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CONTRAST AND CONGRUENCE EFFECTS IN AFFECTIVE PRIMING OF WORDS AND MELODIES

We examined possible congruence and contrast effects during affective priming of linguistic and musical stimuli. In Experiment 1, when two words were presented auditorily, participants judged the affective content of the second item (happy or sad) faster when the affects matched (congruency), as expected. In Experiment 2, however, a contrast effect was observed with melodies, with slower responses in the matched conditions. In Experiment 3, two words, two melodies, or one of each were presented. A congruency effect was observed when the target was a musical stimulus (regardless of the prime type) but a contrast effect was observed when the target was a linguistic stimulus (again, regardless of the prime type). The results show that affective properties can influence the priming in both music and language. However, such priming is sensitive to the type of task, and strategic/expectancy effects play a large role when stimulus types are mixed.

Key words: language and music, affect communication, affective priming, auditory priming, emotion and priming, congruency effects, contrast effects

Language and music can both convey emotion. In language, this is more indirect in that words are symbolic and arbitrary and communication of emotion thus depends on learning about meaning associations. In music such communication does not rely on previous conceptual learning (e.g., Bigand & Poulin-Charronnat, 2006) – for instance, the minor third can convey sadness simply upon perception (e.g., Curtis & Bharucha, 2010). In recent years, several studies have explored judgments of emotion conveyed bylinguistic and musical stimuli (e.g., Koelsch, Kasper, Sammler, Schulze, Gunter, & Friederici, 2004; Sollberger, Reber, & Eckstein, 2003; Steinbeis & Koelsch, 2010). Although much of this data show that both language

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and music communicate emotion, it is still unclear whether the same mechanisms are at play in the two domains, and, in particular, whether the processing of emotion information is automatic or strategic.

We used a priming paradigm in which linguistic and musical stimuli were categorized as happy or sad. They were preceded by primes comprising other linguistic and musical stimuli that were similar or different in their conveyed emotion. Typical priming experiments in language test pairings of words that are related in some fashion, such as in terms of semantic category(e.g., cat-dog or cat-basketball). Often, the finding is that the closer the relationship between the prime and the target, the faster the responses. An assumption in much of priming research is that the first stimulus activates parts of other representations or associations in memory, which are then more easily retrieved when the second stimulus is encountered, thus improving speed on the task (Anderson & Bower, 1973; Collins & Loftus, 1975; Sumner & Samuel, 2007). Priming experiments in music also test whether initially presented tones, chords, or melodies influence the speed with which the target stimuli are responded to (e.g., Bharucha & Stoekig, 1987; Bigand, Poulin, Tillmann, Madurell, & D'Adamo, 2003; Tillmann, Bigand, Escoffier, & Lalitte, 2006).

In affective priming, the task is to evaluate a stimulus on dimensions such as liking, goodness, or, more relevant to present purposes, the conveyed emotion.For instance, in one of the first studies of its kind in the linguistic domain, Fazio, Sanbonmatsu, Powell, and Kardes (1986) found that participants were faster to judge the valence of a target stimulus (e.g., "ugly") when it was preceded by another negative word (e.g.,"hate") than when preceded by a neutral word (e.g.,"flower"). They argued that the priming effect was based on fast-acting processes that did not depend upon the conscious identification of the primes or on the allocation of processing resources (Fazio, 2001). That is, just as with meaning, affect was also activated and processed automatically.

Some studies have examined affective priming in cross-domain stimuli, as well, mainly through priming of linguistic stimuli by musical stimuli (Sollberger et al., 2003; Steinbeis & Koelsch, 2010). These studies have found that affective congruence, manipulated either through consonance/dissonance or mode (major/minor) in chords and pleasantness in words, do indeed lead to faster processing of words. Priming of musical stimuli by related linguistic stimuli has also been shown (Daltrozzo & Schön, 2009), although in this study, the relationship has been at the conceptual rather than affective level. Nevertheless, if affective evaluations of words are fast-acting processes (e.g., Fazio, et al., 1986) or if the meaning-to-affect mediation is automatic, congruent words should prime musical stimuli at the affective level, as well.

There is one caveat in proposing similar congruence effects with cross-domain priming of affect. Interestingly, in language, conceptual relationships between prime and target items appear to influence lexical decision judgments, but not judgments of affect; in contrast, affective relationships between prime and target influence affective judgments, but not lexical judgments (cf. Klinger Burton & Pitts, 2000). Thus, it is assumed that the dimension the person is asked to judge is what is pertinent to the task. This suggests that even if meaning-to-affect mediation is automatic (Fazio, 2001), the strategy employed in making use of these dimensions can still influence utilization of this information. In addition, although music has been shown to activate meaning (e.g., Daltrozzo & Schön, 2009), when outside of a musical context, more processing needs to occur with music than with other meaningful stimuli (Painter & Koelsch, 2011). Thus, whereas affective features of musical stimuli appear to be activated automatically (e.g., Sollberger et al., 2003), extracting meaning or any affect-to-meaning mediation within music may not necessarily be automatic. One prediction, then, might be that even though in language affect and meaning dimensions are both processed automatically (e.g., Fazio, 2001), in music, affect processing can be different if the meaning dimension is also activated.

Further, congruency effects, although often obtained in studies of affect, are not ubiquitous. Indeed, sometimes the opposite result obtains. This is termed hedonic contrast and shows how affect judgments can be influenced by context. When people make aesthetic or hedonic evaluations, they often rate average stimuli as lower when preceded by positive exemplars from the same category and as higher when preceded by negative exemplars (e.g., Dolese, Zellner, Vasserman, and Parker, 2005). Thus, a mediocre meal, when preceded by a terrible one is rated higher than it would be without the contrasting stimulus. Unlike in meaning-based priming studies, the task in these studies is a comparison based on just the affect dimension, and the meaning dimension is largely irrelevant.

Hedonic contrast has been found with musical stimuli, as well. Parker, Bascom, Rabinovitz, and Zellner (2008) asked participants to rate the quality of musical selections after hearing other sequences that had been previously rated as "good" or "bad" within a single presentation list. Goodness was defined as steady and rhythmic melodies, with typically Western consonant harmonies (predominantly major thirds and perfect fifths). "Bad" melodies were arrhythmic with dissonant harmonies and minor seconds and diminished fifths ever-present. When the neutral sequences were heard after "good" music they were rated worse than when they were heard first, and when they were heard after "bad" music they were rated better than an unbiased control, demonstrating positive and negative hedonic contrast. Thus, the affect dimension in music was evaluated in terms of the context in which it had been experienced.

To date, studies using only musical stimuli have not looked at just affective priming. One hypothesis suggested by the hedonistic contrast effects in aesthetics literature then is that in cases with musical stimuli where conveying of the affect dimension is not contaminated by any conceptual evaluation or the meaning dimension, contrast effects should emerge rather than congruence effects.

The first aim of our study was to replicate previous findings in language where both the prime and the target were words. Thus, in Experiment 1,with both meaning and affect dimensions processed simultaneously and automatically, in the absence of any strategy needed to suppress one or the other dimension, we expected to see congruence effects (e.g., Fazio, 2001; Schmitz & Wentura, 2012). Our second aim was to extend the same methodology to musical stimuli. However, in Experiment 2, where both the prime and the target were melodies, our expectations were less clear. Congruence effects similar to those expected with only words could emerge. On the other hand, because the processing of affect is automatic with melodies, but not necessarily the processing of conceptual information, in the absence of any strategy for also processing the meaning dimension, hedonic contrast effects could emerge instead (cf. Parker et al., 2008). Our third aim was to use cross-domain stimuli in addition to just linguistic and just musical stimuli. Thus, in Experiment 3, we also included melody-word, and word-melody stimuli. In the absence of any special strategies, with melody-word pairs we expected to replicate the congruence effect shown by Sollberger et al. (2003).With word-melody pairs, however, just as in Experiment 2, the expectations were less clear. One possibility was that Daltrozzo and Schön's (2009) findings would be extended to the affective domain. However, it is also possible that whereas a musical prime out of context can enable a participant to focus directly on the affective component of a word, a word prime out of context, because it also encompasses an automatically processed conceptual component, could have at least a diluted effect in priming the affect component of a melody. Further, all of the predictions become less obvious if participants change strategies to cope with the occurrence of both stimulus types showing up as targets.

Finally, we should note that this study also addressed whether congruency effects with words could be produced completely within the auditory domain, as auditory stimulus presentation tends to be longer and it has been previously suggested that there may be limitations on stimulus length to achieve affective priming (Klauer, 1998). Moreover, an important methodological advantage of our paradigm was that by contrasting performance on congruent prime-target pairs (prime and target are both positive or both negative) with incongruent pairs (one positive, the other negative), the affective priming effect did not rely on comparisons between different sets of words (such as comparison of negative vs. positive words, as in negativity effects). The same words and melodies were placed in congruent as well as incongruent prime-target pairs. It was therefore unlikely that any uncontrolled aspects of the words (e.g., familiarity, informational diagnosticity, or extremity) or melodies (number of notes, range, or frequency of occurrence) could explain the affective priming effects if they occurred (Klauer, 1998).

Experiment 1

Experiment 1 served as a replication of affective priming studies in language but with a purely auditory presentation procedure.

Method

Participants. The participants were 32 undergraduate students from Memorial University, who were all native English speakers and had no hearing problems. They were paid a nominal fee for their participation.

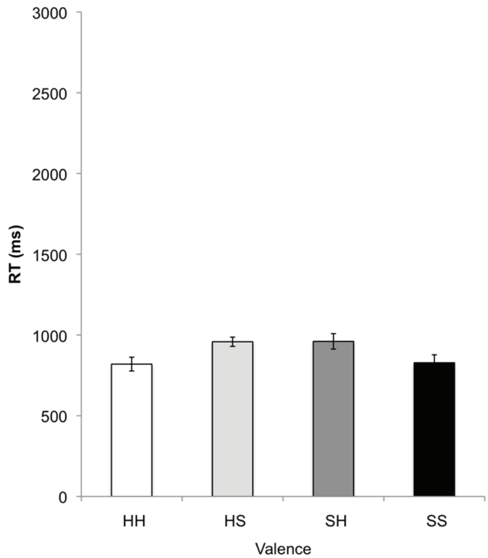
Materials. The stimuli in all experiments were synthesized using an Apple Macintosh computer and Logic Studio software. In this experiment, 48 happy and 48 sad words were chosen from Bradley and Lang's (1999) list of norms. Happy words (e.g., *angel, bright, laugh*) had valence ratings between 6.3 – 8.7. Sad words (e.g., *beaten, death, regret*) had valence ratings between 2.6 – 1.1. Along with low valence, typically, it is low arousal that implicates sadness rather than high arousal (e.g., Russell, 1980). However, because we were not going to control for arousal levels of the musical stimuli in the subsequent experiments, we wanted to limit affect only to the valence dimension. Thus, even though our materials are perhaps better classified as pleasant or unpleasant, we will keep using the happy/sad terminology for ease of comparisons with the musical stimuli in Experiments 2 and 3. The 'Alex' voice, bundled with Mac OS X Leopard, was used as the presentation voice.

All stimuli were presented binaurally via headphones and were adjusted to a comfortable intensity (~70 dB). Responses were collected via a button box. As is usual in the auditory priming literature, responses were measured from the onset of the target: the clock and stimulus were started by the same software trigger (Sumner & Samuel, 2007). The stimuli ranged from 400 ms to 500 ms in length with an average of 451 ms, and happy and sad words did not differ ($p > 0.10$). Playing time was equated by adding silence to the end of the stimuli so that the interstimulus interval was the same for each trial.

Design. We used a 2 (prime affect: happy or sad) x 2 (target affect: happy or sad) repeated measures design. There were 48 trials in total. Twenty-four happy and 24 sad words were used as primes. For each of the primes, 24 happy words and 24 sad words served as targets; half of each was paired with a congruent prime and half with an incongruent prime. No word was used more than once. Each pairing could thus consist of a happy or sad word as the prime, and a happy or sad word for the target. For each participant, there were an equal number of each of the four types of prime-target pairs, all constructed randomly without replacement. The stimuli that were the primes for half the participants became the targets for the other half. The order of trials was randomized.

Procedure. Participants were tested individually. They were told that they would be listening to two words and should respond to the second word as quickly as they could. They were told to press the left (or right) button labeled "happy" if they judged the second word to be happy and the left (or right) button labeled sad if they judged it to be sad. These instructions remained on screen throughout the trials. The response buttons were counterbalanced across individuals. Four practice

Figure 1. Mean RT (ms) as a function of valence (H=Happy, S=Sad). The first letter indicates the valence of the prime, the second the target. Error bars show the standard error of the mean



trials, comprising one of each type of pairing, preceded the main experiment. Participants were given a break midway through the experiment after the 24th trial.

Results and Conclusions

The results are shown in Figure 1. The analyses were based on correct responses; response times greater than 3 standard deviations from the mean for each participant were marked as incorrect and excluded from the analyses (2.7% of all responses). Overall accuracy was about 93% and did not differ as a function of pair type ($p > 10$).

A 2 x 2 repeated measures analysis of variance (ANOVA) showed no main effects of prime or target affect (both *F's* <1), but there was a significant interaction, $F(1, 31) = 16.62$, $MSE = 35929$, $p < 0.05$). Fisher LSD post-hoc tests showed that, as expected, congruent pairs were responded to faster than incongruent pairs. In fact, Happy-Happy pairs were responded to faster than Sad-Happy pairs ($p < 0.01$), and Sad-Sad pairs were responded to faster than Happy-Sad pairs ($p < 0.01$). Neither the two congruent nor the two incongruent conditions differed from one another ($ps > 0.10$)

Thus, we replicated the typical affective priming findings with the particular word stimuli we had chosen and with only auditory presentation. A congruency effect was found in that happy words were responded to faster when preceded by other happy words and sad words were responded to faster when preceded by other sad words. However, response times in the current study were well above the typical response times reported (e.g., Klauer, 1998). It is probable that the increase in overall response time was due to the modality differences between the current and past studies in that the current study used computer-generated auditorily presented words as both prime and targets.

Experiment 2

In this experiment, we used only musical stimuli. Even though priming studies have used only musical stimuli at the cognitive representation level (Bigand & Poulin-Charronnat, 2006),to date, no study has looked at musical stimuli priming other musical stimuli at the affective level.

Method

Participants. The participants were 32 undergraduate students from Memorial University who had no hearing problems and who had not participated in Experiment 1. Mean music training was 3.7 years, although there was no reason to expect any differences as a function of musicianship in this particular task. They were paid a nominal fee for their participation.

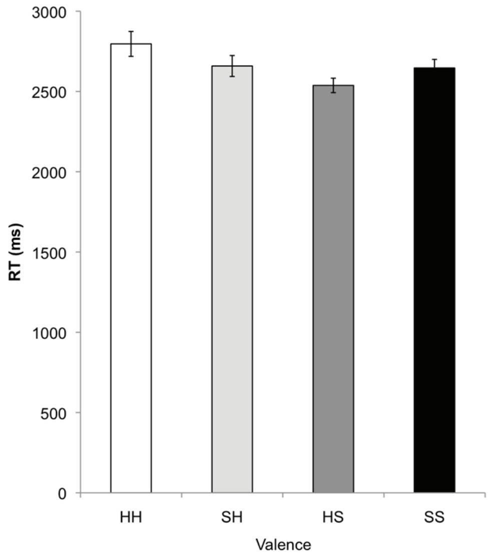
Materials*, Design, and Procedure.* Twenty-four tones were synthesized (C1, C#1, D1, D#1, E1, F1, F#1, G1, G#1, A1, A#1, B1, C5, C#5, D5, D#5, E5, F5, F#5, G5, G#5, A5, A#5 and B5) according to an equal tempered tuning ranging from 660 Hz to 1144 Hz in order to produce short-duration melodies (all of the music stimuli (.wav) can be accessed at http://play.psych.mun.ca/~ams/Musicstimuli). Using these tones, 72 happy and 72 sad melodies were created, using four notes in ascending order for the former and two separate notes in a descending interval for the latter. These melodies were then piloted for affect with seven participants using a Likert scale with 1 indicating very sad and 5 very happy. The 48 happiest (mean rating 4.7) and the 48 saddest (mean rating of 1.2) were selected. The happy melodies ranged from 0.9 s and 1.05 s and the sad melodies ranged from 0.9 and 1.1 s in length. All melodies had 100% rater agreement with respect to happy/sad categorization. The timbre used in this study was that of a concert piano. All other aspects of the method were identical to that of Experiment 1, except that happy and sad melodies were used as primes and targets instead of words.

Results and Conclusions

The results are shown in Figure 2. As before, the analyses were based on correct responses, and the same exclusion criteria led to the exclusion of 1.4% of all responses.

A 2 x 2 repeated measures ANOVA, as in Experiment 1, showed no main effect of prime affect ($F < 1$), but a significant effect of target affect, $F(1, 31) = 20.66$, $MSE = 33183$, $p < 0.01$, as well as a significant interaction, $F(1, 31) = 18.41$, $MSE = 25441$, $p < 0.01$. Fisher LSD post-hoc tests showed that this time, unlike in Experiment 1, overall, incongruent pairs were responded to faster than congruent pairs. Responses to Happy targets were slower than those for Sad targets ($p < 0.01$),

Figure 2. Mean RT (ms) as a function of valence (H=Happy, S=Sad). The first letter indicates the valence of the prime, the second the target. Error bars show the standard error of the mean



but were even slower when they were preceded by a congruent prime ($p < 0.01$). Responses to Sad targets did not differ as a function of prime congruence ($p > 0.10$).

In this experiment accuracy was only 83%, and was noticeably lower for the Happy-Happy pairs (61%). A 2 x 2 repeated measures ANOVA on the accuracy data revealed significant main effects of prime affect, $F(1, 31) = 50.86$, $MSE = 0.93$, $p < 0.01$, and target affect, $F(1, 31) = 50.61$, $MSE = 2.69$, $p < 0.01$, as well as a significant interaction, $F(1, 31) = 53.68$, $MSE = 2.24$, $p < 0.01$. Fisher LSD post-hoc tests showed that accuracy results mirrored the reaction time results in that the slowest conditions were also the least accurate. Thus, a speed/accuracy trade-off did not confound the reaction time results.

The results of this study were quite different from those of Experiment 1. First, responses were slower, which was not too surprising because speeded evaluation of melodies is not a common everyday task (e.g., Blair, Richell, Mitchell, Leonard, Morton, & Blair, 2006). Second, accuracy was lower. Finally, and more importantly for present purposes, a contrast rather than a congruency effect was observed.

We assume that because judgments were based only on perceptual/affective processing,with no concepts to corroborate them, the happy and sad melodies were somewhat more ambiguous in their conveying of affect than words. This greater ambiguity could have induced the context created by the prime to play a greater role in the affective classification of the target. Similar to the hedonic contrast studies, the happy stimuli, when preceded by a relatively better example of a happy stimulus, were judged as less happy and were therefore harder to classify. The contrast between the happy and sad stimuli, on the other hand, was more salient and helped the participant evaluate the target relatively unambiguously, thus leading to faster and more accurate response times in the incongruent conditions.

Experiment 3

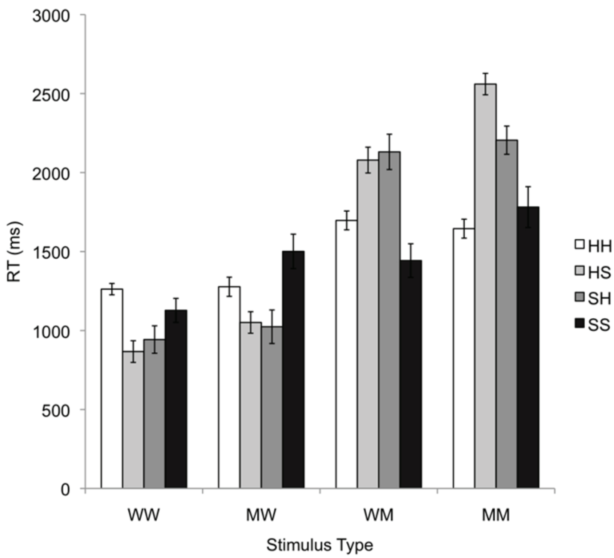
Experiment 1 showed that affective priming results shown in language could be replicated using auditorily presented words. Experiment 2, however, showed a contrast effect with the same priming paradigm when the stimuli were all melodies. Experiment 3 included both pure word and pure melody pairs in the same test, and also introduced cross-domain pairs to determine whether musical stimuli could act as affective primes for linguistic targets and vice versa. One difference between our study and those of Sollberger et al. (2003) and Steinbeis and Koelsch (2010), who did show congruence effects using musical primes and linguistic targets, was that whereas the targets in their studies were always words, the targets in our study could be either melodies or words. Further, we tested whether word primes could influence decisions on melody targets, thereby extending the findings of Daltrozzo & Schön (2009) to the affective domain.

Method

Participants. The participants were 40 undergraduate students from Memorial University who had no hearing problems and who had not participated in Experiments 1 or 2. Mean music training was 1.7 years, although again musicianship was not likely to be relevant to this particular task. They were paid a nominal fee for their participation.

Materials*, Design, and Procedure.* The stimuli, as well as all other materials, were the same as those used in Experiments 1 and 2. The apparatus, stimulus presentation software and hardware were the same as in the other experiments. The experiment was a 2 (prime affect) x 2 (target affect)x 2 (prime type) x 2 (target type) within-subjects design. Prime and target affects referred to whether the emotions conveyed by these stimuli were happy or sad, and prime and target types referred to whether the stimuli appearing as primes and targets were words or melodies. There were 96 trials, comprising 24 happy words, 24 sad words, 24 happy melodies and 24 sad melodies used as primes in four separate blocks. Each of the four blocks also had 24 happy words, 24 sad words, 24 happy melodies and 24 sad melodies as targets. No word or melody was ever repeated in either the target or the prime conditions. Each pairing could consist of a happy or sad word or a happy or sad melody as the prime, with the same possibilities occurring for the target. Along with prime/target status of the stimuli, order of condition was also counterbalanced across participants but randomized within each block. The procedure was the same as before except that participants made judgments about words or melodies, and could not anticipate the target type when given the prime.

Figure 3. Mean RT (ms) as a function of stimulus type and valence (W=Word, M=Music, H=Happy, S=Sad). The first letter indicates the valence of the prime, the second the target. Error bars show the standard error of the mean



Results and Conclusions

The results are shown in Figure 3. As before, the analyses were based on correct responses, and the same exclusion criteria led to the exclusion of 3.3% of all responses. Accuracy was 94% and did not differ as a function of pair type (all *F's* < 1.5).

First, it should be noted that given the random intermixing of stimulus types and thus the need for task switching, it was not surprising that response times in this experiment were somewhat slower. A 2 x 2 x 2 x 2 repeated measures ANOVA showed no main effects of prime affect, $F(1, 39) = 1.05$, $MSE = 189609$, $p > 0.10$, or target affect, $F(1, 39) = 0.60$, $MSE = 215575$, $p > 0.10$. There were main effects of prime type, $F(1, 39) = 77.76$, $MSE = 71915$, $p < 0.01$, and target type, $F(1, 39) = 140$, $MSE = 751685$, $p < 0.01$, with words being generally responded to faster than musical sequences. There were target valence x prime type, $F(1, 39) = 42.08$, $MSE = 3965791$, $p < 0.01$, and prime valence x target type, $F(1, 39) = 5.01$, $MSE = 156227$, $p < 0.01$, interactions, as well. However, these interactions can be subsumed into the below discussion of the more informative three-way interaction that also emerged between prime valence, target valence, and prime type, $F(1, 39) = 234.39$, $MSE = 34072290$, $p < 0.01$.

As can be seen in Figure 3, there were clear differences when words were targets (the left half of the figure) compared to when melodies were targets (the right half of the figure). In fact, there was a congruency effect when melodies were the targets (Fisher LSD--happy-happy = sad-sad < sad-happy < happy-sad), but a hedonic contrast effect when words were the targets (Fisher LSD--happy-happy = sad-sad > sad-happy = happy-sad). Moreover, this pattern was essentially the same whether the prime stimuli were words or melodies, thus there was no significant four-way interaction, $F(1, 39) = 3.85$, $MSE = 99450$, $p > 0.05$.

Although there was an overall congruency effect, that is, collapsed across item types there was an interaction of prime and target valence such that the congruent pairs were responded to faster than the incongruent pairs, this congruence effect was driven by the music targets. When words were the targets, there was a contrast effect.

It seems then that the mixed nature of the prime-target combinations, the only difference between Experiment 3 and the previous two experiments, influenced the processing of affect in language and in music. Switching between decisions of affects conveyed by perceptual properties of music (affect dimension only) and those conveyed by the simultaneous automatic activations of conceptual and affective properties of words (meaning and affect dimensions),coupled with the unpredictable nature of the target type, likely led to a strategy change in making the affective judgments. Knowing that either type of target (a word or a melody) could be presented, it would be less stressful and perhaps more efficient for participants to adopt the strategy of expecting a cross-domain target at all times, and, to make the decision easier, choose to utilize both meaning and affect dimensions in both types of targets. When the targets were melodies, this would have required the non-automatic and comparatively effortful processing of the meaning dimension in music (cf. Painter & Koelsch, 2011), which would in turn render the decision to be partially at the conceptual level, producing the typical congruence effects shown at this level of priming (e.g., Bigand & Poulin-Charronnat, 2006; Bigand et al., 2003). Such a strategy change would not have an influence when the targets were words because the conceptual and affect dimensions can be activated simultaneously and automatically (cf. Fazio, 2001), and participants have been shown to be able to utilize either dimension effectively (cf. Klinger et al., 2000). Given the nature of the current decision task (affect judgment), the affect dimension could be chosen to be utilized as the sole informative dimension while the conceptual dimension could be ignored at no cost and hence lead to a contrast effect with word targets.

There remains the question of why such contrast effects are not obtained in typical linguistic affective priming studies as a rule. It is reasonable to assume that it is because in such studies there is no need to adopt a special strategy. When the targets are always words, as also in our Experiment 1, there is no need to accommodate whether the conceptual or the affective dimension should be given salience. Both dimensions are activated automatically, which enables the conceptual representations to automatically lead to the assumed spreading of activation along with the affect representations, and hence to the typical congruence effects. This was the first study where because of the unpredictability of the target type, individuals likely changed their way of processing. The conceptual dimension of the word targets was actively ignored, which did not have any mental cost to the participant but which led to judgments being based solely on the affect dimension (also activated automatically) and to the observed contrast effect.

Conclusions

Experiment 1 replicated previous findings and extended congruence effects in affective priming in language to the auditory modality. Experiment 2 was the same as Experiment 1 except that musical stimuli replaced the linguistic stimuli. Interestingly, a contrast rather than a congruency effect was observed, suggesting that in the absence of conceptual information hedonistic contrast influences affective judgments (cf. Parker et al., 2008).

Contrast effects are provocative because they pose problems for theoretical accounts of evaluative priming. In one view, activation spreads from valenced primes to concepts related in valence, causing priming effects in evaluations. In this account, spreading activation can explain only assimilation, not contrast. Although spreading activation is usually seen as causing facilitation, Berner and Maier (2004) suggested that activation turns into inhibition once a certain level of activation is exceeded, as might be the case for extreme primes and highly anxious participants in their view. Hermans, Spruyt and Eelen (2003), on the other hand, argued that activation might turn into inhibition for the weakest primes. Regardless, contrast effects exist in a variety of capacities within the priming literature through a variety of manipulations such as action valence blindness, success and failure feedback, positivity proportion effects, and emphasis on accuracy (Klauer, Teige-Mocigemba, & Spruyt, 2009).

Experiment 3 included both musical and linguistic pairs as well as cross-domain pairs, all in a single list. Surprisingly, a congruency effect was observed when targets were musical stimuli and a contrast effect was observed when targets were linguistic stimuli. This was true regardless of the prime type, suggesting a strategy difference in the processing of the targets.

Melodies and words clearly belong to different categories and direct comparisons of affect are not possible without the mediating effects of the conceptual/meaning dimension. Indeed, in judgments of affect, hedonic contrasts can disappear when items do not belong to the same category (cf. Dolese et al., 2005).Processing both conceptual and affective dimensions was a reasonable strategy on the part of the participants to aid in the task faced in Experiment 3. However, activating the conceptual dimension in music takes effort (Painter & Koelsch, 2011) and because through such processing the attention to cognitive representations cannot be suppressed, conceptual spreading activation might be unavoidable and lead to congruence effects. On the other hand, in words, both affective and conceptual dimensions can be processed effortlessly, or the mediating effects of the conceptual dimension is automatic (Fazio, 2001); thus, attending to just the affective component can be accomplished at no cost, and a hedonic contrast effect can arise.

We suspect our Experiment 3 results were inconsistent with those of Sollberger et al. (2003) and Steinbeis & Koelsch (2010) where they showed a congruence effect because their primes were always musical and targets always linguistic. Thus, the conceptual mediation of affect was always present though also always automatic. Because of the specific strategy adopted by our participants to cope with the possibility of either musical or linguistic targets, however, we were able to extend the congruence effect found in the conceptual priming of musical stimuli by linguistic stimuli (Daltrozzo & Schön, 2009) to the affective priming domain.

One fruitful avenue for future research would be to test this strategy change explanation directly and compare cross-domain priming in pure lists to that in mixed lists. The prediction would be that as long as the targets were all words (melody-word) or all melodies (word-melody), congruence effects should emerge. If the mixed list included only cross-domain pairs and no same-domain pairs, one might still expect only congruence effects because the type of target would be predictable from the prime itself. The case where both same-domain and cross-domain pairs appeared, and appeared randomly, should, however, show the congruence and contrast effects found in Experiment 3.

In sum, we showed that, although music and language possess affective properties that are in most circumstances compatible and congruous, this interrelation can also be influenced by the task at hand. Our findings suggest that with words, because both conceptual and affective dimensions are automatically processed, congruence effects emerge; with melodies, because only the affective dimensions are automatically processed, contrast effects emerge. Moreover, intermixing of cross-domain and same-domain evaluations and their unpredictability appears to influence expectancies on how affect should be evaluated, which in turn influences the specific strategies used in these evaluations.

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