Remembering Beloved Objects From Early Childhood, Middle Childhood, and Adolescence and the Role of the Five Senses

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Abstract

Beloved objects are cherished and valued possessions that we feel attached to. Previous research has demonstrated that the functions of beloved objects change across a lifespan. However, beloved objects may not only be appreciated because of their functions but also because of their sensory qualities. We hypothesized that the sensory experiences with beloved objects show a developmental trajectory and that the proximal senses (touch, taste, smell) become less important across childhood and adolescence, while the distant senses (vision, hearing) become more important. Moreover, we assumed that the observed changes in the sensory experiences are associated with the corresponding changes of functions across life stages. Building on the idea that those (perceptual) aspects of our environment that are particularly important to us are preferentially stored in memory, we hypothesized that this developmental trajectory would also be reflected in retrospective accounts. Hence, participants (N = 225) were asked to remember beloved objects from early childhood, middle childhood, and adolescence, to describe their functions and to answer questions regarding their sensory experiences with the objects. The mixed methods data analyses confirmed our hypotheses. Taken together, our study illustrates and underlines the importance of beloved objects for thinking, behavior, memory, and identity.

Keywords: beloved objects; valued possessions; lifespan; senses; memory

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When you were a child, did you have a favorite stuffed animal that you used to carry around all day long and that you held in your arms when falling asleep? What about today? Do you have a favorite cup from which you regularly drink your coffee – or maybe a necklace that you inherited from your grandmother and that reminds you of her whenever you put it on? All of these objects are *beloved objects*, that is, cherished and valued possessions that we feel attached to and that are especially dear and important to us. Initially, object attachment was investigated in infants and young children: In his seminal work, Winnicott (1953) proposed that so-called transitional objects provide young children with a sense of security that enables them to develop a sense of self and to explore their environment more freely (see also Litt, 1986; Richins & Chaplin, 2021). Since then, however, it has become clear that not only young children, but also adolescents and adults have beloved objects that become part of their extended selves (Belk, 1988; Csikszentmihalyi, 1993; Csikszentmihalyi & Rochberg-Halton, 1981; Mead & Baumeister, 2021; Wheeler & Bechler, 2021), and that can play an important role when remembering one's past (cf. Heersmink, 2018; 2020).

Interestingly, the functions of beloved objects change across the lifespan (see, e.g., Dyl & Wapner, 1996; Furnham & Jones, 1987; Habermas, 1996; Kamptner, 1991; Kleine & Baker, 2004; Myers, 1985). Most studies in the field have focused on the early stages of life (for studies on beloved objects in later life, see, e.g., Kroger & Adair, 2008; Phenice & Griffore, 2013; Stevens et al., 2019). In accordance with Winnicott's (1953) observation, beloved objects in *early childhood* often have a soothing function: They "provide comfort and security for their young owners particularly at bedtime, during anxiety-arousing situations, and during separations from primary caregivers" (Kamptner, 1991, p. 210; see also Myers, 1985). In *middle childhood,* fulfilling the needs for competence and mastery becomes more important (Dyl & Wapner, 1996; Myers, 1985). In *adolescence* (and young adulthood),

beloved objects support two more functions: developing a sense of self-identity and establishing intimacy with others (Dyl & Wapner, 1996; Myers, 1985; see also Csikszentmihalyi & Rochberg-Halton, 1981; Kamptner, 1991).

By definition, beloved objects have a close relationship with their owner, implying that they are often placed prominently in one's room, accompany their owner in many situations, and are frequently used. Therefore, besides their functions, their *sensory qualities* may also play an important role. For instance, a teddy bear may not only be a beloved object because it works as an emotional stabilizer for a young child but also because it is soft and fluffy or because it smells familiar. Similarly, a pullover may be a beloved object because it was a present from a dear friend but also because it has a nice color. To date, however, "we have only a limited understanding of how [our senses] affect our cognitive processes and, especially, our autobiographical memory" (Ernst et al., 2021, p. 1); that is, although we experience the world and make memories using our perceptual abilities, the exact role that the five senses (vision, hearing, touch, smell, and taste) play in this context remains largely unknown. This general observation also applies to beloved objects in particular.

The lack of direct evidence notwithstanding, the existing studies allow for at least some informed speculations. As vision is the most important sense for most adults in our present-day societies (Hutmacher, 2019) and as current models auf autobiographical memory claim that the formation and retrieval of autobiographical memories heavily rely on vision (e.g., Conway, 2001; Knez et al., 2017; Rubin, 2005; 2006; see also Hutmacher, 2021), one might assume that vision is the most important sensory modality in the context of beloved objects. If this were the case, the visual appearance of beloved objects should be more important than, for example, their smell or the way they feel – both when interacting with the objects and when remembering these interactions later on. However, one could also speculate that there is not only a developmental trajectory with respect to the *functions* of beloved objects, but also with respect to the *importance of the five senses* (see, e.g., Becker, 2009;

Ernst, 2008). Put differently, this would mean that the sensory experiences that we have with beloved objects and the memories that we keep from these objects are potentially centered around different modalities, depending on the stage of life during which we interacted with them.

In order to describe this hypothesized developmental trajectory in more detail, it is helpful to classify the five senses into two groups: the *proximal senses* (touch, smell, and taste), which are "associated with the body and what is in reach of the body" and the *distant senses* (vision, hearing), which permit "the perception of a world beyond the body's immediate reach" (Rodaway, 1994, p. 26; see also Katz, 1925/1989).[1] Although the development of the five senses begins by around the second month of pregnancy and newborns are consequently already equipped with all senses (see, e.g., Clark-Gambelunghe & Clark, 2015; Haith, 1986), in the beginning of life, the proximal senses seem of particular importance. For instance, touch has been termed the 'first sense' (Fulkerson, 2014) as well as the 'deepest sense' (Classen, 2012). During that phase, the other two proximal senses, taste and smell, seem equally important for intimate experiences (Becker, 2009) – a claim that is indirectly also supported by studies that used retrieval cues in different modalities and that have demonstrated the crucial role of smell in early childhood memories (Chu & Downes, 2000; Miles & Berntsen, 2011; Willander & Larsson, 2006, 2007). Over the course of the first years, however, when children begin to explore their environments more freely and pursue activities that have a greater spatial range, the distant senses arguably become more important (Becker, 2009).

[1] The distinction between distant and proximal senses can be traced back to Plato and Aristotle and has since had a long career in the history of Western philosophical thought (see, e.g., Classen, 1997; Howes, 2003; Kovach, 1970). Rather than speaking of *distant* and *proximal* senses, many authors speak of *higher* senses (vision, hearing), which are considered to be involved in intellectual thought and aesthetic experience, and *lower* senses (touch, smell, taste), which are considered to be rather primitive and animalistic. To avoid these evaluative connotations, we use the more neutral terms distant and proximal senses.

Interestingly, far less is known about the differential role of the five senses beyond early childhood. As we live in inherently (audio-)visual cultures (Mirzoeff, 1999; see also Hutmacher, 2019), however, one could speculate that the developmental trajectory observed in early childhood progresses through middle childhood and adolescence. In other words, we assume that the distant senses become more and the proximal senses less important across these three stages of life. Crucially, these changes in importance should also be observable in the context of beloved objects. Moreover, as the functions of beloved objects are closely associated with particular kinds of objects (e.g., the soothing function of a teddy bear), which in turn afford different sensory experiences (e.g., holding and cuddling the teddy bear), we hypothesize that the observed changes in the sensory experiences with beloved objects are associated with the corresponding changes of functions across life stages.

Assuming that those aspects of our environment and those perceptual impressions that are particularly important to us in a given moment are preferentially stored in memory, this developmental trajectory should also be reflected in retrospective accounts (cf. Brown, 2014): Remembering beloved objects from different life stages should go along with different sensory experiences being salient. Such a finding would potentially also challenge established models of autobiographical memory (e.g., Rubin, 2005; 2006), which postulate – as mentioned above – a close link between vision and autobiographical memories. More specifically, such a finding would demonstrate that the importance and salience of the five senses when remembering beloved objects, which are by definition infused with autobiographical meaning, depends on the specific stage of life and that the dominance of vision is – at least in this context – not established until later childhood and adolescence.

To investigate our hypotheses, we asked participants to remember beloved objects from early childhood, middle childhood, and adolescence, to rate the importance of the five senses with respect to these objects, and to describe the most intense perceptual impression associated with the objects. In addition, we also asked the participants to describe the

functions of the beloved objects in order to replicate previous findings and to be able to connect the changes with respect to the functions to the changes with respect to the importance of the five senses.

Method

Participants

The minimum sample size (N = 116) was based on a power analysis (G*Power 3.1.9.7; Faul et al., 2007) to have sufficient power (.95, α = .05) in order to detect a small interaction effect (f = 0.15) in a within-subjects design with the two factors *stage of life* (early childhood, middle childhood, adolescence) and *sense* (distant versus proximal). The decision to assume a small interaction effect was based on the fact that there are no previous studies investigating the role of the five senses in the context of beloved objects and that we consequently considered it best to use a conservative estimate in order not to miss a real effect. As we estimated that about ten percent of the participants would not be able to provide a beloved object for each stage of life and could thus not be included in our main analyses, we decided to recruit at least 125 participants but to continue data collection if necessary. Among the first 125 participants, only about the half of the participants remembered a beloved object for all three stages of life ($N_{One\ Object}$ = 13, $N_{Two\ Objects}$ = 45, $N_{Three\ Objects}$ = 67). Hence, we decided to collect data from additional 100 participants, resulting in a final sample of 225 participants (80 female, 139 male, 6 diverse, M_{Age} = 25.56, SD = 4.48, 18-35 years), in which about one half of the participants remembered a beloved object for all three stages of life ($N_{No\ Object}$ = 1, $N_{One\ Object}$ = 24, $N_{Two\ Objects}$ = 88, $N_{Three\ Objects}$ = 112).

The study was programmed on SoSciSurvey (Leiner, 2019). Participants were recruited via Prolific (www.prolific.co). Participation was only possible for Prolific users with an approval rate of at least 90% who indicated having German as first language and who were 18 to 35 years of age. The participants provided informed consent and after completing the study, they were compensated with €3.50. The study lasted about 20 minutes. Data collection

took place from February 2, 2021 to February 18, 2021. The local ethics committee approved the study. All data exclusions, manipulations, and measures are reported. The study was preregistered (https://osf.io/bhzmt/?view_only=1fac6b3c82664550a8ba946011d7e75d).

Procedure and Materials

Before beginning with the study, the participants were told that beloved objects can be defined as objects to which they have an intimate connection and that are especially dear and important to them. Then, they were asked about beloved objects from three different stages of their lives (i.e., early childhood: until six years of age; middle childhood: six to eleven years; adolescence: 12-18 years). The order in which the participants were asked about the three stages of life was counterbalanced across participants.

First, the participants were asked to remember the particular stage of life as vividly as possible. Next, they were asked to indicate whether they had had a beloved object in this stage of their life. In case participants indicated not having had a beloved object in a particular stage of life, they continued with the next stage of life until they had been asked about all three stages. If they reported having had such an object, the participants were asked to answer specific questions about the object, which are described in the following.

Object Description and Function

Participants were asked to name and briefly describe a beloved object from the stage of life that they were being asked about (e.g., “a teddy bear I got from my grandmother”). In addition, they were asked to describe why the specific object qualified as a beloved object (e.g., “My teddy bear helped me to fall asleep at night”) and responded to both questions in an open text field. If they had more than one beloved object in a specific stage of life, they were asked to focus on the object that they deemed most important.

Importance

Participants retrospectively rated the importance of the beloved object in the specific stage of life on a 7-point Likert scale, ranging from “very unimportant” to “very important”.

Most Intense Perceptual Impression

Participants were asked to give a detailed description of the most intense perceptual impression related to the beloved object when remembering it (e.g., "The teddy bear was soft and fluffy"), giving the description in an open text field.

Importance of the Five Senses

Participants rated the importance of each of the five senses (vision, hearing, touch, taste, and smell) regarding the memory of the beloved object on a 7-point Likert scale, ranging from "very unimportant" to "very important". The order in which participants were asked about the importance of the five senses was random. The ratings were used to calculate two dependent variables. First, we calculated the *average importance for distant and proximal senses*. The ratings for vision and hearing were averaged to obtain a measure for the average importance of the distant senses. The ratings for touch, smell, and taste were averaged to obtain a measure for the average importance of the proximal senses. Second, we calculated the *highest importance for distant and proximal senses*. The highest importance rating among vision and hearing was used as an indicator of the highest importance of the distant senses. The highest importance among touch, smell, and taste was used as an indicator of the highest importance of the proximal senses.

Vividness

Participants rated the vividness of their memory for the beloved objects using an adapted version of the vividness subscale of the short form of the Memory Experiences Questionnaire (MEQ; Luchetti & Sutin, 2016); that is, the participants rated three items ("My memory for this object is very vivid", "My memory for this objects is very detailed", "My memory for this object is dim [reverse coded]") on a 5-point Likert scale, ranging from "strongly disagree" to "strongly agree". The ratings for the three items were averaged to obtain an estimate for the vividness.

Presence of the Object

Participants were asked to state whether they could see the beloved objects while filling in the questionnaire (“yes” or “no”).

Demographics

After being asked about their beloved objects in the three stages of life, the participants answered demographic questions regarding age and gender.

Results

Data Processing

In the preregistration, we stated that those participants who did not name a beloved object for all three stages of life would be excluded. This exclusion rule was based on the assumption that only about 10% of the participants would not be able to remember a beloved object. As stated above, however, only about one half of the participants stated having had a beloved object in all three stages of life (while almost all of them had had a beloved object in at least one stage of life; see above). Against this background, we decided to deviate from our preregistered analyses in order to be able to include the data of all participants and to increase the statistical power of our analyses. More specifically, we decided to use linear mixed-effects models for testing all our hypotheses.

In addition, the preregistration also stated that the participants who indicate that they were able to see the beloved object that they were describing while participating in the study would be excluded. The number of beloved objects that were visible for the participants was quite high (early childhood: 20 out of 173 objects, middle childhood: 28 out of 188 objects, adolescence: 57 out of 175 objects). Hence, excluding these participants would have drastically reduced sample size and power. Note also that the exclusion rule was formulated to ensure that the importance ratings for vision are not biased due to the fact that objects are visible to participants. However, the importance ratings for vision did not differ between objects that were visible to the participants ($N_{Objects}$ = 105, $M_{Importance}$ = 6.11, SD = 1.27) and

those that were not ($N_{Objects}$ = 431, $M_{Importance}$ = 6.01, SD = 1.32), $t(534) = 0.75$, $p = .45$, $d = 0.08$. Against this background, we decided not to exclude these participants.

As they were not part of the main research questions, the preregistered analyses of the overall importance and vividness ratings for the beloved objects, of potential serial position effects as well as the relation between vividness and the involvement of distant and proximal senses are reported in the supplemental material.

Qualitative Data Analysis

The qualitative data analysis was conducted with MAXQDA 2020 (VERBI Software). We conducted two separate qualitative data analyses: one to analyze the kinds of beloved objects and their functions and one to analyze the descriptions of the most intense perceptual impression. We analyzed the kinds of beloved objects and their functions using the method of qualitative content analysis (see, e.g., Mayring, 2014). First, a codebook was created based on initiating text work (e.g., Kuckartz, 2019); that is, an initial read-through of the material was used as an inductive coding strategy to create different categories to capture both the kinds of beloved objects and their functions. The codebook included definitions of each category as well as examples and explicit coding rules. Next, the data were coded based on the codebook. To ensure the objectivity of the coding process, 20% of the data were coded by two independent raters. The interrater reliability (Brennan & Prediger, 1981) indicated an almost perfect agreement (Landis & Koch, 1977), $\kappa = 0.94$. Against this background, one rater coded the remaining material. However, open questions and potentially ambiguous sections were discussed between the two raters.

In our second qualitative analysis, the descriptions of the most intense perceptual impression provided by the participants were coded for the involvement of the five senses. More specifically, it was coded whether each of the five senses was part of the description (0 = the sense was not mentioned, 1 = the sense was mentioned). If a participant wrote, for instance, that “the teddy bear was brown, cuddly, and smelled in a particular way”, vision,

touch, and smell were coded with 1, while hearing and taste were coded with 0. Some features of objects (e.g., form) can be perceived with more than one sense (e.g., vision and touch). If it became clear from the description that the participant was referring to one particular sense and not the other, only this sense was coded. If it remained unclear, which sense the participant was referring to, both senses were coded. The first 20% of the data were coded by two independent raters. The interrater reliability indicated an almost perfect agreement, $\kappa = 0.98$. Against this background, one rater coded the remaining material. However, open questions and potentially ambiguous descriptions of the most intense perceptual impression were discussed between the two raters.

Quantitative Data Analysis

We analyzed our data with R 4.0.3 (R Core Team, 2020). For the definition of the linear mixed-effects models, we used the lme4 package (Bates et al., 2015). In addition, we used the emmeans package to calculate the estimated marginal means (Lenth, 2021). In our follow-up analyses, we evaluated the significance of the fixed effects in the models with Type II Wald chi-square tests using the car package (Fox & Weisberg, 2019). The p-values for the Type II Wald chi-square tests were adjusted using the Tukey method for comparing a family of three estimates.

Beloved Objects and Their Functions

Kinds of Beloved Objects

Participants named a wide range of objects that qualified as beloved objects for them. A detailed overview of the category frequencies and a statistical analysis of the changes regarding the frequency of the different categories across the three stages of life can be found in the supplemental material (see also Figure 1 for the associations between the kinds of beloved objects and their functions across the three stages of life). The different categories are described in the following. The typical example among *stuffed animals* was the teddy bear. However, the participants also mentioned various other kinds of stuffed animals. With respect

to *toys*, they named, for instance, puppets, action figures, rocking horses, toy cars, and building bricks. *Vehicles and mobility devices* included mostly bicycles, scooters, and motorbikes. However, one participant also mentioned his father's truck. *Clothes and jewelry* included clothes, such as the person's favorite pullover, t-shirt, scarf, or pair of shoes, as well as jewelry and accessories, such as bracelets, rings, wristwatches, and barrettes. Beloved objects from their *personal environment* were objects that the participants kept in their immediate vicinity. This heterogeneous category included objects ranging from bedclothes (e.g., pillow, blanket) and furniture (e.g., couch, bed) over decorative objects (e.g., statue, painting, poster) to school-related objects (e.g., pen, pencil case, school bag). Finally, the participants named a wide range of objects that they used when engaging in their *hobbies*. The objects ranged from game consoles (e.g., Nintendo, PlayStation, Game Boy) and computers to music playing devices (e.g., MP3-player, loudspeaker, headphones) and musical instruments (e.g., piano, guitar), to diaries, books, and sports equipment (e.g., tennis ball, puck, football).

Functions of Beloved Objects

The beloved objects were beloved objects for various reasons. A detailed overview of the category frequencies and a statistical analysis of the changes regarding the frequency of the different categories across the three stages of life can be found in the supplemental material (see also Figure 1 for the associations between the kinds of beloved objects and their functions across the three stages of life). The different categories are described in the following. Many of the objects were a source of *fun, enjoyment, and play* for the participants. Some participants felt a distinct *pride of ownership* with respect to the beloved object. For instance, they claimed that they were proud of owning a "cool" object or that their admiration for the object was "almost religious". The beloved objects were also appreciated because of their *sensory qualities*, that is, because of the way they looked and felt like, because of the sounds that they emitted, or even because of their particular smell.

Crucially, the objects helped satisfying *basic psychological needs*. Participants stated that the object enabled them to be more independent and self-reliant; that is, the objects fulfilled their need for freedom and autonomy. For instance, several participants reported that owning a laptop meant having "a door to the world". Similarly, having a bicycle or scooter gave participants the opportunity to explore a greater part of their environment – especially when they lived in a rural area. Moreover, the beloved objects helped the participants to experience competence and creativity. For instance, some participants reported having learned and improved specific skills – such as riding a bike or playing a musical instrument – or other, more abstract abilities – such as their technical understanding or their spatial abilities – using the beloved object. In addition, the beloved objects helped to satisfy the participants' need for relatedness. In other words, the beloved objects were a means to connect to with other people – such as siblings, parents, and friends – and to interact with them.

In addition, the beloved objects helped to satisfy the need for *safety and security*. Within the broad category of *safety and security*, different sub-functions could be distinguished. Some participants used the beloved object to achieve safety and security through distraction, giving them a means to escape from unpleasant aspects of everyday life (e.g., the parents fighting, a stressful day at school) and be able to dive into a different world that they experienced as more positive and inspiring. In addition, beloved objects can also provide support and consolation. For instance, the beloved objects helped the participants to calm down when they were sad or to cope with the loss of a loved one who had passed away. Beloved objects also served as companions. To some participants the beloved objects were like friends that accompanied them anywhere at any time (e.g., a stuffed animal that participants took into bed, to the kindergarten, and on vacation). More specifically, beloved objects can also serve as sleeping aids. In some cases, the participants even stated that they could not fall asleep without having the beloved object (e.g., stuffed animal, pillow, blanket) with them.

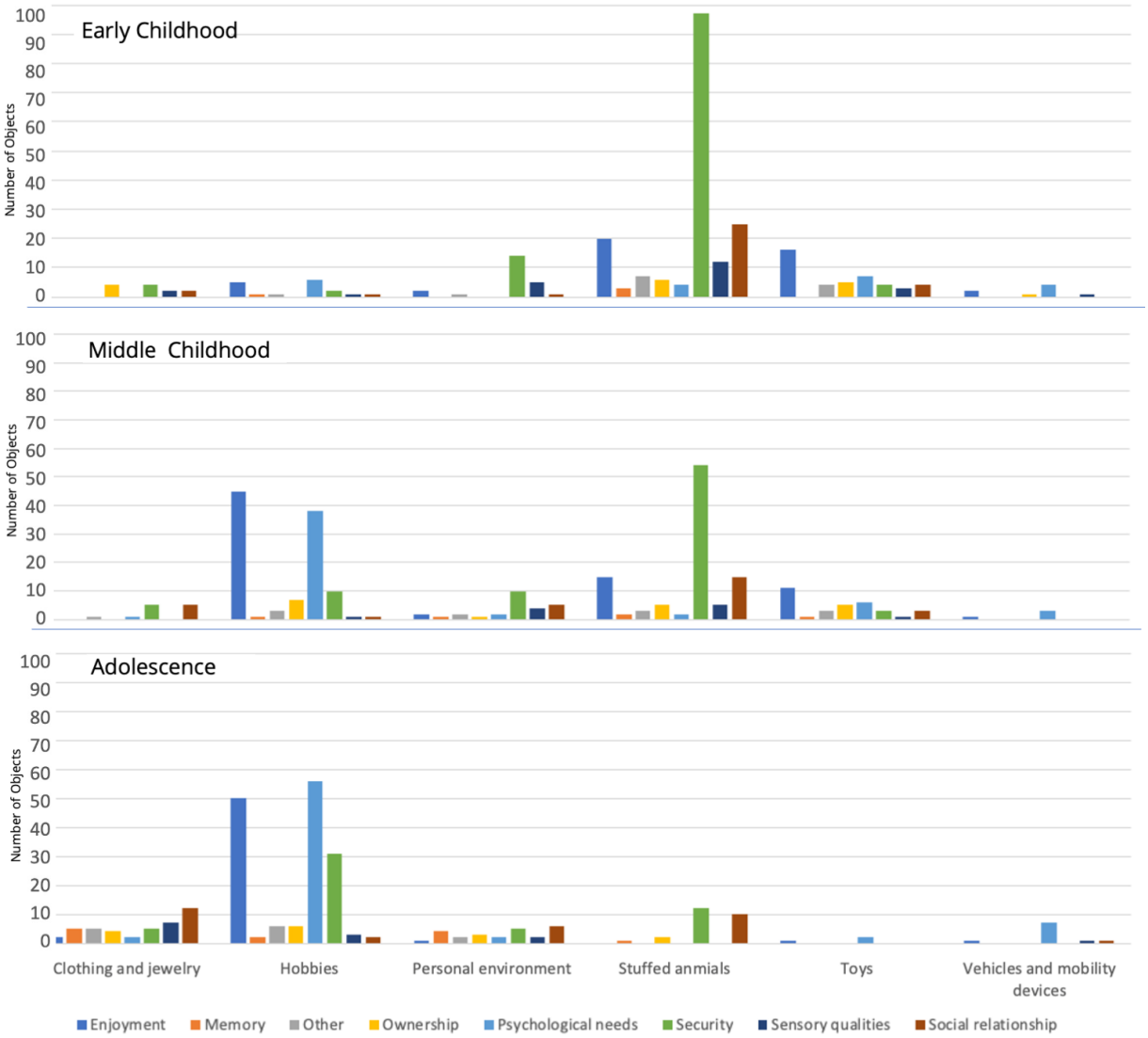
Apart from these functions, the beloved objects were also described as *symbols of a social relationship*; that is, the beloved object was important and meaningful because it connected the individual with another specific person. For instance, the beloved object was a gift from this person or just reminded the individual of this person. Finally, beloved objects were also manifestations of specific, particularly dear *memories*. The objects, for example, reminded the participants of a vacation, a specific event, or a specific period of their lives.

Associations Between the Kinds of Beloved Objects and Their Functions

In addition to our preregistered analyses, we investigated whether the kinds of objects and their functions are associated in characteristic ways. The frequency distribution of functions attributed to the various classes of beloved objects across the three stages of life is depicted in Figure 1. It shows that objects are not bound to single functions but may serve several different functions instead. This holds for stuffed animals during early and middle childhood but also for toys, hobby-related objects, clothing and jewelry, and items in the personal environment. In addition, the relationships between object classes and function undergo some change from childhood to adolescence. In particular, the role of providing feelings of security increasingly moves from stuffed animals to hobby-related objects. Also, while enjoyment is related to stuffed animals and toys in early childhood, hobby-related objects begin to play an important role for enjoyment from middle childhood on.

Figure 1

Associations Between the Kinds of Beloved Objects and Their Functions



Note. The figure depicts the associations between the kinds of beloved objects and their functions across the three stages of life.

The Role of the Five Senses

Average Importance

In order to compare the average importance between distant and proximal senses in the context of beloved objects across the three stages of life, we fit a linear mixed-effects model containing *stage of life* (early childhood, middle childhood, adolescence), *senses* (distant

versus proximal) and their interaction as fixed effects, and a random intercept for participant as a random effect (see Table 1 for descriptive statistics). The effect for *stage of life* was not significant, $\chi^2(2) = 3.74$, $p = .154$. However, we found a significant effect for the *senses*, $\chi^2(1) = 443.27$, $p < .001$. Overall, the average importance of the distant senses was higher than the average importance of the proximal senses. Crucially, we also found a significant interaction, $\chi^2(2) = 127.86$, $p < .001$, indicating that the average importance of distant versus proximal senses depends on the stage of life. In line with our hypothesis, the follow-up analysis showed that the average importance of the distant senses increased across the three stages of life, while the average importance of the proximal senses decreased (see Table 2).

Table 1

Average and Highest Importance as Dependent Variables: Descriptive Statistics

	Early Childhood		**Middle Childhood**		**Adolescence**	
	M	*SD*	*M*	*SD*	*M*	*SD*
Average Importance						
Proximal Senses	3.58	0.94	3.14	0.95	2.83	0.99
Distant Senses	3.97	1.13	4.64	1.38	5.04	1.44
Highest Importance						
Proximal Senses	6.39	1.00	5.97	1.46	5.39	1.94
Distant Senses	6.02	1.25	6.24	1.17	6.31	1.22

Table 2

Average and Highest Importance as Dependent Variables: Statistical Tests

	Early vs. Middle Childhood		**Early Childhood vs. Adolescence**		**Middle Childhood vs. Adolescence**	
	estimate	*p*	*estimate*	*p*	*estimate*	*p*
Average Importance						
Proximal Senses	0.44	<.001*	0.75	<.001*	0.31	.016*
Distant Senses	-0.67	<.001*	-1.06	<.001*	-0.40	.001*
Highest Importance						
Proximal Senses	0.44	.002*	1.00	<.001*	0.55	<.001*
Distant Senses	-0.19	.312	-0.28	.090	-0.09	.769

Note. Significant effects are marked with an asterisk.

Highest Importance

In order to compare the highest importance between distant and proximal senses in the context of beloved objects across the three stages of life, we fit a linear mixed-effects model containing *stage of life* (early childhood, middle childhood, adolescence), *senses* (distant versus proximal) and their interaction as fixed effects, and a random intercept for participant as a random effect (see Table 1 for descriptive statistics). We found a significant effect for *stage of life*, $\chi^2(2) = 14.19$, $p < .001$. Overall, the highest importance slightly decreased across the three stages of life. In addition, we found a significant effect for the *senses*, $\chi^2(1) = 13.53$, $p < .001$. Overall, the highest importance of the distant senses was higher than the average importance of the proximal senses. Crucially, we also found a significant interaction, $\chi^2(2) = 47.09$, $p < .001$, indicating that the highest importance of distant versus proximal senses depends on the stage of life. In line with our hypothesis, the follow-up analysis showed that

the highest importance of the proximal senses decreased across the three stages of life. The highest importance of the distant senses remained unchanged on a high level (see Table 2).

Additional Analyses: Beyond Distant and Proximal Senses

In order to better understand what drove the changes in importance within the distant and proximal senses in the context of beloved objects, we decided to conduct further analyses, that were not part of the preregistration. In particular, we decided to analyze the changes in importance across the three stages of life for all five senses separately. Again, we fit a linear mixed-effects model containing *stage of life* (early childhood, middle childhood, adolescence), *senses* (vision, hearing, touch, smell, taste) and their interaction as fixed effects, and a random intercept for participant as random effect (see Table 3 for descriptive statistics). We did not find a significant effect for *stage of life*, $\chi^2(2) = 0.17$, $p = .919$. However, we found a significant effect for the *senses*, $\chi^2(4) = 3979.75$, $p < .001$. Crucially, we also found a significant interaction, $\chi^2(8) = 226.98$, $p < .001$, indicating that the importance of the five senses depends on the stage of life. As the follow-up analysis showed, the importance of *vision* and *taste* did not differ significantly across the three stages of life, while the importance of *hearing* increased and the importance of *touch* and *smell* decreased (see Table 4).

Table 3

Importance of the Five Senses: Descriptive Statistics

	Early Childhood		**Middle Childhood**		**Adolescence**	
	M	*SD*	*M*	*SD*	*M*	*SD*
Vision	5.95	1.31	6.11	1.21	6.02	1.40
Hearing	1.99	1.78	3.17	2.35	4.07	2.49
Touch	6.32	1.04	5.89	1.50	5.33	1.95
Smell	2.99	2.10	2.40	1.92	2.07	1.71

Taste	1.43	0.95	1.14	0.50	1.10	0.44

Table 4

Importance of the Five Senses: Statistical Tests

	Early vs. Middle Childhood		**Early Childhood vs. Adolescence**		**Middle Childhood vs. Adolescence**	
	estimate	*p*	*estimate*	*p*	*estimate*	*p*
Vision	-0.15	.622	-0.06	.934	0.09	.835
Hearing	-1.17	<.001*	-2.06	<.001*	-0.90	<.001*
Touch	0.44	.022*	1.00	<.001*	0.56	.002*
Smell	0.60	<.001*	0.92	<.001*	0.32	.121
Taste	0.29	.177	0.34	.108	0.05	.958

Note. Significant effects are marked with an asterisk.

Most Intense Perceptual Impression

Most Intense Perceptual Impression: Distant Versus Proximal Senses

To be able to compare the involvement of distant and proximal senses with respect to the most intense perceptual impression, the ratings obtained through the qualitative data analysis (see above) were integrated into a new variable that indicated whether the most intense perceptual impression involved at least one proximal sense, at least one distant sense, at least one proximal *and* one distant sense, or no reference to a specific sense (see Table 5 for descriptive statistics). Next, we fit a log-linear mixed-effects model containing *stage of life* (early childhood, middle childhood, adolescence), *senses* (at least one distant sense, at least one proximal sense, at least one distant *and* one proximal sense, no reference to a specific sense) and their interaction as fixed effects, and a random intercept for participant as a random effect. We found no significant effect for *stage of life*, $\chi^2(2) = 0.38$, $p = .828$.

However, we found a significant effect for the *senses*, $\chi^2(3) = 80.00$, $p < .001$. Crucially, we also found a significant interaction, $\chi^2(6) = 31.17$, $p < .001$. In line with our hypotheses, the follow-up analysis showed that the probability that at least one distant sense was involved with the most intense perceptual impression increased across the three stages of life, while the probability that at least one proximal sense was involved with the most intense perceptual impression decreased. In addition, there was a slight increase in the number of descriptions that did not contain a reference to a specific sense at all (see Table 6).

Table 5

Most Intense Perceptual Impression: Descriptive Statistics

	At least one distant sense	**At least one proximal sense**	**At least one distant *and* one proximal sense**	**No reference to a specific sense**
Early Childhood	35	74	55	9
Middle Childhood	60	64	46	18
Adolescence	66	50	35	24

Table 6

Most Intense Perceptual Impression: Statistical Tests

	Early vs. Middle Childhood		**Early Childhood vs. Adolescence**		**Middle Childhood vs. Adolescence**	
	estimate	*p*	*estimate*	*p*	*estimate*	*p*
At least one distant sense	-0.68	.012*	-0.81	.002*	-0.13	.804
At least one proximal sense	0.21	.563	0.54	.032*	0.33	.284
At least one distant and one proximal sense	0.23	.567	0.56	.050	0.33	.370
No reference to a specific sense	-0.74	.186	-1.05	.024*	-0.32	.596

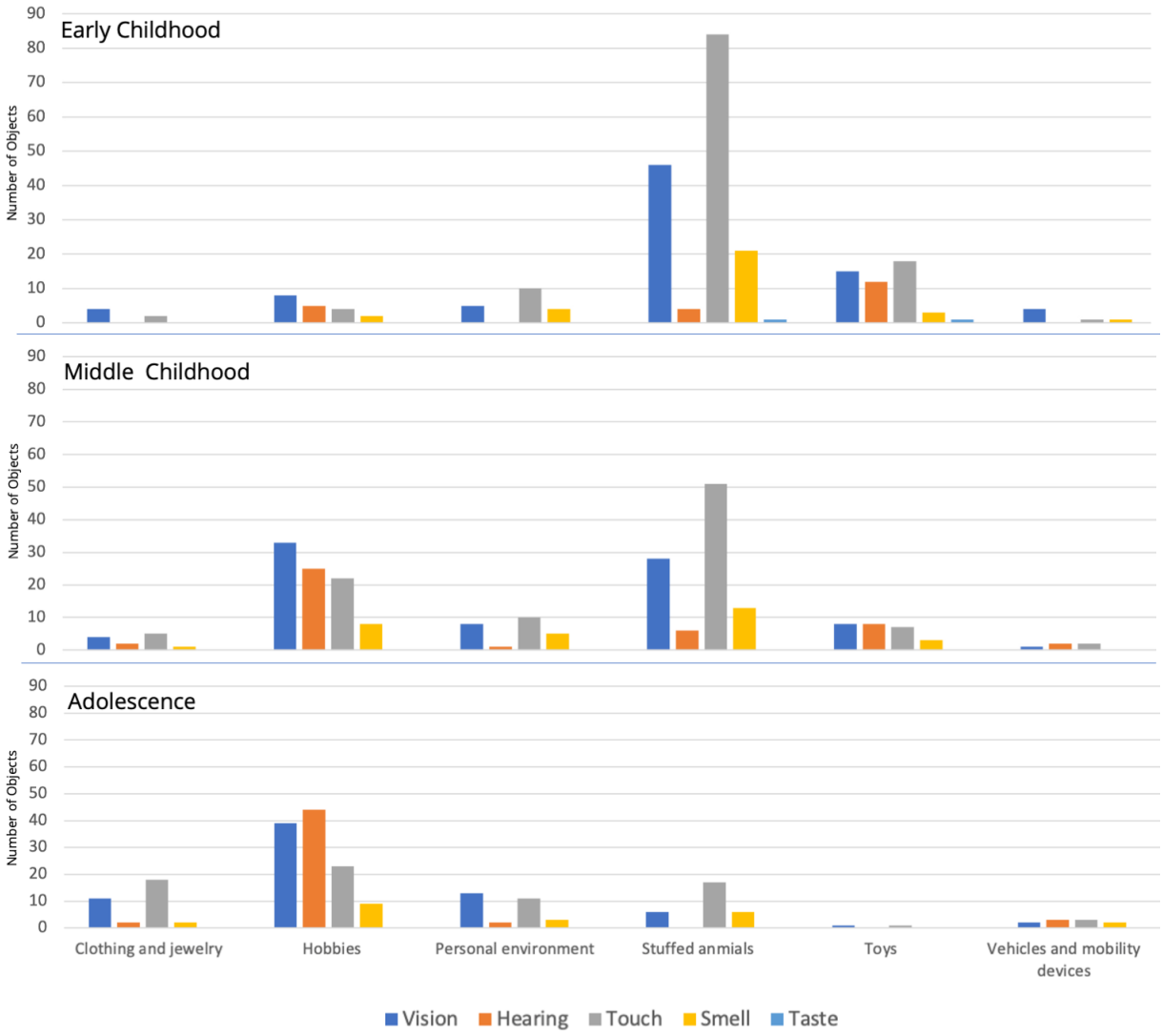
Note. Significant effects are marked with an asterisk.

Associations Between the Kinds of Objects and the Most Intense Perceptual Impression

The frequency distribution of different senses involved in the most intense perceptual impression across the various classes of beloved objects and the three stages of life is depicted in Figure 2. It shows that the most intense perceptual impressions of beloved objects are not bound to single senses. Also, each of the senses is not confined to a single object class but associated with several classes of beloved objects. In addition, the relationships between object classes and senses involved in most intense perceptual impression undergo some change from childhood to adolescence. Notably, the relevance of the haptic sense becomes more distributed across the different object types during middle childhood and adolescence, albeit on a lower level overall. In contrast, the relevance of the auditory channel not only increases in frequency but also becomes focused on hobby-related beloved objects.

Figure 2

Associations Between the Kinds of Objects and the Most Intense Perceptual Impression



Note. The figure depicts the association between the kinds of beloved objects and the most intense perceptual impression related to these objects across the three stages of life.

Discussion

The present study had two main goals. Our first goal was to investigate the role of the five senses when remembering beloved objects from early childhood, middle childhood, and adolescence. We hypothesized that the importance of the distant senses increases across one's lifespan, while the importance of the proximal senses decreases and that this would also be mirrored in retrospective accounts. Our second goal was to replicate previous findings

regarding the developmental trajectory of the functions of beloved objects and to connect these findings to the changes regarding the importance of the five senses.

With respect to the first goal, our results confirm the hypothesis that the importance of the distant senses increases across early childhood, middle childhood, and adolescence, while the importance of the proximal senses decreases when remembering beloved objects from these three stages of life. We found this pattern for both of our dependent variables, the subjective importance of the five senses when remembering the beloved objects and the most intense perceptual impression related to the objects. As additional analyses revealed, the importance of vision was stable across the three stages of life, while the importance of hearing increased and the importance of most proximal senses decreased. Note, however, that touch remained highly important even in middle childhood and adolescence. As beloved objects are infused with autobiographical meaning, these results also speak to current models of autobiographical memory. As already described in the introduction, these models typically propose a close link between vision and autobiographical memory (Conway, 2001; Knez et al., 2017; Rubin, 2005; 2006). In a certain sense, our results confirm this assumption: The importance of vision was high and remained unchanged across the three stages of life. However, our results also demonstrate that the importance of the five senses is not constant across the lifespan but undergoes significant changes. Against this background, developing a better understanding of the nuanced ways our senses affect cognition and memory in the context of beloved objects and beyond seems highly desirable (see, e.g., Ernst et al., 2021). Ultimately, this does not only apply to the functioning of the individual senses but also to their complex interactions that give rise to multisensory perceptions and memories (cf. Bremner et al., 2012; Driver & Spence, 2000).

With respect to our second goal, we identified systematic associations between the objects, their functions, and the role of the five senses that were mirrored in the retrospective accounts provided by the participants. In line with previous research (Kamptner, 1991; Litt,

1986; Myers, 1985; Richins & Chaplin, 2021; Winnicott, 1953), we found that providing a sense of security is the key function of beloved objects in early childhood. Although being comparably less important, symbolizing a social relationship, as well as, providing fun, enjoyment, and play, was also a prominent function. All three functions were mostly fulfilled by stuffed animals (which accounted for about two thirds of the beloved objects from early childhood). With respect to stuffed animals, touch was the most important sense, followed by vision. In some cases, participants also stated that the smell of the stuffed animals was particularly important.

When remembering beloved objects from middle childhood, the range of functions became more diverse. In addition to the three functions highlighted above – which remained important –, fulfilling psychological needs became increasingly important (for similar evidence, see Dyl & Wapner, 1996; Myers, 1985). In this stage of life, both supporting fun, enjoyment, and play and fulfilling psychological needs were achieved through objects that the participants used when engaging in their hobbies, but also by stuffed animals and toys. With respect to toys and objects used for hobbies, vision, hearing, and touch played about the same role.

As far as the beloved objects that participants remembered from adolescence are concerned, the importance of providing a sense of security continued to decrease, while the importance of the other functions remained relatively stable. This shift with respect to the functions was associated with a shift with respect to the kinds of objects. Toys played hardly any role anymore and stuffed animals decreased drastically in importance (although still forming a prominent category). At the same time, objects that reflect personal interests and possibly also processes of identity formation (i.e., clothing and jewelry as well as objects that support hobbies; see Csikszentmihalyi & Rochberg-Halton, 1981; Dyl & Wapner, 1996; Kamptner, 1991; Myers, 1985) accounted for about three quarters of the remembered objects.

With respect to the senses, vision and touch played a particularly prominent role across the different categories.

To sum up, beloved objects have different functions and are associated with specific sensory experiences. These functions change across childhood and adolescence, which is reflected in changes regarding the kinds of objects that serve as beloved objects and which is associated with changes in the importance of the five senses. Importantly, the changes and shifts observed in our retrospective accounts fit very well with previous research in the context of beloved objects. Among the three life stages that were investigated in the present study, middle childhood seems to mark a transition period: Here, the objects and functions that are most prominent in early childhood still play an important role, while at the same time objects and functions that are key in adolescence already gain importance. Interestingly, the most important categories in middle childhood were also associated with diverse sensory experiences, in particular with a combination of vision, hearing, and touch. On a more general note, these findings also complement recent debates on the importance of objects for thinking, behavior, memory, and identity (see, e.g., Heersmink, 2018; 2020; Malafouris, 2013; 2020; Wheeler & Bechler, 2021). Briefly speaking, it is assumed that the objects in our environment are not merely "just there", but that we have complex interactions and build multi-layered relationships with them. By doing so, objects may become part of our extended selves, begin to represent key aspects of our identities, help us to remember our past, or even contribute to modifying and transforming our cognitive processes. The observation made in the present study that the functions of beloved objects are related to certain sensory experiences being salient and that the exact nature of this relation differs depending on the stage of life provides a nice illustration of these general claims.

Nevertheless, there are at least four limitations to be mentioned. First, our study was based on retrospective accounts, assuming that those aspects of our environment and those perceptual impressions that are particularly important to us in a given moment are

preferentially stored in memory. This assumption can be considered problematic, as the participants' memories of their beloved objects may have been distorted. Note, however, that such memory distortions would only have an impact on the interpretation of our results, if they would have affected memories for the five senses differently. There seems to be no obvious reason why this should have been the case. Note also that it would not have been possible to conduct the same study with (young) children, as they would not be able to answer the detailed questions posed to the participants. Second, the number of beloved objects that were visible for the participants was quite high. Although the importance ratings for vision did not differ between objects that were visible to the participants and those that were not, indicating that the visibility did not impact the participants' ratings, replicating the study under more controlled conditions could be a task for future research. Third, data were collected in a wealthy Western country (Germany) in which children and adolescents have easy access to a wide range of different objects. Investigating whether the results can be replicated for other cultures as well as less affluent societies seems to be a promising avenue for future research, especially as it has been demonstrated that having a beloved object does not depend on owning a wide range of different objects (see, e.g., Hill, 1992). Fourth, the present study only investigated three stages of life, namely early childhood, middle childhood, and adolescence. However, it would be interesting to know whether the importance of the five senses in the context of beloved objects also changes in later stages of life.

Overall, the present study provides evidence for the assumption that beloved objects are not only beloved objects because of the functions that they have, but also because of their sensory qualities – and that the kind of sensory qualities that are particularly important differ across a lifespan. More specifically, the importance of the distant senses increases across childhood and adolescence, while the importance of the proximal senses decreases. Crucially, these shifts are still observable in retrospective accounts, that is, in the memories that adults have of their beloved objects from earlier stages of their lives. Moreover, our study shows that

the changes in the importance of the five senses are associated with changes in the functions of beloved objects. This also illustrates the crucial role that the material objects in our environment play for having experiences, constituting ourselves, and creating memories of our past.

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