to them (i.e. countryside vs city) or to specific periods of time (i.e. summer holidays vs winter) or seasons (i.e. Christmas)]. The scented oils were presented in glass test tubes, masked so that the participants couldn't recognize the scent from any visual cue. The scented oils were obtained from a company (Nature's Garden Wholesale Candle and Soap Supplies) that sells and fragrances in 1/2-ounce vials and has been used for similar studies (Reid et al., 2015). For each scent, participants indicated completed scent-level measures (adapted from Barrett et al., 2010; Reid et al., 2015) (see also Measures 3.2).

**Procedure:** Participants were instructed two or three days prior to the test to avoid consuming food neither earlier nor later than 2 hours before the beginning of the day of the test since the olfactory perception could be affected by the degree of hunger (Ramaekers, Boesveldt, Lakemond, van Boekel, & Luning, 2014); they were also instructed to not wear any perfume on the day of the test to avoid any bias or fatigue during when sniffing the test odors (the same guideline was applied for the test moderator).

The test took place in a controlled lab setting with no visual or olfactory stimuli that could distract participants during the experimental process; the room was also ventilated with fresh air in between sessions to maintain a neutral and unbiased setting for each olfactory session. Participants were placed at two meters between each other to avoid any interaction or bias in the evaluation. Initially, each participant was asked to take a deep breath and relax by closing his/her eyes for 10 seconds. The goal was to establish a common baseline/starting point for all participants before the beginning of the experimental measurements. Then, the test material was distributed to the participants and the measurements took place. Each participant sniffed five different scents in a sequential order; randomization was applied to avoid any order effect. The smell of each scent lasted 3 - 4 seconds while the inter-test interval between the smell of the scents was 2.5 minutes—an average duration indicated by the relevant literature regarding the inter-test interval required during the smell of different scents—during this time the participants were asked to “clean” the olfactory tract by inhaling air molecules (Ramaekers et al., 2014).

## 3.2. Measures

### 3.2.1. Southampton Nostalgia Scale (SNS)—Translated in Greek

The SNS gives participants a definition of “nostalgia” as provided by the Oxford Dictionary—a *sentimental longing for the past*—and then asks them to rate nostalgia proneness by filling seven items in total; four items measure frequency of nostalgic engagement (“how often do you experience nostalgia, “generally speaking, how often do you bring to mind nostalgic experiences”, specifically,

how often do you bring to mind nostalgic experiences”; 1 = very rarely, 7 = very frequently) and three items assessing the importance assigned to nostalgic engagement (“how valuable is nostalgia for you”, “how important is it for you to bring to mind nostalgic experiences?”, “how significant is for you to feel nostalgic”, “how prone are you to feeling nostalgic”; 1 = not at all, 7 = very much). For the test, we used the Greek version of the SNS scale (Petratou et al., 2019).

### 3.2.2. Odor-Induced Nostalgia Assessment Questionnaire

The questionnaire assesses whether each scent caused nostalgia on a 7-point scale (i.e.—How much nostalgia do you feel when you smell the scent? “I feel somewhat nostalgic”, “I feel nostalgia”). The three questions were calculated after the end of the measurements in order to form a single indicator of olfactory memory for each scent (Reid et al., 2015; Barrett et al., 2010).

### 3.2.3. Olfactory Memory Assessment Questionnaire

The questionnaire assesses the degree of olfactory memory. Questions that measure on a 7-point scale the following were used: olfactory recognition (i.e. “I recognize what the scent is”), olfactory identification (i.e. “Can I identify the scent”), olfactory familiarity (i.e. “The scent is familiar”) (Reid et al., 2015; Barrett et al., 2010). The questions were calculated after the end of the measurements in order to form a single indicator of olfactory memory for each scent (Herz & Engen, 1996).

### 3.2.4. Psychological Processes of Nostalgia Questionnaire

Questionnaire that measures the degree of positive effect of nostalgia on the positive variables (Reid et al., 2015; Cheung et al., 2013) of the olfactory experience of the scent (Reid et al., 2015). It included questions about the degree to which each individual experiences for each scent (7-point scale) *self-esteem* [(a) perfume makes me feel good about myself, (b) perfume makes me feel worthwhile (Reid et al., 2015; Barrett et al., 2010)], *optimism* [(a) perfume makes me feel optimistic about the future, (b) perfume makes me want to take on new challenges (Reid et al., 2015; Barrett et al., 2010)], *social connectedness* [(a) perfume makes me feel connected to loved ones, (b) perfume makes me feel loved (Reid et al., 2015; Barrett et al., 2010)], *meaning of life* [(a) perfume makes me feel that life has meaning, (b) perfume makes me feel that life has a purpose (Reid et al., 2015; Barrett et al., 2010)], *inspiration* [(a) perfume inspires me, (b) perfume makes me want to create].

## 4. Results

The statistical analysis was carried out with the use of SPSS Vol. 25.

*Reliability analysis.* Cronbach’s Alpha—coefficient of reliability—was calculated to explore internal consistency of the scales that were used to measure how closely related the set of items per dimension they are as a group (Cohen, Cohen,

West, & Aiken, 2002).

*Normality testing.* Shapiro-Wilk test was used to test if the scores in the sample are normally distributed. The test is based on the correlation between the data and the corresponding normal scores and is recommended by researchers as the best choice for testing the normality of data (Thode, 2002).

*Kruskal-Wallis test (or one-way ANOVA on ranks).* To test if there are significant differences across the scents used for the study we used *Kruskal-Wallis test*, a non-parametric method. It is used for comparing two or more independent samples of equal or different sample sizes. The parametric equivalent of the Kruskal-Wallis test is the one-way analysis of variance (ANOVA). A significant Kruskal-Wallis test indicates that at least one sample stochastically dominates one other sample. For analyzing the specific sample pairs for stochastic dominance, Dunn's test, with Bonferroni correction, was used (Corder & Foreman, 2009).

*Correlation analysis.* Correlation analysis was conducted to explore relationship—correlation coefficients ( $r$ )—between the scent-level measures. Strong positive correlations are considered the ones with  $r > 0.7$  (Akoglu, 2018).

#### 4.1. Reliability Analysis

Reliability analysis shows that all scent-level measures have a high level of internal consistency. Reliability coefficients (Cronbach's Alpha) per dimension are as follows: Nostalgia,  $\alpha = 0.972$ , Self-esteem,  $\alpha = 0.894$ , Optimism,  $\alpha = 0.878$ , Social connection,  $\alpha = 0.856$ , Life meaning,  $\alpha = 0.937$ , Inspiration,  $\alpha = 0.945$ , Olfactory memory,  $\alpha = 0.923$ .

#### 4.2. Normality Testing

A Shapiro-Wilk test showed a significant departure from normality for most scents for dimensions tested: the sig. value of the Shapiro-Wilk Test is below than 0.05. Sig. below 0.05, means that the data significantly deviate from a normal distribution (see Table 1 below).

#### 4.3. Kruskal-Wallis Test

A Kruskal-Wallis H test showed that there was a statistically significant difference in *nostalgia*,  $\chi^2(2) = 23.205$ ,  $p = 0.000$ , *self-esteem*,  $\chi^2(2) = 11.116$ ,  $p = 0.025$ , *optimism*,  $\chi^2(2) = 11.857$ ,  $p = 0.018$ , *social connection*,  $\chi^2(2) = 11.836$ ,  $p = 0.019$ , *inspiration*,  $\chi^2(2) = 10.317$ ,  $p = 0.035$  and *olfactory memory*,  $\chi^2(2) = 47.353$ ,  $p = 0.000$ , scores between the different scents; no statistical difference is observed in *life meaning*,  $\chi^2(2) = 2.428$ ,  $p = 0.658$  (see Table 2).

The mean rank of *nostalgia* score was 152.14 for Butter caramel, 186.35 for Cotton candy, 162.33 for Chocolate, 227.92 for Bubblegum and 173.76 for Pop Corn. For *self-esteem* score, the mean rank was 160.48 for Butter caramel, 195.13 for Cotton candy, 168.31 for Chocolate, 208.50 for Bubblegum and 170.09 for Pop Corn. For *optimism*, it was 164.66 for Butter caramel, 191.19 for Cotton

**Table 1.** Shapiro-Wilk test<sup>a</sup>.

	<b>Odor</b>	<b>Shapiro-Wilk Statistic*</b>	<b>df</b>	<b>Sig.</b>
<b>Nostalgia</b>	Butter caramel	0.904	71	0
	Cotton Candy	0.964	72	0.037
	Chocolate	0.944	71	0.003
	Bubblegum	0.925	72	0
	Pop Corn	0.921	68	0
<b>Self-esteem</b>	Butter caramel	0.918	71	0
	Cotton Candy	0.982	72	0.392
	Chocolate	0.935	71	0.001
	Bubblegum	0.964	72	0.035
	Pop Corn	0.934	68	0.001
<b>Optimism</b>	Butter caramel	0.931	71	0.001
	Cotton Candy	0.98	72	0.301
	Chocolate	0.916	71	0
	Bubblegum	0.953	72	0.009
	Pop Corn	0.919	68	0
<b>Social connection</b>	Butter caramel	0.918	71	0
	Cotton Candy	0.958	72	0.017
	Chocolate	0.931	71	0.001
	Bubblegum	0.94	72	0.002
	Pop Corn	0.911	68	0
<b>Life meaning</b>	Butter caramel	0.909	71	0
	Cotton Candy	0.973	72	0.13
	Chocolate	0.924	71	0
	Bubblegum	0.935	72	0.001
	Pop Corn	0.936	68	0.002
<b>Inspiration</b>	Butter caramel	0.899	71	0
	Cotton Candy	0.96	72	0.023
	Chocolate	0.902	71	0
	Bubblegum	0.935	72	0.001
	Pop Corn	0.923	68	0
<b>Olfactory Memory</b>	Butter caramel	0.948	71	0.006
	Cotton Candy	0.968	72	0.066
	Chocolate	0.919	71	0
	Bubblegum	0.82	72	0
	Pop Corn	0.93	68	0.001

\*This is a lower bound of the true significance. <sup>a</sup>Lilliefors Significance Correction.

**Table 2.** Kruskal-Wallis test.

	Test Statistics <sup>a, b</sup>						
	Nostalgia	Self-esteem	Optimism	Social-connection	Life-meaning	Inspiration	Olfactory-Memory
Kruskal-Wallis H	23.205	11.116	11.857	11.836	2.428	10.317	47.353
df	4	4	4	4	4	4	4
Asymp. Sig.	0.000	0.025	0.018	0.019	0.658	0.035	0.000

<sup>a</sup>Kruskal Wallis Test; <sup>b</sup>Grouping Variable: Odor.

candy, 165.01 for Chocolate 209.93 for Bubblegum and 163.59 for Pop Corn. For *social connection*, it was 157.61 for Butter caramel, 197.53 for Cotton candy, 164.49 for Chocolate, 206.00 for Bubblegum and 174.28 for Pop Corn. For *life meaning*, the score was 167.19 for Butter caramel, 186.50 for Cotton candy, 179.83 for Chocolate, 190.42 for Bubblegum and 173.39 for Pop Corn. For *inspiration*, it was 163.81 for Butter caramel, 190.19 for Cotton candy, 166.46 for Chocolate, 210.31 for Bubblegum and 171.74 for Pop Corn. For *olfactory memory*, the score was 148.59 for Butter caramel, 162.94 for Cotton candy, 167.05 for Chocolate, 254.31 for Bubblegum and 169.60 for Pop Corn (see **Table 3**).

#### 4.4. Dunn's Multiple Comparison Test

A Kruskal-Wallis test provided very strong evidence of a difference ( $p < 0.001$ ) between the mean ranks of at least one pair of groups. Dunn's pairwise tests were carried out for the five pairs of groups. There was very strong evidence ( $p < 0.001$ , adjusted using the Bonferroni correction) of a difference between Bubblegum and Cotton Candy along with Bubblegum and Butter Caramel in olfactory memory; the median of *olfactory memory* for Bubblegum was 254.31, 162.94 for Cotton candy and 148.59 for Butter caramel (see also **Table 3**). Also, significant differences ( $p < 0.001$ ) were observed in nostalgia between Bubblegum and Butter caramel, Bubblegum and Chocolate, Bubblegum and Pop Corn; the median of *nostalgia* for Bubblegum was 173.76, 152.14 for Butter caramel, 162.33 for Chocolate and 173.76 for Pop Corn (see also **Table 3**). There was no evidence of a difference between the other pairs (Field, 2013) (see **Figures 1-7**).

#### 4.5. Correlation Analysis (Pearson Correlation)

A Spearman's rank-order correlation was run to determine the relationship between nostalgia and self-esteem, optimism, social connection, life meaning, inspiration and olfactory memory marks. There was a strong, positive and statistically significant correlation between nostalgia and self-esteem ( $r_s(8) = 0.722$ ), nostalgia and optimism ( $r_s(8) = 0.667$ ), nostalgia and social connection ( $r_s(8) = 0.754$ ) and nostalgia and inspiration ( $r_s(8) = 0.698$ ). Moderate, positive and statistically significant correlation between nostalgia and life meaning ( $r_s(8) = 0.637$ ) and nostalgia and olfactory memory ( $r_s(8) = 0.586$ ) (Akoglu, 2018) (see **Table 4**).

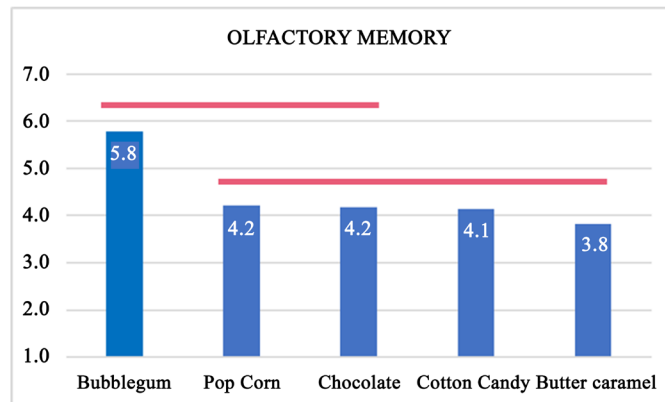


**Table 3.** Mean ranks.

		<b>Ranks</b>	
	<b>Odor</b>	<b>N</b>	<b>Mean Rank</b>
Nostalgia	Butter caramel	72	152.14
	Cotton Candy	72	186.35
	Chocolate	72	162.33
	Bubblegum	72	227.92
	Pop Corn	72	173.76
	Total	360	
Self-esteem	Butter caramel	72	160.48
	Cotton Candy	72	195.13
	Chocolate	72	168.31
	Bubblegum	72	208.50
	Pop Corn	72	170.09
	Total	360	
Optimism	Butter caramel	71	164.66
	Cotton Candy	72	191.19
	Chocolate	71	165.01
	Bubblegum	72	209.93
	Pop Corn	71	163.59
	Total	357	
Social-connection	Butter caramel	72	157.61
	Cotton Candy	72	197.53
	Chocolate	72	164.49
	Bubblegum	72	206.00
	Pop Corn	71	174.28
	Total	359	
Life-meaning	Butter caramel	72	167.19
	Cotton Candy	72	186.50
	Chocolate	72	179.83
	Bubblegum	72	190.42
	Pop Corn	70	173.39
	Total	358	
Inspiration	Butter caramel	72	163.81
	Cotton Candy	72	190.19
	Chocolate	72	166.46
	Bubblegum	72	210.31
	Pop Corn	72	171.74
	Total	360	
Olfactory-Memory	Butter caramel	72	148.59
	Cotton Candy	72	162.94

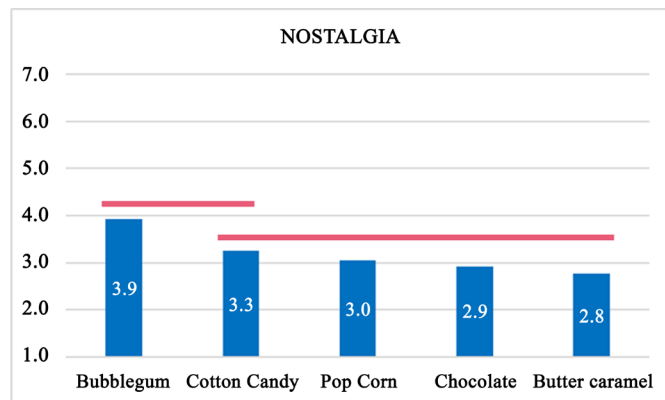
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Chocolate	72	167.05
Bubblegum	72	254.31
Pop Corn	72	169.60
Total	360	



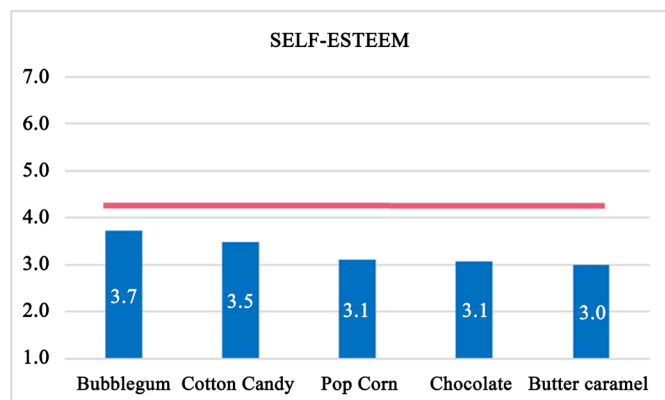
— no sig. difference (95% CI)

**Figure 1.** Olfactory memory.



— no sig. difference (95% CI)

**Figure 2.** Nostalgia.



— no sig. difference (95% CI)

**Figure 3.** Self-esteem.

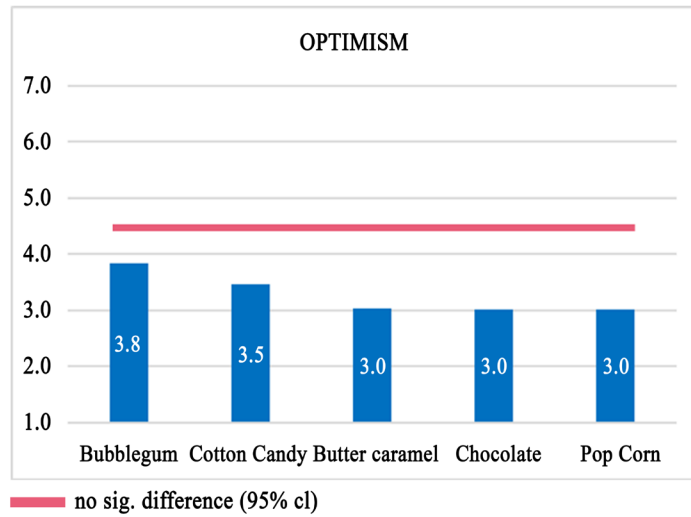


Figure 4. Optimism.

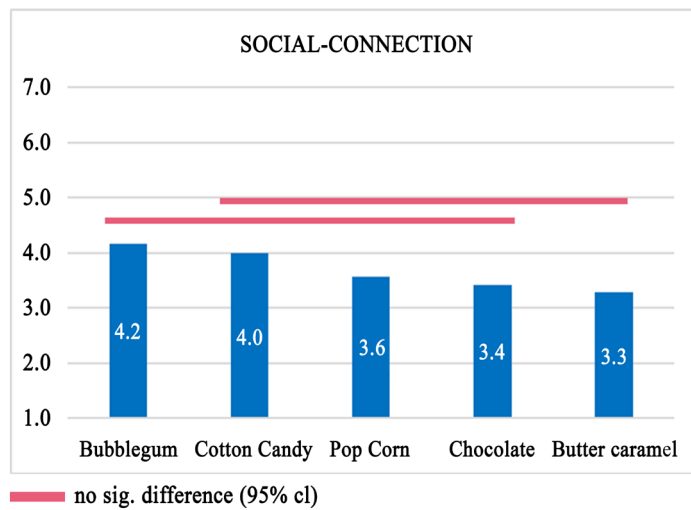


Figure 5. Social connection.

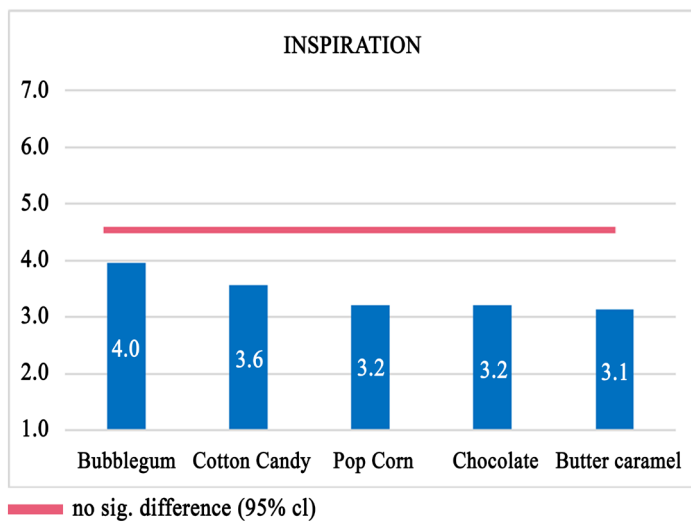


Figure 6. Inspiration.

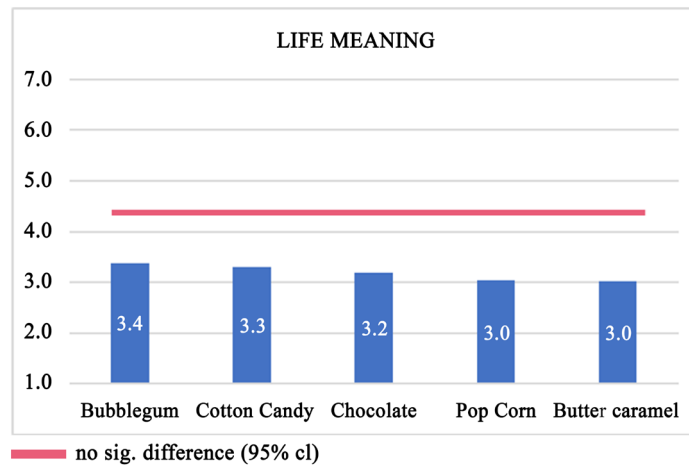


Figure 7. Life meaning.

Table 4. Pearson correlation.

		Nostalgia	Self esteem	Optimism	Social connection	Life meaning	Inspiration	Olfactory Memory
<b>Nostalgia</b>	Correlation Coefficient	1	0.722**	0.667**	0.754**	0.637**	0.698**	0.586**
	Sig. (2-tailed)		0	0	0	0	0	0
	N	360	360	357	359	358	360	360
<b>Self-esteem</b>	Correlation Coefficient	0.722**	1	0.853**	0.794**	0.786**	0.806**	0.507**
	Sig. (2-tailed)	0		0	0	0	0	0
	N	360	360	357	359	358	360	360
<b>Optimism</b>	Correlation Coefficient	0.667**	0.853**	1	0.748**	0.796**	0.802**	0.469**
	Sig. (2-tailed)	0	0		0	0	0	0
	N	357	357	357	356	355	357	357
<b>Social connection</b>	Correlation Coefficient	0.754**	0.794**	0.748**	1	0.729**	0.801**	0.603**
	Sig. (2-tailed)	0	0	0		0	0	0
	N	359	359	356	359	357	359	359
<b>Life meaning</b>	Correlation Coefficient	0.637**	0.786**	0.796**	0.729**	1	0.761**	0.390**
	Sig. (2-tailed)	0	0	0	0		0	0
	N	358	358	355	357	358	358	358
<b>Inspiration</b>	Correlation Coefficient	0.698**	0.806**	0.802**	0.801**	0.761**	1	0.523**
	Sig. (2-tailed)	0	0	0	0	0		0
	N	360	360	357	359	358	360	360
<b>Olfactory Memory</b>	Correlation Coefficient	0.586**	0.507**	0.469**	0.603**	0.390**	0.523**	1
	Sig. (2-tailed)	0	0	0	0	0	0	
	N	360	360	357	359	358	360	360

\*\*Correlation is significant at the 0.01 level (2-tailed).

## 5. Discussion

The results of the study provide empirical support for the fact that childhood scents can trigger nostalgia and that there are scents that evoke significantly higher nostalgia than others—bubblegum, cotton candy (see **Figure 2**). Also, the analysis revealed that the scent that elicited the highest nostalgia, bubblegum, (see **Figure 2**) triggered the highest olfactory memory (see **Figure 1**) showing the strong linkage between nostalgia and memory activation through olfaction (Chrea et al., 2007).

Furthermore, the study confirms the psychological functions and particularly the positive impact of scent-evoked nostalgia (Chrea et al., 2007). Specifically, the study shows strong, positive correlation between nostalgia and self-esteem, optimism, social connection and inspiration (see **Table 4**) (Reid, Green, Wildschut, & Sedikides, 2015).

### 5.1. Limitations and Future Directions

The results of this study should be considered directional since there are various factors that should be taken into consideration for future research. For example, the vast majority of the sample was women ( $M_{age} = 21$ ).

Another important factor to consider is the category of scents that were used. It would be interesting to explore psychological functions of a broader variety of scent categories and investigate if there are differences in their psychological implications factoring in gender, age or other individual differences (i.e. personality traits).

### 5.2. Implications

Overall, the study could have several scientific and clinical applications. For example, mental health professionals could use childhood scents that trigger nostalgia in their interventions with clients—during the therapeutic process—to access difficult memories for trauma processing or for certain exercises of calming down (Torre, 2008).

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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