Attention please: Evaluative priming effects in a valent/non-valent categorization task

(Reply to Werner and Rothermund, 2013)

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Abstract

It has previously been argued (a) that automatic evaluative stimulus processing is dependent upon feature-specific attention allocation (FSAA) and (b) that evaluative priming effects can arise in the absence of dimensional overlap between the prime set and the response set. In opposition to these claims, Werner and Rothermund (2013) recently reported that they were unable to replicate the evaluative priming effect in a valent/non-valent categorization task. In this manuscript, I report the results of a conceptual replication of the studies by Werner and Rothermund (2013). A clear-cut evaluative priming effect was found, thus supporting the initial claims about FSAA and dimensional overlap. An explanation for these divergent findings is discussed.

Attention please: Evaluative priming effects in a valent/non-valent categorization task (Reply to Werner and Rothermund, 2013)

It is a widespread assumption that humans process the evaluative meaning of all incoming stimulus events in an automatic, almost reflexive fashion (e.g., Bargh, Chaiken, Govender, & Pratto, 1992). In a number of recent publications, however, my colleagues and I have demonstrated that automatic evaluative stimulus processing occurs only under conditions that promote selective attention for the evaluative stimulus dimension (Spruyt, De Houwer, Hermans, & Eelen, 2007; Spruyt, De Houwer, & Hermans, 2009; Spruyt, De Houwer, Everaert, & Hermans, 2012). As an example, consider the evaluative priming studies by Spruyt et al. (2009). In a typical evaluative priming study, participants are asked to categorize target stimuli in terms of their evaluative meaning (hereinafter referred to as the evaluative categorization task). Crucially, each target is preceded by a briefly presented prime stimulus and the evaluative congruence of the prime-target pairs is manipulated: Whereas both stimuli share the same evaluative connotation on some trials, other trials consist of stimuli that are incongruent in terms of their evaluative meaning. A typical observation is a performance benefit in speed and/or accuracy for congruent trials relative to incongruent trials. Such an effect can come about only if participants process the evaluative meaning of the primes and can therefore be used as an index of evaluative stimulus processing. To examine whether this so-called ‘evaluative priming effect’[1] depends on the degree of attention assigned to the evaluative stimulus dimension (hereinafter referred to as feature-specific attention allocation, FSAA), Spruyt et al. (2009, Experiment 3) presented participants with two types of trials: (a) experimental trials (25%) that required participants to pronounce target words as fast as possible (i.e., a semantically neutral task) and (b) induction trials (75%) that required a speeded categorization of the target words. Crucially, the nature of this categorization task was manipulated. Whereas one group of participants was required to categorize targets as referring to either humans or objects (i.e., semantic categorization condition), participants in a second group were asked to classify targets in terms of their evaluative meaning (i.e., evaluative categorization condition). Selective attention for the evaluative stimulus dimension was thus maximized in the evaluative categorization condition whereas participants in the semantic categorization condition were encouraged to direct their attention to non-evaluative semantic stimulus features. Results showed that the nature of the induction trials had a clear impact on the evaluative priming effects captured by the experimental pronunciation trials. Whereas evaluative congruency between the primes and targets exerted no influence at all on target responding in the semantic categorization condition, a strong effect of evaluative congruency emerged in the evaluative categorization condition. This data pattern clearly shows that automatic evaluative stimulus processing is critically dependent upon FSAA. Moreover, adding to the generality of this conclusion, a number of recent studies confirmed that FSAA exerts similar effects on various other behavioral (Everaert, Spruyt, & De Houwer, 2013) and neuropsychological markers (e.g., Everaert, Spruyt, Rossi, Pourtois, & De Houwer, in press) of automatic affective stimulus processing.

Recently, however, Werner and Rothermund (2013) published data that, at first sight, seem inconsistent with the FSAA framework developed by Spruyt et al. (2007, 2009, 2012). Unlike standard evaluative priming studies, they asked participants to categorize positive, negative, and neutral target stimuli as either valent (positive or negative) or non-valent (neutral). Because such a task requires participants to assign attention to the evaluative stimulus dimension, one would expect automatic evaluative stimulus processing to occur in this version of the evaluative priming paradigm too. Nevertheless, Werner and Rothermund (2013) failed to obtain a reliable evaluative priming effect, despite ensuring adequate statistical power.

It might be noted, however, that a lack of evaluative priming in the valent/non-valent categorization task is not necessarily at odds with the idea that automatic stimulus evaluation depends on FSAA. As an alternative explanation, it could simply be argued that the mechanism responsible for translating the outcome of the prime-evaluation process into an observable evaluative priming effect is inoperative in the valent/non-valent categorization task. According to this viewpoint, the evaluative priming effect can come about only if there is dimensional overlap between the prime set and the target set (Kornblum, Hasbroucq, & Osman, 1990). In the standard evaluative categorization task, this is clearly the case. In this task, both the prime set and the target set consist of positive and negative stimuli, and participants are required to respond with a positive or negative response. As a result, the primes can pre-activate the responses that are mapped onto the evaluative stimulus dimension by means of the instructions. While this pre-activation is beneficial on congruent trials, it results in a Stroop-like response conflict on incongruent trials, thereby producing the evaluative priming effect. In a valent/non-valent categorization task, however, such a mechanism cannot be operative because participants always respond with the same response on critical priming trials (i.e., ‘valent’). Accordingly, if it is assumed that Stroop-like response interference is the only mechanism that can underlie the evaluative priming effect (see Voss, Rothermund, Gast, & Wentura, 2013), the absence of this effect in the valent/non-valent categorization task is a logical finding.

However, while several researchers reported that they were unable to replicate the evaluative priming effect in the absence of dimensional overlap between the prime set and the response set (e.g., De Houwer, Hermans, Rothermund, & Wentura, 2002; Klauer & Musch, 2002; Klinger, Burton, & Pitts, 2000), others reported that they did succeed in capturing this phenomenon, at least under certain conditions (e.g., Bargh, Chaiken, Raymond, & Hymes, 1996; De Houwer, Hermans, & Spruyt, 2001; Everaert, Spruyt & De Houwer, 2011; Hermans, De Houwer, & Eelen, 1994; Spruyt, Hermans, De Houwer, & Eelen, 2002; Spruyt et al., 2007, 2009, 2012; Spruyt, Hermans, De Houwer, Vandromme, Eelen, 2007; Schmitz & Wentura, 2012; Wentura, 2000; Wentura, & Frings, 2008). These findings suggest that processes other than Stroop-like response interference are also involved in the translation of the outcome of the prime-evaluation process into an observable evaluative priming effect. Therefore, although the FSAA account concerns the prime-evaluation process only, it might be argued that inducing selective attention for the evaluative stimulus dimension should be sufficient to obtain the evaluative priming effect. From this viewpoint, the null-findings obtained by Werner and Rothermund (2013) are clearly incompatible with the FSAA framework. However, an inspection of the experimental procedures used in their studies suggests (at least) two potential explanations for these null-findings while maintaining the central assumptions of the FSAA framework.

First, remember that the task developed by Werner and Rothermund (2013) requires participants to discriminate between valent and non-valent (neutral) targets. Crucially, in both their experiments, the prime set included both neutral and valent stimuli. As a result, Werner and Rothermund (2013) not only manipulated the evaluative match between the primes and the targets on evaluative priming trials, they also manipulated the compatibility between the prime set and the response set. In fact, results showed that target responding was influenced by this factor: Both in Experiment 1 ($d = 1.82$) and Experiment 2 ($d = 1.66$), participants were faster to respond to compatible trials as compared to incompatible trials. It could therefore be argued that evaluative priming effects were abolished by the presence of response priming effects. It is not inconceivable, for example, that the evaluative match between the primes and the targets failed to speed up target responding because participants were already responding quite fast due to the response priming effect.

A second potential explanation for the null-findings obtained by Werner and Rothermund (2013) relates to the nature of the valent/non-valent categorization task itself. According to the FSAA framework developed by Spruyt et al. (2007, 2009, 2012), variations along attended stimulus dimensions become more salient relative to variations along unattended stimulus dimensions. It could thus be argued that differences between positive and negative stimuli become less rather than more salient when participants are encouraged to assign attention to a valent/non-valent stimulus dimension (see also Werner and Rothermund, 2013). To the extent that this reasoning is correct, the FSAA framework thus predicts a lack of evaluative priming when using the valent/non-valent categorization task, as was observed by Werner and Rothermund (2013).

Both issues are inherently linked to the valent/non-valent categorization task and are therefore difficult to deal with. Nevertheless, it could be hypothesized that removing the neutral primes from the design could (at least partially) reduce both problems. First, although it is technically impossible to rule out response priming effects completely in the valent/non-valent categorization task, it seems reasonable to assume that response priming effects should be less pronounced when the prime set no longer varies along the response-relevant stimulus dimension (e.g., Notebaert, Verbruggen, & Soetens, 2005). Second, despite the nature of the response task, participants may be more sensitive to variations along the positive/negative dimension when they learn that all the prime stimuli (or 75% of all the stimuli) are either positive or negative (see also

Everaert et al., 2011). To examine these possibilities, I decided to run a conceptual replication of Experiment 2 of Werner and Rothermund (2013) using valent primes only.

Method

Participants

Participants were 53 undergraduates at Ghent University (20 men, 33 women, $M_{age} = 19.9$ years old). They were paid €4 in exchange for their participation. One participant had an exceptionally high mean response latency (i.e., 1979 ms). Because this observation was clearly an outlier in comparison to the rest of the sample ($M = 684$ ms; $SD = 115$), the data of this participant were excluded from further analyses. In addition, I also excluded the data of one additional participant who signed up for participation despite failing to meet the requirement to be a native Dutch-speaker. Note, however, that none of the results reported below were contingent upon inclusion or exclusion of these two participants. All participants had normal or corrected-to-normal vision.

Materials

Based on the word norms collected by Hermans and De Houwer (1994), I selected 60 positive ($M = 6.19$), 60 negative ($M = 1.59$), and 40 neutral words ($M = 4.01$). A complete list of all stimuli used in the present experiment is provided in the Appendix. All differences in mean valence between different categories of words were highly reliable, all ts > 52, all ps < .0001. Other criteria such as word length and familiarity were not taken into account. Stimuli were presented in white (font Arial, font size 22) against the black background of a 19 inch computer monitor (100 Hz, screen resolution 1024 × 768). An Affect 4.0 program (Spruyt, Clarysse, Vansteenwegen, Baeyens, & Hermans, 2010) controlled the presentation of the stimuli as well as the registration of the response latencies. Responses were recorded by means of a standard computer keyboard.

Procedure

Participants were tested individually in a darkened room. For each participant separately, the computer program selected 40 positive words and 40 negative words at random to serve as primes. The remaining words (20 positive, 20 negative, and 40 neutral) were used as targets. The experiment consisted of 3 blocks of 80 trials each (240 trials in total). Within each block, primes and targets were combined at random and all primes and targets were presented exactly once. A neutral target was thus presented on exactly half of the trials and the number of positive and negative primes and targets was balanced. Due to the random combination of the primes and the targets, the number of congruent and incongruent trials was not balanced. Across participants, the consistency proportion varied between 40.83 % and 59.17 %, with a mean of 48.84 % (SD = 4.70 %). None of the effects reported below correlated with the consistency proportion (all $|r| < .10$, all ts $> .50$).

Similar to the earlier studies by Spruyt et al. (2007, 2009), each trial started with a 500-ms-presentation of a fixation cross. Next, after an interstimulus interval of 500 ms, the prime was presented for 200 ms. Finally, 50 ms after the offset of the prime (SOA 250 ms), the target was presented until a response was registered. Incorrect responses were followed by a 2000-ms error message (i.e., ‘FOUT!!!’). The inter-trial interval (ITI) varied randomly between 500 ms and 1500 ms, with a mean of about 1000 ms. Participants were asked to press a left key (i.e., ‘^{2}’) in response to neutral targets and a right key (i.e., ‘-’ of the numeric keypad) in response to positive and negative targets. Instructions emphasized that it was important to respond as fast as possible to the target stimuli. Unlike Werner and Rothermund (2013), participants were not instructed to ignore the prime stimuli.

Results

The main analyses were restricted to trials on which the target was either positive or negative. Mean error rates and mean response latencies were analyzed by means of a 1-way repeated measures ANOVA (congruent vs. incongruent). Mean response latencies were computed after exclusion of trials on which an incorrect response (10.32 %) or a far-out value (2.61 %) was registered. Similar to my earlier work, outliers were defined as values that deviated more than 2.5 standard deviations from a participant’s mean latency in a particular condition. Virtually identical results are obtained when using the outlier treatment procedure described by Werner and Rothermund (2013).

The response latency data were clearly affected by the evaluative congruence of the prime-target pairs. Responses were faster on congruent trials (M = 683 ms) as compared to incongruent trials (M = 693 ms), $F(1, 50) = 5.72$, $p = .02$. A similar analysis of the error rates revealed the same data pattern, although the effect just missed conventional significance levels. Participants made less errors on congruent trials (M = 9.69 %) as compared to incongruent trials (M = 10.97 %), $F(1, 50) = 3.52$, $p = .07$.[2]

To assess whether performance was affected by response priming effects, I also compared task performance on experimental and non-experimental trials (i.e., trials on which the target was either valent or non-valent, respectively). While mean response latencies on experimental trials (M = 688 ms) and non-experimental trials (M = 686 ms) were virtually identical, $F < 1$, an analysis of the error rates revealed a clear difference between both types of trials, $F(1, 48) = 38.34$, $p < .001$. However, in contrast to the idea that response priming effects facilitated responding on experimental trials, participants made much more (not less) errors on the experimental trials (*M* = 10.32 %) as compared to the non-experimental trials (*M* = 6.08 %).

Discussion

The results are clear-cut. In line with the FSAA framework proposed by Spruyt et al. (2007, 2009, 2012), a significant evaluative priming effect was found using the valent/non-valent categorization task. Moreover, as noted in Footnote 2, I ran this study twice and found exactly the same data pattern in both studies. It can thus be concluded that the occurrence of the evaluative priming effect in the valent/non-valent categorization task is a reliable finding.

This conclusion stands in sharp contrast with the null-findings obtained by Werner and Rothermund (2013). The question thus arises how one can reconcile these divergent findings. As explained above, there are reasons to assume that the inclusion or exclusion of neutral prime stimuli is a critical factor. First, when neutral prime stimuli are used, variations in irrelevant stimulus – response compatibility may impact target performance to an extent that it becomes difficult to capture the evaluative priming effect. I suspected that removing the neutral primes from the design would lead to a lesser degree of response priming, and the present findings are in line with this reasoning. In fact, target performance in the present experiment was worse (not better) on response-compatible trials (i.e., the experimental priming trials) than on response-incompatible trials (i.e., a valent prime followed by a neutral target). It should be noted, though, that it is impossible to obtain a pure estimate of the response priming effect in the present design as response compatibility and target valence were perfectly confounded. Nevertheless, the fact that a reliable evaluative priming effect emerged under these conditions is at least consistent with the idea that response priming effects interfered with the evaluative priming effect in the studies of Werner and Rothermund (2013). As an alternative explanation, however, it might also be argued that variations along the positive/negative dimension are more likely to be picked up in the valent/non-valent categorization task when 100% of the prime stimuli (or 75 % of all the stimuli) are either positive or negative (see also Everaert et al., 2011). Further research would thus be needed to unravel the precise reason why the inclusion or exclusion of neutral stimuli in the prime set makes such a difference.

Moreover, an interpretation of the reasons why the present experiment produced significant effects is also complicated by the fact that the procedures used by Werner and Rothermund (Experiment 2, 2013) and those implemented in the present experiment differ in a number of ways. As an example, consider the temporal details of the priming trials used in the two studies. Whereas the SOAs and the prime durations were of the same scale, a marked difference can be found in terms of the response – stimulus interval (RSI), that is, the time between the execution of a response on trial *t*-1 and the presentation of the next prime stimulus on trial *t*. Whereas Werner and Rothermund (2013) used an RSI of 950 ms, the RSI was (about) 2000 ms in the present experiment. This difference in RSI is potentially important as response selection on trial *t*-1 might affect response selection on trial *t* if the RSI is relatively short.

One might also note that the instructions used in the present study and Experiment 2 of Werner and Rothermund (2013) were quite different. In the present experiment, instructions merely emphasized that is was important to respond as fast as possible to the targets. In contrast, Werner and Rothermund (2013) instructed participants to ignore the primes. This difference is potentially important as some reports attesting to the controllability of the evaluative priming effect have appeared recently in the literature (e.g., Teige-Mocigemba & Klauer, 2008; 2012). Nevertheless, there are good reasons to doubt that the null-findings reported by Werner and Rothermund (2013) resulted from the fact that participants somehow managed to counteract the influence of the primes. Remember that the design used by Werner and Rothermund (2013) included trials consisting of a neutral prime stimulus as well as a neutral target stimulus. Crucially, in Experiment 1, the associative relationship of these stimuli was manipulated such that half of these neutral priming trials consisted of associatively related concepts whereas the other half consisted of associatively unrelated concepts. Despite the fact that Werner and Rothermund (2013) failed to obtain significant evaluative priming in this experiment, they did capture a significant associative priming effect. This observation is clearly difficult to reconcile with the idea that participants managed to ignore the primes. Associative relatedness was no longer manipulated in Experiment 2 of Werner and Rothermund (2013), but the instructions used in both experiments were identical. Taken together then, is seems rather unlikely that strategic attempts to counteract the influence of the primes can account for the divergent findings obtained by Werner and Rothermund (2013) and myself.

Finally, the present study and Experiment 2 of Werner and Rothermund (2013) were different in terms of the extent to which participants were encouraged to respond as fast as possible. In the present experiment, although the instructions certainly emphasized that it was important to respond as fast as possible, the overall speed of responding was inconsequential. In contrast, unlike previous studies by Spruyt et al. (2007, 2009, 2012), Werner and Rothermund (2013) terminated the execution of their experiments when a participant failed to respond with a correct and sufficiently fast (i.e., 1000 ms) response on at least 75 % of a series of practice trials (i.e., one or two blocks of practice trials, depending on task performance). In addition, Werner and Rothermund (2013) rewarded good performance across the entire experiment with a small incentive (i.e., a candy bar). It is not surprising then, that the average response time in the present experiment (i.e., 688 ms) was about 100 ms slower as compared to the average response time observed in Experiment 2 (i.e., 589 ms) of Werner and Rothermund (2013). This observation raises the question whether the occurrence of the evaluative priming effect in the valent/non-valent categorization task depends on the overall speed of responding of a participant. Additional analyses strongly suggest, however, that this is not the case. First, I calculated the correlation between the mean response time and the evaluative priming effect. Contrary to the idea that the evaluative priming effect in the valent/non-valent decision task might depend upon a participant's overall speed of responding, this correlation was far from significant ($r = -.10$, $p = .50$). Second, I split the individual reaction time distributions for each priming condition into three bins and examined whether the evaluative priming effect reached significance in the first bin. This was indeed the case. In fact, the evaluative priming effect was much more pronounced in the first bin, $F(1, 50) = 17.68$, $p = .0001$, as compared to the second bin $F(1, 50) = 7.15$, $p = .01$, and the third bin $F(1, 50) = 1.16$, $p = .29$. Reassuringly, the mean response latency in the first bin (i.e., 553 ms) was well below the mean response latency observed in Experiment 2 of Werner and Rothermund (2013). It therefore seems rather unlikely that differences in overall response speed are critical to explain the presence or absence of the evaluative priming effect in the valent/non-valent categorization task.

In sum, although I initially suspected that the use of neutral primes was a critical factor, one can identify a number of other factors that may or may not have contributed to the null-effects obtained by Werner and Rothermund (2013). In addition, even if it is assumed that the inclusion or exclusion of neutral primes is indeed a critical factor, it remains an open question why exactly this factor exerts such a profound impact on the emergence of the evaluative priming effect in the valent/non-valent categorization task. Nevertheless, the mere fact that I did obtain a significant evaluative priming effect in a valent/non-valent categorization task under normal automaticity conditions is logically sufficient to reject the conclusion that the evaluative priming effect fails to replicate in the valent/non-valent categorization task (Werner & Rothermund, 2013).

The present findings are also relevant for the discussion concerning the mechanisms responsible for translating the outcome of the prime-evaluation process into an observable evaluative priming effect (see Spruyt et al., 2011; Eder, Leuthold, Rothermund, Schweinberger, 2011). Given that evaluative overlap between the prime set and the response set is missing in the valent/non-valent categorization task, the present findings add further weight to the hypothesis that processes other than Stoop-like response competition are at play in the evaluative priming paradigm. As already suggested in earlier publications (e.g., Spruyt et al., 2002), one possibility is that the evaluative match or mismatch between the primes and the targets exerts an influence on the encoding speed of the targets. In the case of the valent/non-valent categorization task, however, it could also be argued that so-called evaluative matching processes contribute to the occurrence of the evaluative priming effect (see Klauer and Musch, 2002; Wentura, 2000). According to an evaluative matching account of evaluative priming, congruent prime-target pairs give rise to a feeling of plausibility that facilitates the execution of affirmative responses and inhibits the execution of negative responses. Incongruent prime-target pairs, in contrast, are assumed to generate a feeling of implausibility that inhibits the execution of affirmative responses and facilitates the execution of negative responses. If it is assumed that the response ‘valent’ is an affirmative response in the valent/non-valent categorization task, this framework can readily account for the occurrence of the evaluative priming effect in the valent/non-valent categorization task. Finally, it could be argued that positive and negative stimuli activate competing evaluative-motivational response dispositions (Hermans, Van den Broeck, & Eelen, 1998), at least under conditions that maximize selective attention for the evaluative stimulus dimension (see Gast, Werner, Heitmann, Spruyt, & Rothermund, in press). According to this viewpoint, positive stimuli are likely to elicit an approach tendency whereas negative stimuli are likely to elicit an avoidance tendency. Congruent priming trials thus result in an activation of one and the same response disposition whereas conflicting response dispositions become active on incongruent trials. If it is assumed that an organism requires some time to deal with this internal conflict, evaluative priming effects can be readily accounted for. Moreover, because the activation of approach/avoidance tendencies is assumed to take place independently of the nature of the response task, the evaluative-motivational account of Hermans et al. (1998) can readily deal with evaluative priming effects that arise in the absence of dimensional overlap between the prime set and the response set.

To summarize, the present research demonstrates that reliable evaluative priming effects can be obtained using a valent/non-valent categorization task. This finding adds further weight to the hypotheses that (a) automatic evaluative stimulus processing is dependent upon feature-specific attention allocation and (b) evaluative priming effects can arise in the absence of dimensional overlap between the prime set and the response set. Nevertheless, further research is needed to unravel the precise nature of the processes driving the evaluative priming effect under conditions that rule out Stroop-like response interference.

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Footnotes

[1]In line with Fiedler, Bluemke, and Unkelbach (2011), I use the term ‘evaluative priming’ rather than the more commonly used term ‘affective priming’. While the latter term may be used to refer to priming phenomena that concern multiple dimensions of affective meaning, the former is better suited to describe priming along a single, evaluative stimulus dimension (positive vs. negative).

[2]It is perhaps worth mentioning that I actually ran this experiment twice. In a first attempt, participants completed this experiment after they had already participated in another evaluative priming study ($N = 76$). This experiment produced reliable evaluative priming effects, both in the error rates, $F(1, 75) = 6.66$, $p = .01$, and the response latency data $F(1, 75) = 13.80$, $p = .0004$. As I was worried that prior experience with the evaluative priming paradigm might have contributed to the emergence of these effects, I decided to replicate this experiment using participants that had no prior experience with the evaluative priming paradigm. Reassuringly, the present findings clearly demonstrated that my initial findings were not contingent upon participants having prior experience with the evaluative priming paradigm.

Appendix

Complete stimulus list

Neutral words (*n* = 40): bril, hek, keel, steen, autobus, trapezium, schaar, tand, agentschap, gemiddeld, conventioneel, trompet, vergelijk, lijn, pool, onverdroten, gist, streep, vierkant, accent, naaimachine, boog, microscoop, stoep, behangpapier, bord, tas, bier, doos, tekstverwerker, papier, klas, raadsel, godsdienstig, geregeld, informeel, golf, klei, cirkel, tafel

Positive words (*n* = 60): begrijpend, geboorte, hoopvol, schoonheid, goedgehumeurd, moedig, goedaardig, feest, enthousiast, creatief, sociaal, baby, origineel, behulpzaam, ontspannen, goed, grappig, zacht, aangenaam, warmte, warm, prettig, leven, cadeau, sympathiek, verrassing, dankbaar, oprecht, bloemen, lente, geschenk, bewonderenswaardig, humor, opgewekt, thuis, vriendelijk, rechtvaardig, zonneschijn, warmhartig, muziek, zon, romantiek, gezond, betrouwbaar, optimistisch, knuffel, zomer, eerlijk, blij, omhelzing, trouw, vrede, vakantie, vriend, gelukkig, kus, lach, liefde, levendig, waarheid

Negative words (*n* = 60): moord, verkrachting, incest, oorlog, aids, marteling, tumor, executie, bommen, haat, kanker, alcoholisme, gezwel, verstikking, slachting, pedofiel, vals, misdaad, oneerlijk, haatdragend, ongeluk, geweren, hatelijk, leugenaar, coma, wreed, kogel, harteloos, stank, boosaardig, gemeen, hebzuchtig, bemoeiziek, ziekte, drugs, onbetrouwbaar, braaksel, gangster, tiran, gijzelaar, werkloosheid, tandpijn, sadist, virus, bedreiging, zelfzuchtig, onvriendelijk, ongeval, begrafenis, lijk, ondankbaar, brutaal, snobistisch, enggeestig, egoïstisch, pijn, zelfmoord, infectie, vijandig, vulgair