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Music-Evoked Nostalgia: Affect, Memory, and Personality

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Participants listened to randomly selected excerpts of popular music and rated how nostalgic each song made them feel. Nostalgia was stronger to the extent that a song was autobiographically salient, arousing, familiar, and elicited a greater number of positive, negative, and mixed emotions. These effects were moderated by individual differences (nostalgia proneness, mood state, dimensions of the Affective Neurosciences Personality Scale, and factors of the Big Five Inventory). Nostalgia proneness predicted stronger nostalgic experiences, even after controlling for other individual difference measures. Nostalgia proneness was predicted by the Sadness dimension of the Affective Neurosciences Personality Scale and Neuroticism of the Big Five Inventory. Nostalgia was associated with both joy and sadness, whereas nonnostalgic and nonautobiographical experiences were associated with irritation.

Keywords: popular music; Big Five Inventory; Affective Neurosciences Personality Scale; autobiographical memory; mixed emotions

Nostalgia is an affective process that can accompany autobiographical memories (Batcho, 2007; Leboe & Ansons, 2006; Sedikides, Wildschut, Arndt, & Routledge, 2008; Wildschut, Sedikides, Arndt, & Routledge, 2006). It has been described as a complex emotion that gives rise primarily (albeit not exclusively) to positive affect, and serves to counteract sadness and loneliness (Wildschut et al., 2006; Zhou, Sedikides, Wildschut, & Gao, 2008). Recent investigations have implicated nostalgia as an emotion often triggered by music (Janata, Tomic, & Rakowski, 2007; Juslin, Liljestrom, Vastfjall, Barradas, & Silva, 2008; Zentner, Grandjean, & Scherer, 2008). Although the few descriptions of nostalgia within the current psychological literature have been useful in exploring the history, content, and functions of nostalgia, they have addressed neither the specific structure of music-evoked nostalgia nor individual differences in the affective and mnemonic structure of music-evoked nostalgia. The objective of our research was to address these issues.

In Figure 1, we present a heuristic model outlining both context-level and person-level constructs that may contribute to nostalgic experience, as well as the links through which these constructs may relate to nostalgia (L1–L8). By *context-level constructs*, we are referring to aspects of a person's relationship to a given song,

as well as attributes of a person's experience while listening to a given song. A person's relationship to a given song may be expressed as how familiar they are with it, as well as the degree to which the song is associated with a personal memory. An attribute of a person's experience while listening to a song may include how aroused a person feels during listening, as well as the particular emotions that a person experiences during listening. Context-level constructs may help explain why the same person experiences varying levels of nostalgia when listening to different songs.

By *person-level constructs*, we are referring to individual differences between listeners, such as the degree to which a person is generally prone to experience nostalgia and the degree to which individuals differ on personality traits (such as extraversion or neuroticism). Person-level variables may help explain why some persons feel more nostalgic than others when listening to music. Our underlying premise is the basic idea that the extent to which a particular piece of music will evoke nostalgia is a function of context-level variables (e.g., autobiographical salience of a particular song for a given person), person-level variables (e.g., how prone to nostalgia the listener is), and the interaction between context-level and person-level variables. We triggered nostalgia using a method previously applied to explore music-evoked autobiographical memories (Janata et al., 2007). First, however, we briefly review literature on the constructs in Figure 1 and their possible relationships to nostalgic experience.

Context-Level Constructs and Music-Evoked Nostalgia

We begin with the dependent variable of interest: nostalgia. Wildschut et al. (2006) enumerated several triggers of nostalgia based on participants' descriptions of circumstances under which they experience nostalgia. Three prominent categories of nostalgia triggers emerged: negative affect, social interactions, and sensory inputs (e.g., music, smell). We focus on one of these reported

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This work was supported by a Templeton Advanced Research Program grant from the Metanexus Institute to Petr Janata.

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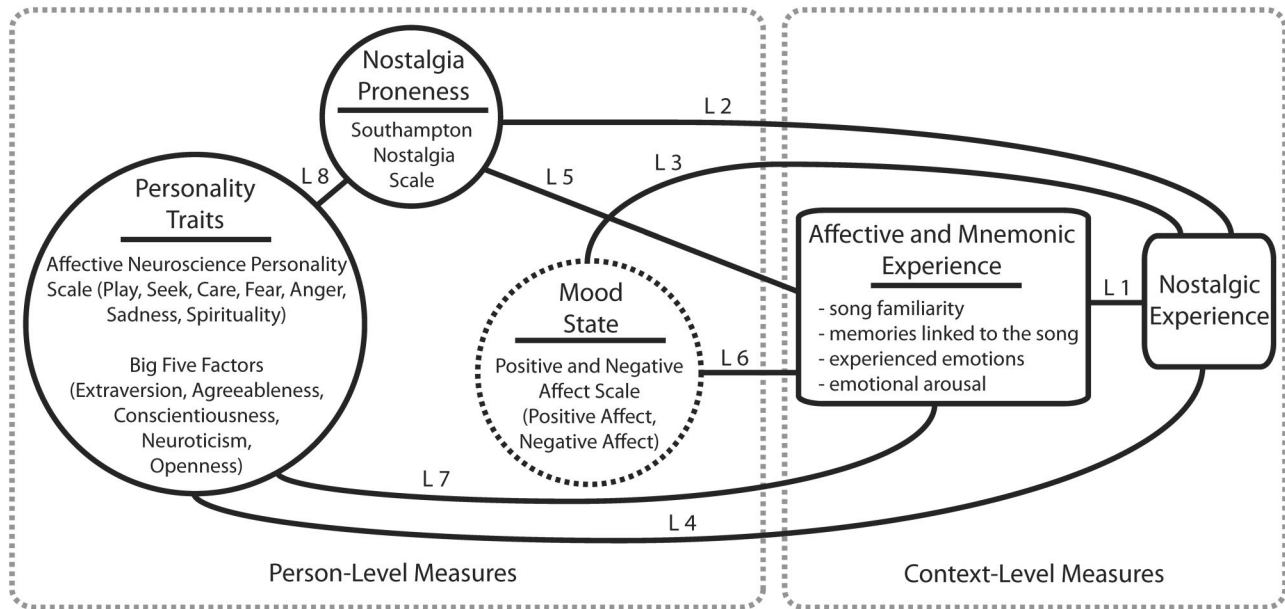


Figure 1. A heuristic model of context-level and person-level constructs that may contribute to nostalgic experience. Each link (L1–L8) represents a possible relationship between constructs. Constructs farthest to the left are the most abstract person-level constructs, whereas constructs farthest to the right represent context-level variables closest to immediate momentary experience of nostalgia. This figure summarizes both our conceptual and statistical model, reflecting data at two levels (person and context). Because we used the trait Positive and Negative Affect Schedule (PANAS) as an indicator of general mood state at the beginning of study, rather than at discrete points during the course of the study, we have included the PANAS in our model at the person level rather than at the context level.

sensory triggers: music. We consider music to encompass instrumental, vocal, and lyrical components.

Nostalgia has been identified elsewhere as an emotion triggered by music. In one study, nostalgia emerged as an emotional experience frequently triggered by music (Zentner et al., 2008); in another study, nostalgia featured as the third most frequently endorsed emotional descriptor during music-evoked autobiographical memories (Janata et al., 2007). Finally, in an experience sampling study, nostalgia was triggered more often in the context of musical than nonmusical episodes (Juslin et al., 2008).

Nostalgia has been labeled as bittersweet, involving a mixture of sadness and wistful joy (Batcho, 2007; Sedikides, Wildschut, & Baden, 2004). Wildschut et al. (2006) described nostalgia as a happiness-related emotion that contains elements of love, pride, and joy, but they recognized that nostalgic experiences often contain elements of negative emotionality. They showed that nostalgia is an emotional experience that may comprise a number of other, more basic, emotions. These findings raised the possibility of exploring mixed emotions (i.e., concurrent happiness and sadness) during nostalgic experience. We sought to confirm the emotional profile of nostalgia as including both positive and negative emotions (see Figure 1, L1).

Arousal has been identified as a component of emotional experience that could be easily manipulated by both musical and nonmusical sounds (Juslin & Västfjäll, 2008; Lundqvist, Carlsson, Hilmersson, & Juslin, 2008). We therefore included a self-report measure of arousal to estimate the relationship between this emotional component and nostalgic experience.

Recent research has identified episodic memories as one of several possible mechanisms for musical emotion evocation (Juslin & Västfjäll, 2008; Konecni, 2008). Such memories often have emotional components. These emotional components often aid in the initial storage, and subsequent retrieval, of memories (Buchanan, 2007). Given the inherent connection between nostalgia and autobiographical memories (Wildschut et al., 2006), we propose that the triggers of nostalgia during musical episodes are the particular associations the individual has formed between a given piece of music and both past events (i.e., the autobiographical salience of a particular song for a given person), as well as basic emotions that those events evoke. Therefore, we expected emotions and autobiographical salience to predict nostalgia (see Figure 1, L1).

A person's familiarity with a given song is a context-level construct that may also influence the person's nostalgic experience. In a recent study of music-evoked autobiographical memories, only 3% of songs that were rated unfamiliar evoked an autobiographical memory (Janata et al., 2007). Given that nostalgia is inherently linked with autobiographical memories (Wildschut et al., 2006), song familiarity may be at least indirectly related to nostalgia. Therefore, we included song familiarity as a context-level construct that may also predict nostalgia (see Figure 1, L1).

Person-Level Constructs and Music-Evoked Nostalgia

We now turn to variables that may help explain why some persons may feel more nostalgic than others when listening to

music in general. One such person-level construct is mood state. Wildschut et al. (2006, Study 2) found that participants often identified negative mood as a trigger of nostalgia. They further found that an experimental mood manipulation had a significant effect on nostalgia (Study 3). Participants in a negative mood condition were more nostalgic than participants in either a positive or neutral mood condition (the latter two conditions did not differ). Wildschut et al. interpreted these findings as being consistent with the idea that nostalgia can serve to counteract negative mood. The important implication is that participants who enter the study in a negative mood may be more likely to experience music-evoked nostalgia (see Figure 1, L3).

A domain-specific person-level construct with direct relevance to nostalgia is nostalgia proneness. To explore this construct, Sedikides et al. (2008) developed and validated the Southampton Nostalgia Scale (SNS), a self-report measure of an individual's general tendency to experience nostalgia. The present study tested the hypothesis that nostalgia proneness, as assessed by the SNS, would be positively related to music-evoked nostalgia (see Figure 1, L2).

The structure of underlying human personality traits has received a great deal of attention in the psychological literature, and substantial progress has been made in understanding the factors that underlie and influence behavior. The five-factor model (FFM) has emerged as a widely accepted conception of the general underlying structure of personality, and has been applied to various aspects of psychological functioning, including emotions (John, Naumann, & Soto, 2008). Relationships have been established between the FFM factors Neuroticism and Extraversion, as well as positive and negative emotionality, at both the state and trait levels. Whereas extraversion (relative to neuroticism) is associated more strongly with positive emotionality, neuroticism (relative to extraversion) is associated more strongly with negative emotionality (Costa & McCrae, 1980; John et al., 2008; Watson & Clark, 1992). One of our objectives was to examine whether the higher order personality factors of the FFM would predict music-evoked nostalgia (see Figure 1, L4). A second objective was to examine whether other measures would predict music-evoked nostalgia after controlling for these higher order factors.

Past research on the relationship between emotion and personality as codified by the FFM has used measures that "represent a rather broad level in the hierarchy of personality descriptors" (John et al., 2008, p. 140). This leaves open the possibility that a personality measure that more closely targets affective personality constructs may yield more important information regarding the interaction between underlying personality structure and emotional experiences. The Affective Neurosciences Personality Scale (ANPS; Davis, Panksepp, & Normansell, 2003) was conceived in that spirit.

The ANPS was constructed, based on evidence from the basic neuroscience literature, to study the associations of six posited brain affective systems (play, seek, care, fear, anger, and sadness), as well as an additional construct (spirituality), with self-report measures of behavior. When completing the ANPS, participants endorse agreement or disagreement with self-referential statements of tendencies to exhibit behaviors related to each of the ANPS dimensions. The Play dimension relates "rough-and-tumble" play behavior, which facilitates learning and social interaction, and brings feelings of joy. Seek behaviors are conceived through

appetitive motivation (i.e., searching the environment for solutions to homeostatic imbalances). Nurturing urges and behaviors make up the Care dimension.

Fear behavior is related to low-level anxiety, freezing behavior, and fleeing behavior. Anger behavior is similar to fear, except it exhibits itself in "fight" rather than "flight" behavior. Behavior related to the Sadness dimension is activated behaviorally by loss, separation distress, and breaking of social bonds. Care behaviors have been implicated in the mediation of sadness behaviors. Spirituality has been defined by Davis et al. (2003) as "feeling 'connected' to humanity and creation as a whole, feeling a sense of 'oneness' with creation, striving for inner peace and harmony, relying on spiritual principles, and searching for meaning in life" (p. 60).

Six ANPS dimensions (excluding Spirituality) loaded onto two orthogonal factors of positive (Play, Seek, Care) and negative (Fear, Anger, Sadness) experience, although these six ANPS dimensions are conceptually distinct, differentially relate to separate factors of the FFM (Davis et al., 2003), and stem from unique underlying neural systems (Panksepp, 1998). Whereas the ANPS does not yet enjoy widespread use in psychological research, it may be useful in probing specific underlying affective personality constructs, as these may relate closely to nostalgic experience. For this reason, we have included the ANPS in the present study. As with the Big Five Inventory (BFI), we were interested in testing whether the higher order personality dimensions of the ANPS would predict music-evoked nostalgia (see Figure 1, L4). We were also interested in whether other measures would predict music-evoked nostalgia after controlling for the higher order ANPS dimensions.

Aside from the immediate experience of nostalgia, there may be a distinct relationship between personality structure and overall tendencies to experience nostalgia, as measured by the SNS (see Figure 1, L8). The possibility that personality factors influence nostalgic tendencies has not yet received direct attention, but is explored in this article.

Interactions Between Context-Level and Person-Level Constructs

A final important objective of our research was to examine the way in which music-evoked nostalgia is shaped by interactions between context-level and person-level constructs. Consider, for instance, the case of autobiographical salience (a context-level construct) and nostalgia proneness (a person-level construct). Although we expect individuals to experience stronger music-evoked nostalgia when listening to songs that are high (compared with low) in autobiographical salience, and to experience stronger music-evoked nostalgia when they are high (compared with low) in nostalgia proneness, it is possible that the effect of autobiographical salience is stronger in those individuals who are more prone to nostalgia. We therefore explored these and other potential interaction effects between context-level and person-level constructs.

Overview of the Present Experiment

We presented participants with 30 short clips of popular music and examined ratings of music-evoked nostalgia as a function of

context-level constructs (e.g., rated familiarity of the song), personal-level constructs (e.g., mood state, nostalgia proneness, personality), and their interactions. Furthermore, we sought to identify differences between the profile of emotions experienced during nostalgia and profile of emotions apparent during nonnostalgic and nonautobiographical experiences.

Method

Participants

Participants were 226 University of California, Davis, psychology undergraduate student volunteers (52% women; 43% Asian, 25% Caucasian, 32% other; 15% Hispanic/Latino; age: range = 18–28 years, $M = 19.8 \pm 1.6$). They completed the study online, at locations of their choosing, via Ensemble, a Web-based survey delivery and experiment management system (Tomic & Janata, 2007).

Procedure

Participants visited the Ensemble Web site to complete online consent forms. Next, they provided demographic information and completed measures assessing the person-level constructs of interest (see below). Participants were then presented with a test sound and asked to adjust the volume of their listening device to a comfortable level. Subsequently, participants were presented 30 musical excerpts. After each excerpt, they completed a series of short questionnaires assessing the context-level constructs of interest (see below).

Materials

Stimuli. Stimuli consisted of 15-s song samples downloaded from the Billboard Top-100 Pop, Hip Hop, and R&B lists on the Apple iTunes Music Store. Stimuli were randomly selected from songs released during the time when the participant was between the ages of 7 and 19 years, with the distribution peaking at age 15 and negatively skewed. The distribution of years of release relative to a participant's age was based on the results of a previous investigation of music-evoked autobiographical memories (Janata et al., 2007). Excerpts from a total of 1,112 unique songs were used in this study.

Person-level measures. To assess mood state, we administered the Positive and Negative Affect Schedule (PANAS; Watson, Wiese, Vaidya, & Tellegen, 1988). The PANAS consists of 10 items assessing positive affect (e.g., *interested*, *enthusiastic*; $\alpha = .90$) and 10 items assessing negative affect (e.g., *distressed*, *upset*; $\alpha = .91$). The PANAS was administered in "state" form, with instructions directing the participant to indicate to what extent they are feeling each emotion "right now." Although this is a state-level measure, it was measured only once at the beginning of the study, and was intended to reflect a participants' general mood states as they began the study.

To assess nostalgia proneness, we administered SNS Version 2 (Sedikides et al., 2008). The scale consists of seven items (one reversed scored) that measure nostalgic tendencies (e.g., "How often do you experience nostalgia?"; "How important is it for you to bring to mind nostalgic experiences?"). Routled, Arndt,

Sedikides, & Wildschut (2008) found this measure to be internally consistent and highly correlated with other measures of nostalgia. Cronbach's alpha in the present study was .93.

To assess the higher order personality dimensions of the FFM, we administered the BFI (John et al., 2008). In the present study, Cronbach's alphas for the Big Five factors ranged from .76 to .86. The BFI was completed among a variety of other measures in a previous study.

To examine the role of six posited brain affective structures (and the additional construct of spirituality), we administered the ANPS (Davis et al., 2003). Cronbach's alphas for the ANPS dimensions ranged from .75 to .88.

Context-level measures. After each song, participants reported the degree to which the song made them feel nostalgic ("How nostalgic does this song make you feel?") on a 5-point scale, with 1 = *not nostalgic*, 3 = *somewhat nostalgic*, and 5 = *strongly nostalgic*. Participants also indicated the degree to which the song made them feel aroused ("In the present moment, how arousing do you find the song?") on a 5-point scale, with 1 = *very slightly or not at all*, 2 = *a little*, 3 = *moderately*, 4 = *quite a bit*, and 5 = *extremely*. In addition, participants indicated any and all discrete emotions that they experienced while listening to each song from a list of 29 exemplars of discrete emotions identified by Shaver, Schwartz, Kirson, and O'Connor (1987; "Which of the following emotions did you experience while listening to this song? Check all that apply"). Discrete emotions for each song presentation were split into positive and negative emotions, and the proportion of all endorsed positive (of 13) and negative (of 16) emotional adjectives was calculated for each song presentation, yielding two additional context-level scores (positive experienced emotions and negative experienced emotions). To investigate any additional predictive contribution of mixed emotional experiences, we included a dummy coded variable in analyses (mixed emotions experienced). This variable was coded 1 whenever both positive and negative emotions were endorsed for a given song presentation and 0 when either only positive or only negative emotions were endorsed.

Participants further indicated how familiar the song was ("Please rate your familiarity with the song you just heard") on a 5-point scale, with 1 = *unfamiliar*, 3 = *somewhat familiar*, and 5 = *very familiar*. Finally, participants stated how autobiographically salient the song was ("Please describe your autobiographical association with this song") on a 5-point scale, with 1 = *no association*, 3 = *somewhat autobiographical*, and 5 = *strongly autobiographical*.

Data Analysis

We collected data both at the context level (sets of responses to each of 30 randomly selected songs for each participant) and the person level (PANAS, SNS, BFI, and ANPS administered to each participant). Given the multilevel nature of our data, and the possibility that responses to context-level measures may not be independent within subject, we analyzed our data with mixed effects multilevel regression models (Raudenbush & Bryk, 2002; Singer, 1998). This approach allowed us to compare the main effects of context-level and person-level constructs on nostalgic experience, as well as the cross-level interaction effects of context-level and person-level constructs. To ease interpretation of the

results, we standardized all context-level data within participants (except for nostalgia and the mixed emotion dummy code), and we standardized all person-level scores across participants. We used SAS PROC MIXED to fit the mixed effects multilevel models with restricted maximum likelihood estimation and an unstructured variance/covariance structure.

Personality and Nostalgia Proneness

To assess the relationship between overall nostalgia proneness and underlying personality structure (see Figure 1, L8), we regressed SNS on the ANPS dimensions (Play, Seek, Care, Fear, Anger, Sadness, and Spirituality), and then separately on the BFI factors (Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness) using a linear regression model. We mean-centered ANPS dimensions and BFI factors across participants and kept SNS in raw form for this analysis.

Results

Of the 6,720 song presentations during the experiment, 1,742 (26%) were rated as at least somewhat nostalgic (i.e., a score of 3–5). We began by estimating the variance in rated strength of nostalgia, regressing nostalgia on the intercept only. An intraclass correlation of .24 was obtained from estimates of within-subject (.3091) and between-subjects (.9948) variance, indicating that 24% of the variance in nostalgia ratings could be attributed to between-subjects effects, thus confirming the appropriateness of a mixed effects model.

Context-Level Measures and Nostalgia

We regressed nostalgia on context-level measures, modeling them first as fixed effects predictors, then as random coefficients, to address Link 1 in Figure 1. All measures in both models were significant unique predictors of strength of nostalgia experience. Regression coefficients from the random effects model are presented in Table 1. Participants reported more music-evoked nostalgia when listening to songs that they found autobiographically salient, that were familiar to them, that they found arousing, that evoked in them greater numbers of positive and negative emotions, and that gave rise to mixed emotions. The slopes of all context-level predictors varied significantly when modeled as random coefficients ($p < .0001$), indicating differences between participants in context-level effects. We found a decrease in residual variance in the intercept between fixed effects (.4662) and random effects (.3358) context-level models, as well as a significant de-

crease in -2 log-likelihood between models, $\chi^2(27) = 1549$, $p < .001$, indicating better model fit when the relationships between context-level measures and nostalgia were allowed to vary between participants.

Person-Level Measures and Nostalgia

Davis et al. (2003) reported significant intercorrelations between ANPS dimensions and BFI factors in their original data set, and we have replicated the general structure of those relationships within our data (see Figure 2). Given these significant intercorrelations, we did not estimate models containing both the ANPS and the BFI. Instead, we conducted parallel analyses that included either the ANPS or the BFI.

To address Links 2–4 in Figure 1, we entered the BFI, ANPS, PANAS, and SNS scores individually into separate regression models, investigating the effect of each person-level scale alone in predicting individual differences in the average strength of music-evoked nostalgia within participants. When we included only BFI scores, no BFI factor significantly predicted average strength of nostalgia, although there was a marginal positive association between Neuroticism and music-evoked nostalgia, $\beta = .0795$, $t(220) = 1.79$, $p \sim .08$. When we included only the ANPS, results revealed a significant negative association between Play and strength of music-evoked nostalgia, $\beta = -.1206$, $t(218) = -2.28$, $p < .05$. No other ANPS dimensions significantly predicted nostalgia. When we included only the SNS, it significantly predicted strength of music-evoked nostalgia in the expected direction, $\beta = .1082$, $t(224) = 2.81$, $p < .01$. When we included only the PANAS, Negative Affect showed a significant positive association with music-evoked nostalgia, $\beta = .1039$, $t(223) = 2.53$, $p < .05$, whereas Positive Affect was not significantly associated with nostalgia. Participants who entered the experiment in a more negative mood state reported higher levels of music-evoked nostalgia.

A combined model was then fit with all person-level measures to investigate the conjoined predictive values of Links 2–4 in Figure 1. When estimating a model including the ANPS, PANAS, and SNS, the positive association of SNS with music-evoked nostalgia remained significant, $\beta = .1116$, $t(215) = 2.62$, $p < .01$, whereas the previously significant associations of Negative Affect and Play with music-evoked nostalgia were rendered nonsignificant. We estimated a series of further models, each leaving out all scores from one of the three scales. These analyses demonstrated that when both the ANPS and PANAS were included in a model, neither Negative Affect nor Play retained its significant association

Table 1
Standardized Parameter Estimates When Regressing Nostalgia on Context-Level Measures

Effect	β	df	t	p
Intercept	1.7737	225	45.55	<.0001
Autobiographical salience	.4088	6453	16.90	<.0001
Song familiarity	.1127	6453	6.74	<.0001
Arousal	.1697	6453	9.66	<.0001
Number of positive emotions	.1348	6453	8.75	<.0001
Number of negative emotions	.0307	6453	2.41	.0158
Incidence of mixed emotions	.0353	6453	2.09	.0364

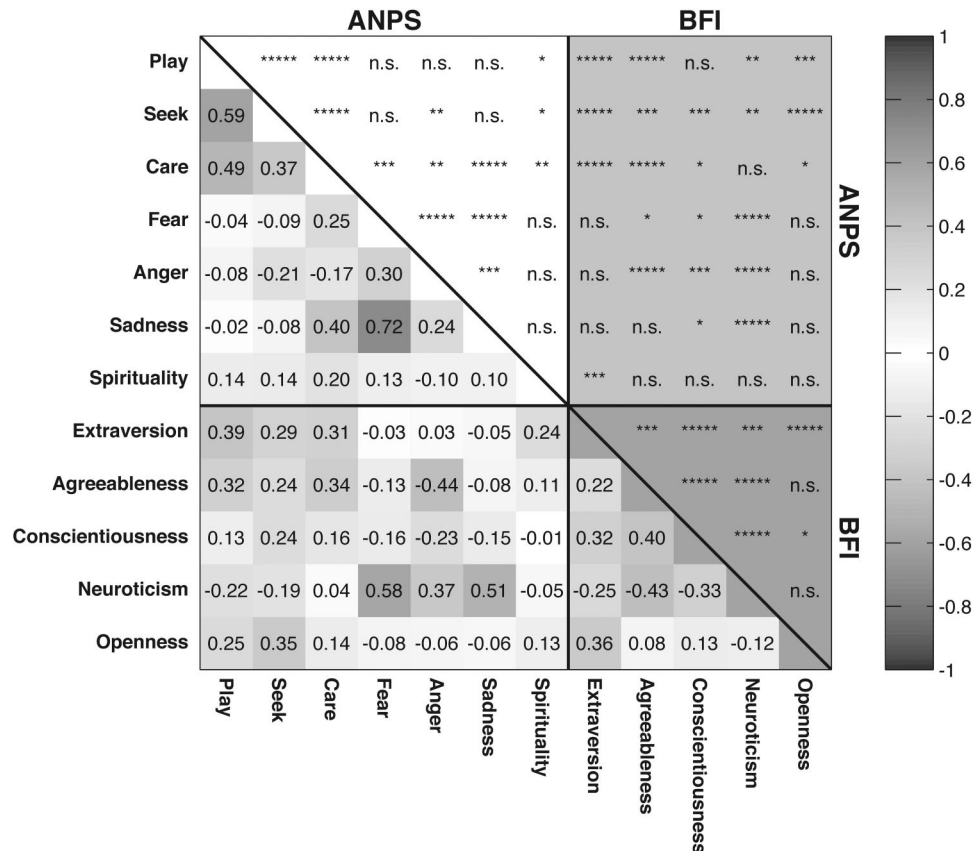


Figure 2. Within-scale and between-scale correlations of the Affective Neurosciences Personality Scale (ANPS) and the Big Five Inventory (BFI). Pearson product-moment correlation coefficients are indicated in the lower triangle. The following statistical significance levels of the given correlations are indicated in the upper triangle: * $p < .05$, ** $p < .01$, *** $p < .001$, **** $p < .0001$, ***** $p < .00001$; *ns* = not significant.

with music-evoked nostalgia. We estimated a parallel model, including the BFI, PANAS, and SNS, within which the BFI factors remained nonsignificant predictors of nostalgia, whereas Negative Affect, $\beta = .1003$, $t(217) = 2.36$, $p < .05$, and SNS, $\beta = .1075$, $t(217) = 2.76$, $p < .01$, significantly predicted nostalgia. These findings indicate that nostalgia proneness, as assessed by the SNS, was the most consistent and robust person-level predictor of music-evoked nostalgia.

Interactions of Context-Level and Person-Level Measures

Finally, we estimated a combined context-level and person-level model with cross-level interactions (see Figure 1, L1–L7), first including the ANPS, PANAS, and SNS as person-level measures and then including the BFI, PANAS, and SNS as person-level measures (see Table 2). The results from these models revealed a number of interesting interactions between context-level and person-level constructs. To aid in interpreting the cross-level interactions within these models, we plotted the within-subjects partial correlations between a particular context-level variable (controlling for all other context-level variables) and music-evoked nostalgia against a particular person-level measure for

which there was a significant cross-level interaction (see Figure 3). Each plot thus shows how the strength of the relationship between a particular context-level measure and music-evoked nostalgia is moderated by a particular person-level construct. Because the effect size of these cross-level interactions was relatively small, we are reticent to interpret these interactions in great detail, although we examine them briefly in the Discussion section.

Profiles of Experienced Emotions

We compared emotional profiles between nostalgic experiences (those experiences rated 2 or higher on the nostalgia rating scale: “How nostalgic does this song make you feel?”), autobiographically salient experiences that were not rated as nostalgic (those experiences rated 1 on the nostalgia rating scale, and 2 or higher on the autobiographical rating scale: “Please describe your autobiographical association with this song”), and experiences that were rated as neither nostalgic nor autobiographical (those experiences rated 1 on both the nostalgia and the autobiographical rating scale). We first compared the overall proportions of positive, negative, and mixed emotional experiences between conditions, and then we compared proportions of discrete emotions that were endorsed between conditions to characterize emotions experienced during

Table 2
Significant Parameter Estimates ($p < .05$) Modeling Context Measures

Effect	β	df	t	p
ANPS, PANAS, SNS				
Intercept	1.7735	215	47.47	<.0001
Autobiographical salience	.4054	6393	17.15	<.0001
Song familiarity	.1142	6393	6.72	<.0001
Arousal	.1673	6393	9.66	<.0001
Number of positive emotions	.1339	6393	8.77	<.0001
Number of negative emotions	.0275	6393	2.33	.0199
SNS	.1111	215	2.61	.0096
Autobiographical Salience \times Seek	.0715	6393	2.33	.0197
Arousal \times Anger	.0604	6393	3.01	.0026
Number of Positive Emotions \times Care	.0484	6393	2.22	.0261
Number of Positive Emotions \times Sadness	-.0522	6393	-2.05	.0406
Number of Negative Emotions \times Play	.0561	6393	3.64	.0003
Number of Negative Emotions \times Seek	-.0693	6393	-4.52	<.0001
Number of Negative Emotions \times Spirituality	-.0303	6393	-2.47	.0134
Incidence of Mixed Emotions \times Play	-.0516	6393	-2.23	.0258
Song Familiarity \times SNS	.0446	6393	2.39	.0169
Arousal \times SNS	.0422	6393	2.16	.0305
BFI, PANAS, SNS				
Intercept	1.7748	217	47.62	<.0001
Autobiographical salience	.4082	6405	17.35	<.0001
Song familiarity	.1104	6405	6.71	<.0001
Arousal	.1686	6405	9.65	<.0001
Number of positive emotions	.1349	6405	8.65	<.0001
Number of negative emotions	.0318	6405	2.49	.0128
SNS	.1073	217	2.76	.0064
NA	.1003	217	2.36	.0190
Autobiographical Salience \times Openness	.0831	6405	3.25	.0012
Song Familiarity \times Openness	-.0438	6405	-2.44	.0148
Arousal \times Conscientiousness	.0441	6405	2.12	.0340
Autobiographical Salience \times SNS	.0530	6405	2.18	.0293
Song Familiarity \times SNS	.0341	6405	2.08	.0379
Number of Negative Emotions \times NA	.0290	6405	1.98	.0479

Note. ANPS = Affective Neurosciences Personality Scale; PANAS = Positive and Negative Affect Schedule; SNS = Southampton Nostalgia Scale; BFI = Big Five Inventory; NA = Negative Affect.

nostalgia. Figure 4 illustrates the proportions of specific positive and negative emotions that were endorsed, compared with all positive and negative emotions endorsed, during (a) song presentations that elicited nostalgia, (b) song presentations that were autobiographically salient but did not elicit nostalgia, and (c) song presentations that elicited neither nostalgia nor autobiographical memories. The prototype emotion that each specific emotion relates to, as identified by Shaver et al. (1987), is also identified in Figure 4.

Positive emotions had a prominent role in nostalgic experience. During nonnostalgic nonautobiographically salient experiences, the ratio of positive to negative emotions endorsed was roughly 1.6 to 1, whereas during nonnostalgic autobiographical experiences, the ratio was roughly 2 to 1, and during nostalgic experiences, the ratio jumped to almost 4 to 1. This is due in part to increased mixed emotional endorsements and to the great increase of multiple positive emotional endorsements per song in nostalgic experiences, whereas this increase was not seen in multiple negative emotional endorsements.

We calculated the proportion of mixed emotions experienced (more than one positive and more than one negative emotion endorsed for a given song presentation) of all songs presented, per participant, for nostalgic, nonnostalgic autobiographical, and non-

nostalgic nonautobiographical experiences. Then, we compared these proportions between conditions using paired t tests. Participants endorsed more mixed emotions for nostalgic experiences ($M = 14.21\%$, $SE = 0.0128$) compared with nonnostalgic autobiographical experiences ($M = 6.01\%$, $SE = 0.0090$), $t(225) = 6.93$, $p < .0001$. Also, participants endorsed more mixed emotions for nonnostalgic autobiographical experiences than nonnostalgic nonautobiographical experiences ($M = 3.93\%$, $SE = 0.0055$), $t(225) = 3.32$, $p < .005$.

We also calculated proportions of song presentations for which participants did not endorse mixed emotions, but instead endorsed more than one positive or one negative emotion. We calculated those proportions within participants, for nostalgic, nonnostalgic autobiographical, and nonnostalgic nonautobiographical experiences. More stimuli were accompanied by multiple positive emotional endorsements for nostalgic experiences ($M = 43.70\%$, $SE = 0.0197$) compared with nonnostalgic autobiographical experiences ($M = 14.94\%$, $SE = 0.0127$), $t(225) = 17.19$, $p < .0001$. Nonnostalgic autobiographical experiences contained a higher incidence of multiple positive emotional endorsements than did nonnostalgic nonautobiographical experiences ($M = 12.19\%$, $SE = 0.0122$), $t(225) = 6.43$, $p < .0001$. Percentage of multiple negative emotions did not differ between nostalgic ($M = 10.63\%$, $SE =$

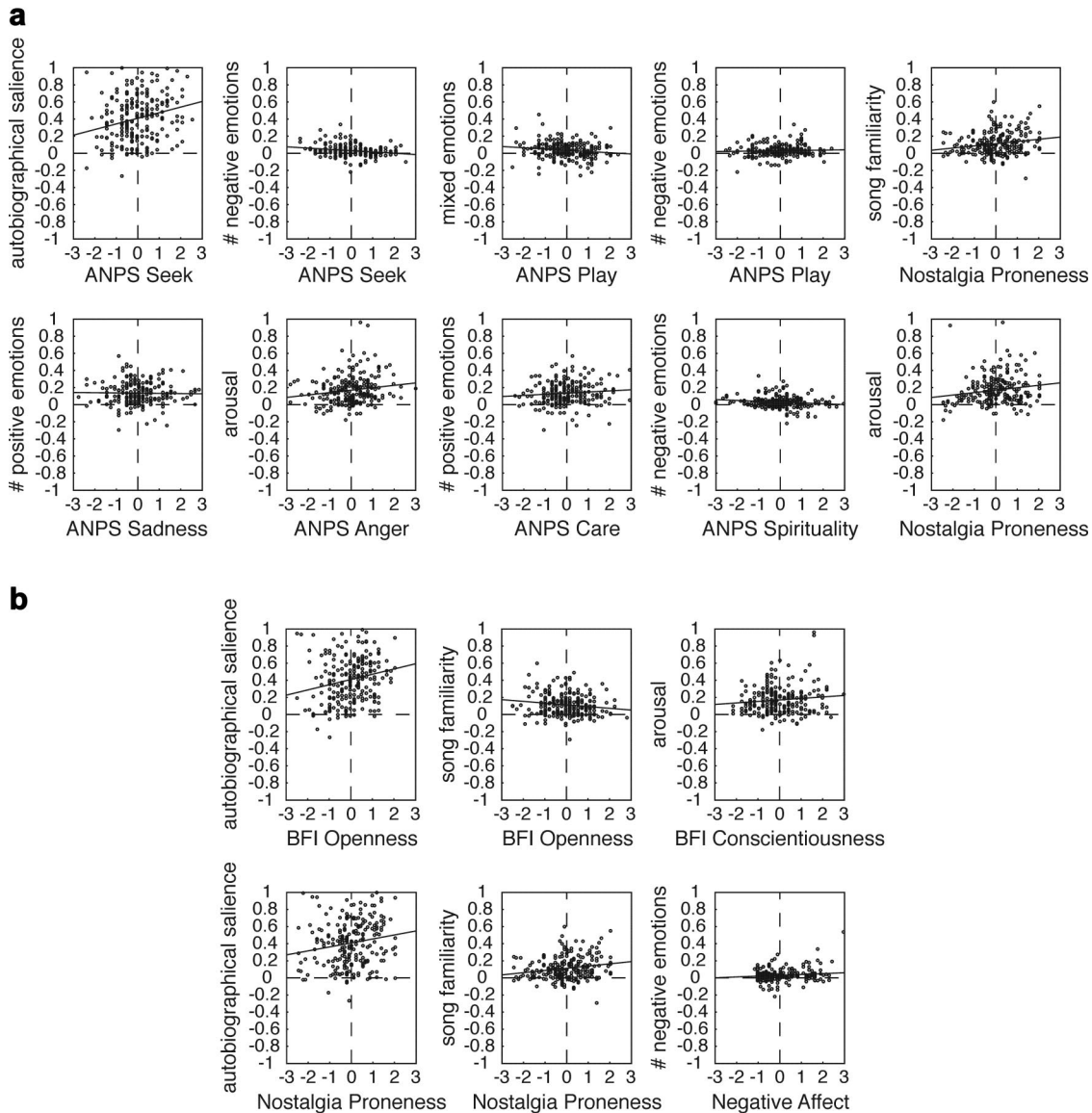


Figure 3. Within-person partial correlations between context-level predictors and strength of nostalgia (y-axis) plotted against standardized person-level measures (x-axis). Values on the x-axis reflect standardized person-level scores ($M = 0$, $SD = 1$), and values on the y-axis reflect standardized regression weights. A line of best fit is plotted through these data to indicate the general trend of the relationship between the given context-level correlation and person-level measures. We present only those combinations of context-level predictors and person-level measures that yielded significant cross-level interactions when modeling context- and person-level predictors, with cross-level interactions, as estimated with (a) the Affective Neurosciences Personality Scale (ANPS) and (b) the Big Five Inventory (BFI).

0.0108) and nonnostalgic autobiographical ($M = 8.43\%$, $SE = 0.0107$) experiences, nor did it differ between nonnostalgic autobiographical and nonnostalgic nonautobiographical experiences ($M = 7.10\%$, $SE = 0.0092$). Percentage of multiple negative emotions did differ significantly, however, between nostalgic and nonnostalgic nonautobiographical experiences, $t(225) = 2.84$, $p < .01$.

When comparing specific endorsed emotions between conditions, we found that love was the most frequently endorsed specific

positive emotion across all conditions. Love did not differentiate between conditions, as it constituted roughly the same percentage of all emotional endorsements in each condition ($\sim 12\%$). When comparing negative endorsed emotions between conditions, irritation was the most frequently endorsed negative emotion during nonnostalgic nonautobiographical experiences, whereas sadness was the specific emotion most often endorsed for both nostalgic and autobiographically salient nonnostalgic experiences. When comparing representation of underlying emotional clusters be-

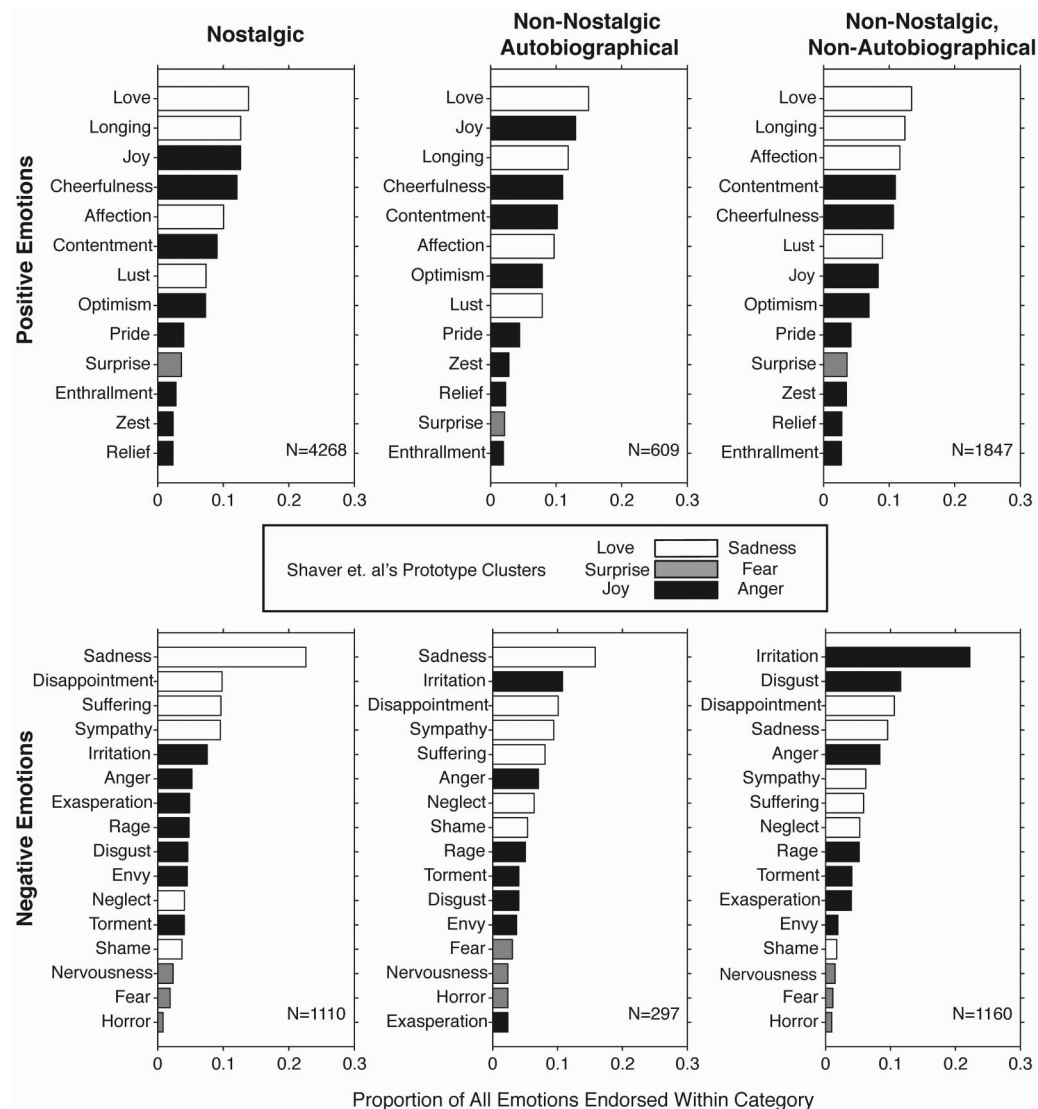


Figure 4. Proportions of discrete emotions endorsed during nostalgic, nonnostalgic autobiographical, and nonnostalgic nonautobiographical experiences. Each discrete emotion was shown by Shaver et al. (1987) to load onto one of six factors: three positively valenced factors (Love, Joy, and Surprise) and three negatively valenced factors (Anger, Sadness, and Fear). Bars within each graph are shaded to indicate the emotional factor onto which each discrete emotion loads.

tween conditions, we found that positive emotions that clustered onto the “love” prototype (longing and affection) were often endorsed for both nostalgic and nonnostalgic nonautobiographical experiences. Furthermore, emotions that loaded onto the “sadness” cluster (i.e., disappointment, suffering, sympathy) were the next most frequently endorsed negative emotions after the specific emotion of sadness during nostalgic experiences, whereas irritation was the next most frequently endorsed emotion, after sadness, during autobiographically salient nonnostalgic experiences.

These findings demonstrate differences in the overall percentages of positive, negative, and mixed emotions endorsed between conditions, with many more positive emotions endorsed during nostalgic experiences, but with specific positive emotions not differentiating strongly between conditions. These findings also

demonstrate differences in the profile of specific negative emotions, and underlying prototypes, that were endorsed between conditions.

Personality and Nostalgia Proneness

The relationship between personality and nostalgia proneness has not yet been explored, but may be of great value in describing the experience of nostalgia (see Figure 1, L8). To this end, we estimated two standard linear regressions, regressing the SNS first onto the seven ANPS dimensions and then onto the five BFI factors. The model including BFI factors yielded a significant main effect of Neuroticism, $\beta = 2.31$, $t(220) = 3.32$, $p < .005$, on SNS, with no other effects being significant at the .05 level. The model

including ANPS factors yielded a main effect of Seek, $\beta = 1.43$, $t(218) = 1.99$, $p < .05$, and a main effect of Sadness, $\beta = 4.12$, $t(218) = 4.66$, $p < .0001$, on the SNS.

Discussion

In this study, we used music-evoked autobiographical memories to explore nostalgia. Participants listened to brief selections of popular music and rated how nostalgic these musical excerpts made them feel. Intensity of music-evoked nostalgia was predicted by context-level affective and mnemonic constructs, mood state, nostalgia proneness, and personality traits, and interactions between context-level and person-level constructs.

Nostalgia and Context-Level Constructs

Analyses focusing on context-level constructs as predictors of music-evoked nostalgia confirmed previous findings regarding the mnemonic and affective components of nostalgia. Autobiographical memories have been identified in the literature as a key component of nostalgic experiences (Batcho, 2007; Sedikides, Wildschut, Arndt, & Routledge, 2006; Sedikides et al., 2008). We extended these findings to larger sets of episodes within individuals, demonstrating that the autobiographical salience of a particular song was the strongest predictor of the intensity of music-evoked nostalgia, even when controlling for all other constructs. In addition, participants' familiarity with a song also significantly predicted the strength of nostalgia experienced while listening to that song.

Whereas positive emotions are integral to nostalgic experience, nostalgia is not devoid of negative emotions (Batcho, 2007; Sedikides, Wildschut, Routledge, Arndt, & Zhou, 2009). Indeed, we found that both the number of positive emotions experienced and the number of negative emotions experienced were significant predictors of more intense music-evoked nostalgia. The number of positive emotions experienced during a song was a much stronger predictor of music-evoked nostalgia than was the number of negative emotions experienced or the incidence of mixed emotions. However, the finding that each of these variables (i.e., positive, negative, and mixed emotions) was positively associated with nostalgia suggests that nostalgia has a complex affective signature. It also provided the impetus for a detailed investigation of the differing emotional profiles of nostalgic, nonnostalgic autobiographical, and nonnostalgic nonautobiographical experiences (discussed below).

Throughout the analyses, context-level variables were the strongest predictors of strength of music-evoked nostalgia. Furthermore, on comparing the relative fit of each model, including models containing person-level variables, addition of context-level variables resulted in the greatest increase in model fit.

Nostalgia and Person-Level Constructs

We also investigated the role of person-level constructs in predicting the average intensity of music-evoked nostalgia across participants. We found that nostalgia proneness, as assessed by the SNS, was the most robust person-level predictor of music-evoked nostalgia. SNS scores were positively associated with ratings of music-evoked nostalgia when the SNS was entered as the sole

predictor and also when controlling for all other context- and person-level measures. Individuals who are generally prone to experiencing nostalgia reported more intense music-evoked nostalgia.

Wildschut et al. (2006) found that an experimental manipulation of negative mood significantly increased nostalgia. Consistent with their findings, we found a significant association between an assessment of negative mood state and intensity of music-evoked nostalgia. Participants who entered the study in a more negative mood reported more intense music-evoked nostalgia across songs. This effect remained significant even after controlling for the BFI factors. However, when we controlled for the ANPS dimensions, the association between negative mood and music-evoked nostalgia was no longer statistically significant. Compared with nostalgia proneness, then, negative mood may be a less robust predictor of music-evoked nostalgia. This same conclusion also applies to the Play dimension of the ANPS. Play scores were positively associated with music-evoked nostalgia when Play was the sole predictor of nostalgia but not when we controlled for other person-level constructs.

Cross-Level Interactions Between Context-Level and Person-Level Constructs

Although the cross-level interactions within our models were statistically significant, their overall contribution to predicting nostalgic experience was very small. This is to be expected, given that the BFI factors represent broadly abstract behavioral tendencies, and the ANPS dimensions are associated with networks that integrate limbic and neocortical brain areas. The BFI dimensions reflect basic tendencies that interact with context in a dynamic process to manifest momentary behavior (McCrae & Costa, 2008). Although they may exert a constant pressure on the individual to behave in a certain way over time, they may exert little direct effect on individual behaviors. Similarly, the ANPS dimensions reflect the prepotent tendencies of underlying brain areas that interact with higher level cognition as well as intra- and extrapersonal context. These tendencies may also exert a constant behavioral pressure over time, but their direct effects on individual behaviors may not be very strong. Given these complexities, these interactions are difficult to interpret clearly within the context of this study. Some general features of interest may be observed, however, from the pattern of cross-level interactions in our data set.

When examining the final model including the ANPS, PANAS, and SNS (see Table 2), all ANPS dimensions except for Fear were involved in cross-level interactions with emotionally relevant context-level variables. Conversely, when examining the final model including the BFI, PANAS, and SNS (see Table 2), the only cross-level interaction involving an emotional context-level construct and the BFI factors was the interaction between conscientiousness and arousal. Overall, this suggests that the ANPS dimensions may be more closely related than the BFI factors to momentary emotional experiences as they relate to nostalgia, given the emphasis of those dimensions on affective constructs.

These final analyses also revealed a notable pattern of interactions between the SNS and context-level constructs, suggesting that nostalgia proneness generally heightens the potency of context-level variables. These interactions, however, were very

weak contributors to the overall strength of nostalgia compared with context-level variables alone. With more focused investigation, the relationships between traits and affective and mnemonic experience in this context may be clarified.

The Emotional Profile of Music-Evoked Nostalgia

Music-evoked nostalgia was related to both positive and negative emotional experience. Our findings are consistent with Wildschut and colleagues' (2006) characterization of nostalgia as a happiness-related emotion that gives rise predominantly (albeit not exclusively) to positive affect, including feelings of joy, love, and pride. Our findings were further consistent with the suggestion of Wildschut et al. that nostalgia can, at times, be bittersweet. That is, nostalgia can involve a blend of positive (e.g., joy) and negative (e.g., sadness) emotions. For instance, we found that mixed emotions were more frequently endorsed during nostalgic experiences (compared with nonnostalgic experiences; see Figure 4).

With regard to the experience of discrete emotions, we found that joy was a stronger component of nostalgic experiences and nonnostalgic autobiographical experiences than of nonnostalgic nonautobiographical experiences. Listening to songs that evoked neither a nostalgic nor an autobiographical memory gave rise to relatively high levels of irritation and disgust. This is consistent with a recent study of the taxonomy of music-evoked emotions, which proposed that irritation is experienced when listening to music with which one is unfamiliar or that one dislikes (Zentner et al., 2008).

Sadness was most frequently endorsed for songs that evoked an autobiographical memory, whether nostalgic or not. However, proportionally, sadness-related emotions were much more prominent for nostalgic experiences than for nonnostalgic autobiographical experiences. The relative proportion of discrete emotions that fall into the underlying emotional clusters of Shaver et al. (1987) suggests a fairly constant emotional profile across experience (nostalgic, nonnostalgic autobiographical, nonnostalgic nonautobiographical) for positive emotions, but variation in the emotional profile across experience for negative emotions. Whereas sadness-related emotions (sadness, disappointment, suffering, and sympathy) were more prominent during nostalgic experiences, anger-related emotions (irritation and disgust) were more prominent during nonnostalgic nonautobiographical experiences.

Shaver et al. (1987) proposed that emotions subordinate to emotional prototypes (e.g., longing, cheerfulness, nervousness) may be meaningfully related to more than one prototype (i.e., love, joy, and sadness), thus giving rise to "emotion blends" (p. 1082). Our findings suggest that nostalgia may be a prime example of an emotion blend that is composed of a variety of emotions that fall into different emotion clusters. Nostalgia may also be a special case of the more general music–emotion experience described by Zentner et al. (2008), who proposed that many emotions experienced while listening to music may occur in a blended fashion, making it difficult to draw distinctions between specific emotions elicited between experiences. Multiple and mixed emotional endorsements within our sample may reflect these blends as they were being experienced by our participants. Although not all nostalgic experiences were characterized by mixed emotions, there was a significant increase in both the incidence of mixed emotions and the simultaneous experience of multiple positive emotions

during nostalgic experiences (compared with nonnostalgic autobiographical and nonnostalgic nonautobiographical experiences).

Nostalgia and the Underlying Structure of Emotion

A long-standing debate within the emotion literature is centered on the exact nature of the underlying structure of emotion and the question of whether it is possible to experience mixed emotions. In our study, the specific characterization of nostalgia as a mixed emotion, containing simultaneous experience of joy and sadness, may be at odds with dimensional models of affect, where the joint experience of joy and sadness would represent experiences within opposite quadrants of dimensional space (Tellegen, Watson, & Clark, 1999b). Although studies using both nonmusical (Larsen, McGraw, & Cacioppo, 2001; Rafaeli, Rogers, & Revelle, 2007) and musical (Hunter, Schellenberg, & Schimmack, 2008) stimuli have provided evidence for mixed emotions, the question of whether these emotions are experienced concurrently versus sequentially has not yet been resolved. The present research, too, falls short in this regard. Although we have highlighted evidence for the bittersweet emotional signature of nostalgia, the question of whether positive and negative emotions were experienced concurrently or sequentially cannot be answered with the available data. Measurement instruments that are sensitive to the temporal sequence of emotional experience (Larsen et al., 2001; Larsen, McGraw, Mellers, & Cacioppo, 2004), when used in combination with our method of eliciting music-evoked nostalgia, may allow future research to determine whether complex emotions, such as nostalgia, are more accurately described by circumplex models of affect (Carroll, Yik, Russell, & Barrett, 1999; Russell & Carroll, 1999), other dimensional models of affect (Tellegen, Watson, & Clark, 1999a; Tellegen et al., 1999b; Watson, Clark, & Tellegen, 1988; Watson & Tellegen, 1999; Watson et al., 1998), or discrete models of affect (Ekman, 1999; Panksepp, 2005, 2007; Shaver et al., 1987).

Predictors of Nostalgia Proneness

Nostalgia proneness, as measured by the SNS, is considered a trait-level construct, and as such is expected to reflect an individual's stable tendency to experience nostalgia. Previous studies have indicated negative mood state as a momentary trigger of nostalgia (Wildschut et al., 2006). If personality traits expressed by the BFI and ANPS are indicators of an individual's tendencies to experience given mood states (e.g., extraversion, neuroticism, anger, sadness), then they may inadvertently reflect a person's tendencies to experience those states shown to trigger nostalgia. It would follow, then, that nostalgia proneness is related to these affectively linked personality traits. Our findings fit this model well, showing nostalgia proneness, as measured by the SNS, to be related to the Sadness dimension of the ANPS and the Neuroticism subscale of the BFI. This describes a mechanism by which person-level negative affective states predict higher nostalgia proneness.

When considering the characteristics of a person that may be highly prone to experiencing nostalgia, one might think of the general archetype of one who neurotically ruminates on the past or runs to the past to escape the woes of the present. This personality is mildly suggested by the relationships between neuroticism, sadness, and nostalgia proneness. Another possible archetype,

however, is someone who is intrigued by the interconnectedness of life and time, for whom the connections between present and past are a thing to marvel at and wonder about. This archetype is mildly suggested by the cross-level interactions found in the final model including the BFI, PANAS, and SNS (see Table 2), where conscientiousness and openness interact with autobiographical salience, song familiarity, and arousal. These relationships, however tenuous, suggest that a number of sources may exist for nostalgia proneness, and further research may be able to tease apart these sources.

Nostalgia as Successful Remembering?

In a recent study of nostalgia, a series of word memory tasks was used to establish that the strength of recall and vividness of the memory of a word influenced the perception of the emotional context in which that word was previously seen (Leboe & Ansons, 2006). Various manipulations of single and paired words of varying emotional valence and context were implemented, controlling for levels of encoding. No manipulation of nostalgic or episodic autobiographical experience was used, nor were participants measured or compared in their actual experience of, or proneness to, nostalgia. In short, the construct of nostalgic experience was reduced to affectively valenced word memory without regard for possible individual differences in nostalgic experience or the effects of more complex memories involving social context or strong, personally salient emotional experience. Nostalgic experience was explained away as an artifact of successful remembering.

Although the effects of successful remembering on affective valence associations may not be in dispute, we challenge the conclusion that nostalgia is no more than a positive affective byproduct of successful remembering. We found, for instance, that nostalgic songs were not associated just with positive emotions but also with negative emotions, thus producing its distinct “bittersweet” emotional profile. Furthermore, not all autobiographical songs were rated as highly nostalgic, indicating that successful remembering alone is not sufficient to trigger nostalgia.

Are Particular Songs Rated as More Nostalgic Than Others?

On the basis of previous literature (Janata et al., 2007; Wildschut et al., 2006) and our current findings, we believe the source of music-evoked nostalgic experience to be the idiosyncratic associations that people have formed between particular songs and events in their past. This does not rule out the possibility, however, that music-evoked nostalgia is a function of specific musical attributes of individual songs, such that these songs would elicit nostalgia in all listeners. To explore this possibility, we calculated Fleiss's k coefficient of rater reliability on nostalgia ratings for those songs that were rated by at least four participants within our original sample. If specific musical attributes were responsible for evoking nostalgia, we would expect interrater agreement for strength of nostalgia to reflect this. That is, there should be high agreement among participants as to which particular songs are nostalgic and which particular songs are not. Seventy-two percent of songs were presented to four or more participants within our study. No song was presented to more than 23 participants. Because k calculation requires an equal number of raters for all songs,

k was first calculated separately for all songs rated by the same number of participants (4–23) and then averaged across songs. Average k for nostalgia ratings of songs was .03 (range = $-.02$ to $.10$). This indicates close-to-chance agreement between participants regarding the level of nostalgia evoked by particular songs. Music-evoked nostalgia is idiosyncratic: We found no evidence that certain particular songs elicited high (or low) levels of nostalgia across listeners.

Limitations and Future Directions

Before closing, we address a number of limitations of the present research. First, before generalizing from the findings, one must keep in mind that the sample consisted predominantly of college-age, U.S. undergraduate students. This raises two important questions: First, what would we expect to find in different age groups? Second, what would we expect to find in different cultures? With regard to age, we expect that for both older adults and young children music-evoked nostalgia will also be associated predominantly (albeit not exclusively) with positive affect. Wildschut et al. (2006, Study 1) sought to identify the affective signature of nostalgia based on personal narratives published in the periodical *Nostalgia*. Although the exact age of the authors of these narratives was unavailable, their age was estimated to range from early 20s to late 80s on the basis of pictures of authors as well as historical details contained in the narratives. The narratives contained more frequent expressions of positive than negative emotions. These findings provide preliminary evidence that for older adults (i.e., postcollege), nostalgia is predominantly a positive experience. Support for the positive affective bias of nostalgia was also found in Chinese children 9–15 years of age (Zhou et al., 2008, Study 1), Chinese college students (Study 2), and Chinese factory workers (Study 4). This shows that, across different age groups and also within different cultures, nostalgia is associated predominantly with positive affect.

Another limitation of the present study is that we allowed participants to indicate the presence or absence of multiple emotions for a given song, but we did not assess how intensely they experienced each emotion. We have assumed that the greater prevalence of one emotion than another (e.g., love vs. sadness) indicates that a given emotion is relatively more characteristic of nostalgic experience, but it may be the case that the more prevalent emotion is generally experienced with less intensity than is the less prevalent emotion. It would therefore be prudent in future studies to assess the degree to which participants feel each emotion as they are experienced during nostalgia.

Finally, we assumed that the music we presented would be associated with participants' autobiographical memories. For most participants, this was indeed the case, but for some the method evoked few or no autobiographical memories at all. The method used in this study may be improved by more closely tailoring particular sets of songs to particular participants. This may be facilitated by considering the relation between personality and music preferences (Cattell & Anderson, 1953; Dollinger, 1993; Rawlings & Ciancarelli, 1997; Rentfrow & Gosling, 2003).

In Closing

This was the first comprehensive study of music-evoked nostalgia. Listening to nostalgic songs was associated with both joy

and sadness, whereas listening to songs lacking autobiographical salience was associated with irritation. More important, the strength of nostalgia was most strongly predicted by context (autobiographical salience; arousal; familiarity; elicitation of positive, negative, and mixed emotions), less strongly but significantly by attributes of the person (nostalgia proneness, mood state), and by the interplay between context and person. We hope the study provides the impetus for more nuanced research into the topic of music-evoked nostalgia.

References

- Batcho, K. I. (2007). Nostalgia and the emotional tone of song lyrics. *American Journal of Psychology*, 120, 361–381.
- Buchanan, T. W. (2007). Retrieval of emotional memories. *Psychological Bulletin*, 133, 761–779.
- Carroll, J. M., Yik, M. S. M., Russell, J. A., & Barrett, L. F. (1999). On the psychometric principles of affect. *Review of General Psychology*, 3, 14–22.
- Cattell, R. B., & Anderson, J. C. (1953). The measurement of personality and behavior disorders by the IPAT music preference test. *Journal of Applied Psychology*, 37, 446–454.
- Costa, P. T., & McCrae, R. R. (1980). Influence of extraversion and neuroticism on subjective well-being: Happy and unhappy people. *Journal of Personality and Social Psychology*, 38, 668–678.
- Davis, K. L., Panksepp, J., & Normansell, L. (2003). The Affective Neuroscience Personality Scales: Normative data and implications. *Neuropsychological Analysis*, 5, 57–69.
- Dollinger, S. J. (1993). Personality and music preference: Extraversion and excitement seeking or openness to experience? *Psychology of Music*, 21, 73–77.
- Ekman, P. (1999). Basic emotions. In T. Dalgeish & M. Power (Eds.), *Handbook of cognition and emotion* (pp. 45–60). Sussex, England: Wiley.
- Hunter, P. G., Schellenberg, G., & Schimmack, U. (2008). Mixed affective responses to music with conflicting cues. *Cognition & Emotion*, 22, 327–352.
- Janata, P. J., Tomic, S. T., & Rakowski, S. K. (2007). Characterization of music-evoked autobiographical memories. *Memory*, 15, 845–860.
- John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative Big Five trait taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp. 114–156). New York: Guilford Press.
- Juslin, P. N., Liljestrom, S., Vastfjall, D., Barradas, G., & Silva, A. (2008). An experience sampling study of emotional reactions to music: Listener, music, and situation. *Emotion*, 8, 668–683.
- Juslin, P. N., & Vastfjall, D. (2008). Emotional responses to music: The need to consider underlying mechanisms. *Behavioral and Brain Sciences*, 31, 559–575; discussion 575–621.
- Konecni, V. J. (2008). Does music induce emotion? A theoretical and methodological analysis. *Psychology of Aesthetics, Creativity, and the Arts*, 2, 115–129.
- Larsen, J. T., McGraw, A. P., & Cacioppo, J. T. (2001). Can people feel happy and sad at the same time? *Journal of Personality and Social Psychology*, 81, 684–696.
- Larsen, J. T., McGraw, A. P., Mellers, B. A., & Cacioppo, J. T. (2004). The agony of victory and thrill of defeat. *Psychological Science*, 15, 325–331.
- Leboe, J. P., & Ansons, T. L. (2006). On misattributing good remembering to a happy past: An investigation into the cognitive roots of nostalgia. *Emotion*, 6, 596–610.
- Lundqvist, L. O., Carlsson, F., Hilmersson, P., & Juslin, P. N. (2008). Emotional responses to music: Experience, expression, and physiology. *Psychology of Music*, 37, 61–90.
- McCrae, R. R., & Costa, P. T. (2008). The five-factor theory of personality. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp. 159–181). New York: Guilford Press.
- Panksepp, J. (1998). *Affective neuroscience: The foundations of human and animal emotions*. Oxford, England: Oxford University Press.
- Panksepp, J. (2005). Affective consciousness: Core emotional feelings in animals and humans. *Consciousness and Cognition*, 14, 30–80.
- Panksepp, J. (2007). Neurologizing the psychology of affects. *Perspectives on Psychological Science*, 2, 281–296.
- Rafaeli, E., Rogers, G. M., & Revelle, W. (2007). Affective synchrony: Individual differences in mixed emotions. *Personality and Social Psychology Bulletin*, 33, 915–932.
- Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (2nd ed.). Thousand Oaks, CA: Sage.
- Rawlings, D., & Ciancarelli, V. (1997). Music preference and the five factor model of the NEO Personality Inventory. *Psychology of Music*, 25, 120–132.
- Rentfrow, P. J., & Gosling, S. D. (2003). The do re mi's of everyday life: The structure and personality correlates of music preferences. *Journal of Personality and Social Psychology*, 84, 1236–1254.
- Routledge, C., Arndt, J., Sedikides, C., & Wildschut, T. (2008). A blast from the past: The terror management function of nostalgia. *Journal of Experimental Social Psychology*, 44, 132–140.
- Russell, J. A., & Carroll, J. M. (1999). On the bipolarity of positive and negative affect. *Psychological Bulletin*, 125, 3–30.
- Sedikides, C., Wildschut, T., Arndt, J., & Routledge, C. (2006). Affect and the self. In J. P. Forgas (Ed.), *Affect in social thinking and behavior: Frontiers in social psychology* (pp. 197–215). New York: Psychology Press.
- Sedikides, C., Wildschut, T., Arndt, J., & Routledge, C. (2008). Nostalgia past, present, and future. *Current Directions in Psychological Science*, 17, 304–307.
- Sedikides, C., Wildschut, T., & Baden, D. (2004). Nostalgia: Conceptual issues and existential functions. In J. Greenberg, S. Koole, & T. Pyszczynski (Eds.), *Handbook of experimental existential psychology* (pp. 200–214). New York: Guilford Press.
- Sedikides, C., Wildschut, T., Routledge, C., Arndt, J., & Zhou, X. (2009). Buffering acculturative stress and facilitating cultural adaptation: Nostalgia as a psychological resource. In R. S. Wyer, C. Y. Chiu, & Y. Y. Hong (Eds.), *Understanding culture: Theory, research and application* (pp. 351–368). New York: Psychology Press.
- Shaver, P., Schwartz, J., Kirson, D., & O'Connor, C. (1987). Emotion knowledge: Further exploration of a prototype approach. *Journal of Personality and Social Psychology*, 52, 1061–1086.
- Singer, J. D. (1998). Using SAS PROC MIXED to fit multi-level models, hierarchical models, and individual growth models. *Journal of Educational and Behavioral Sciences*, 24, 323–355.
- Tellegen, A., Watson, D., & Clark, L. A. (1999a). Further support for a hierarchical model of affect: Reply to Green and Salovey. *Psychological Science*, 10, 307–309.
- Tellegen, A., Watson, D., & Clark, L. A. (1999b). On the dimensional and hierarchical structure of affect. *Psychological Science*, 10, 297–303.
- Tomic, S. T., & Janata, P. (2007). Ensemble: A Web-based system for psychology survey and experiment management. *Behavioral Research Methods*, 39, 635–650.
- Watson, D., & Clark, L. A. (1992). On traits and temperament: General and specific factors of emotional experience and their relation to the five-factor model. *Journal of Personality*, 60, 441–476.
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measure of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, 54, 1063–1070.

- Watson, D., & Tellegen, A. (1999). Issues in the dimensional structure of affect—Effects of descriptors, measurement error and response formats: Comment on Russell and Carroll (1999). *Psychological Bulletin*, 125, 601–610.
- Watson, D., Wiese, D., Vaidya, J., & Tellegen, A. (1998). The two general activation systems of affect: Structural findings, evolutionary considerations, and psychobiological evidence. *Journal of Personality and Social Psychology*, 76, 820–838.
- Wildschut, T., Sedikides, C., Arndt, J., & Routledge, C. (2006). Nostalgia: Content, triggers, functions. *Journal of Personality and Social Psychology*, 91, 975–993.
- Zentner, M., Grandjean, D., & Scherer, K. R. (2008). Emotions evoked by the sound of music: Characterization, classification, and measurement. *Emotion*, 8, 494–521.
- Zhou, X., Sedikides, C., Wildschut, T., & Gao, D. G. (2008). Counteracting loneliness: On the restorative function of nostalgia. *Psychological Science*, 19, 1023–1029.

Received December 19, 2008

Revision received October 7, 2009

Accepted December 23, 2009 ■