

BRIEF REPORT

Web-based mood induction

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This article introduces the methodology of Web-based mood induction and it presents empirical evidence for its feasibility. The Velten procedure, autobiographical recall, and mood-suggestive photographs were tested for their effectiveness in evoking either a positive or a negative mood when compared to an untreated control group. The Velten technique and the photographs successfully deteriorated mood, but were unsuccessful in generating a positive mood. Autobiographical recall failed to induce either positive or negative mood. The effectiveness of these on-line techniques is compared with the effectiveness of similar off-line mood induction procedures.

Although Web-based experimentation is now widespread, experiments involving mood inductions have not yet been conducted via the World Wide Web (WWW). In order to induce moods via the Web one needs suitable mood induction procedures (MIPs). Such on-line MIPs need to meet the same quality criteria as off-line techniques: (a) they must produce the desired mood, in other words, they need to be effective; (b) the affective change they produce needs to be real, that is, their manipulation validity needs to be ensured; (c) on-line participants need to comply with the procedures; and (d) the procedures should be economical, especially with regard to administration time.

Whereas effectiveness and manipulation validity are implemented in the same way on-line and off-line, with Web-based MIPs, particular attention needs to be paid to compliance and economy. If on-line participants find an MIP unacceptable, which might predominantly be the case when depressed mood is induced, they might more likely abandon the experiment or incompletely fill in questionnaires than participants

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who are induced into a positive mood. Thus, a negative MIP might appear ineffective because the data of the participants who dropped out precisely because their mood had deteriorated could not be taken into account (Görizt, 2002). Because on the WWW, participants can easily abort their participation at any time and there is less control over the participation process, it is indispensable to test whether compliance differs between experimental conditions. The second issue is economy. Every on-line mood manipulation should be as short as possible for two reasons. If the mood induction is not itself the study's purpose it precedes the actual experiment. Although it should fulfill its function, it should not steal time. Second, administration time needs to be short to keep drop-out low.

The following sections describe the development and evaluation of three MIPs, which have been adapted for the WWW: the Velten technique, the recall of autobiographical events, and the presentation of emotionally charged photographs. With all three methods, we attempted to arouse both positive and negative mood. The techniques apply easily and make no special demands on the participants' hardware and software. In the Velten procedure (Velten, 1968), subjects read at their own speed positively or negatively tinged self-referent statements. In Larsen and Sinnett's (1991) meta-analysis, participants in Velten-type induction conditions scored 0.76 standard deviations higher than control subjects. However, with deceptive cover stories, effects dropped to $d=0.54$, with non-self-report mood measures, effects dropped to $d=0.52$. Westermann, Spies, Stahl, & Hesse (1996) found in their meta-analysis that the Velten method more effectively deteriorates ($r=.52$) than improves mood ($r=.38$).

With different variants of autobiographical recall (Brewer, Doughtie, & Lubin, 1980) participants recall one or more affectively tinged life event(s). Westermann et al. (1996) established a meta-analytical effect of $r=.36$ for positive and $r=.52$ for negative mood inductions using this method. This difference was significant.

The display of mood-suggestive photographs belongs to a group of procedures that present emotive test material without explicit instructions to get into the target mood. Westermann et al. (1996) assessed the effectiveness of a group of procedures based on stimulative test material in which photos were included. Positive mood was induced at $r=.53$ and negative mood at $r=.50$. Unfortunately, only one research article within this meta-analysis reports the use of actual pictorial stimuli. With the help of slides, McArthur, Solomon, and Jaffe (1980) evoked negative mood at $r=.69$ in study 1 and $r=.59$ in study 2. The effects of the positive mood manipulations were $r=.71$ and $r=.25$, respectively.

Our own search revealed five other studies that used pictures for mood manipulation. In Knapp (1987), viewing and memorising a sad vs. a neutral slide significantly deteriorated mood ($r=.44$). In Stritzke, Patrick, and Lang's (1995) no-alcohol group, pleasant slides evoked a weaker startle reflex ($r=.40$) and negative slides a stronger reflex ($r=.06$) than neutral slides.¹ Harris and Smith's (1975) participants who rated "War and Disaster" pictures felt significantly more depressed than those who looked at "Joy and Beauty" pictures ($r=.30$). However, due to the lack of a neutral group in this study, the absolute effectiveness of the positive and negative induction is unclear. Greenwald, Cook, and Lang's (1989) participants

¹ The two effects are estimated on the basis of Stritzke et al.'s (1995) fig. 1, lower panel.

viewed 21 coloured photographic slides. There was a strong linear relationship ($r = -.88$) between slide valence and subjects' facial electromyogram (EMG), which was used as a mood measure. Finally, Richards and Gross's (2000) participants viewed 18 coloured photographic slides of men, of whom half were badly wounded and half had supposedly been injured at an earlier point in time. Those who had watched the slides of badly wounded men were in a significantly more negative mood than those who had watched the other set of slides ($r = .51$). Also, the difference between the baseline mood and mood aroused by the slides depicting wounded men was significant.²

In sum, according to our literature review, the offline Velten, Photo, and Autobiographical Recall procedures induce negative mood with about equal effectiveness. The Velten and Recall techniques generate euphoric moods less successfully than dysphoric moods. Mood-suggestive stimuli, to which Photos can be counted, improve mood more effectively than positive Velten statements or the recall of positive life events. With all three MIPs, smaller effect sizes result under the following conditions: mood is assessed from behavioural expressions instead of self-reports, a cover story is used, and demand effects are otherwise controlled for.

Based on these results we formulated the hypotheses for our own experiment. We expected the participants in the positive condition of the Velten (V+), the positive Photo (P+), and the positive Recall method (R+) to be in a more positive mood than an untreated control group (CG). We further assumed that participants in the negative Velten (V-), Photo (P-), and Recall technique (R-) would experience a more negative mood than participants in the CG. We had no expectations about effectiveness differences among the three MIPs.

METHOD

The study was announced on the Internet through search engines, banners, links, newsletters, news groups, and mailing lists. Participants registered on a Web page. As a cover story, respondents read that they would take part in an "evaluation of media contents". The welcome screen contained a consent form and a text input field for the e-mail address. After their registration, the participants were automatically sent an e-mail that contained the WWW address of the experiment as well as a one-time password. Participants were randomly assigned to one of six treatment conditions (V+, V-, P+, P-, R+, R-) or to the control group (CG).

Velten procedure

Sixty self-referent statements appeared on six pages. They were a free translation of the original statements by Velten (1968). On the instructions page the participants read:

² The effect's unbiased size, however, could not be determined because the relevant information was not provided. Moreover, the slides' presentation was accompanied by playing back the victims name, occupation, and cause of injury from a tape. The effect of this additional information on the participants' mood cannot be determined.

On the following pages you will find someone's self-referent statements and thoughts. Read through all the statements and think about them for a while. Put yourself into the person's emotional situation and consider when things were similar for you and how you felt. Let each statement work on you. Adopt the feelings and thoughts and try to make this mood your own. Take as much time as you want.

In the course of the six pages, the Velten statements increased in intensity.

Photographs

A total of 250 photos, assumed to exercise a mood-lifting or depressing effect on the viewer, were gathered from the Internet and printed media. In a pretest, four male and two female judges rated the pictures on a 6-point scale with anchors in the following order: *clearly mood-lifting*, *slightly mood-lifting*, *mood-neutral*, *slightly depressing*, *clearly depressing*, and *shocking*. For ethical reasons, we excluded 12 photos because at least three judges found them shocking. From the remaining photos, we used the 58 pictures with the lowest mean score for the positive (P+) and the 57 with the highest score for the negative mood induction (P-).

The participants viewed three to nine photographs per page with different ranges of theme on ten pages total. P+ contained photos on the themes "contented families", "desirable women", "comfortable home", "happy children", "fulfilled partnership", "success at sports", "unspoiled nature", "cuddly animals", "holidays", and "children and animals". P- covered photographs on "starvation", "train crashes", "unpleasant feelings", "illness", "war", "concentration camp", "sports accidents", "environmental destruction", "industrial disasters", and "animal experiments". Instructions at each page's head, varying slightly from page to page, read: "Let all photographs work on you for a while". A radio button was put under each photo. At the end of the P+ pages was the sentence: "Now mark the photograph which you find the best (find nicest, most appealing, etc.)", whereas the P- pages said: "Now mark the photograph which you like the least (find saddest, most moving, etc.)". This rating was intended to obscure the study's true purpose.

Autobiographical recall

Participants were asked to recall four positive or negative personal life events, each on a separate page. The instructions on the introductory page read:

We are interested in (un)pleasant events from four thematic areas. Which amusing, positive, or enjoyable (sad, negative, or traumatic) occurrences did you go through and how did you experience them? We would like to know how you felt at that time and how you reacted to the events. We respect your privacy. We request you just to note pointers from your memory to help us sketch an understanding of what was happening to you. It is important that you sink into the situation again and re-experience how you felt.

The following questions in slight variations accompanied each theme (e.g., childhood events): "Your happiest (saddest) childhood experience. Please think yourself into the past again and imagine how everything was at the time. In what year was this? [pull-down menu] Please summarise what you experienced. Describe the

dominant feelings and thoughts you had [text input field]”. The three remaining pages featured the themes “nicest experience in connection with social life, integration and togetherness (worst experience of social denial and rejection)”, “nicest experience with a loved one (greatest disappointment with another person)”, and “greatest achievement (greatest failure)”.

After the mood induction, participants self-assessed their mood on the two scales *Scale A – Depressed Mood* and *Scale A – Elated Mood* of the *Adjective Scales for the Assessment of Mood (SES)* by Hampel (1977). The instructions for filling out the scale stated: “Ask yourself with each one of the following adjectives ‘How do I feel at the moment?’” Each scale comprised seven adjectives each with seven anchors ranging from *completely applicable* to *not at all applicable*. On the same page, the participants answered six more items on demographics and on their Internet use. Participants in the control condition received the page that contained the two mood scales without prior mood induction. Thus, the untreated control group saw all pages and read the same cover story, in the same order as treated participants, with the exception of pages that served for the mood induction. Subsequently, all participants took part in a task consistent with the cover story, namely to note similarities and differences of two TV shows (see Göritz & Moser, 2003). In order to ensure that the participants in V–, P–, and R– did not leave the session distressed, they went through three pages of remedial cartoons. All participants were then debriefed.

Participants

A total of 509 people, who were predominantly German, gave their e-mail address on the registration page. Of these, 435 (86%) accessed at least the experiment’s first page. Of the persons who had accessed the first page, 346 (71%) completed the experiment in a manner that was deemed to be valid, eight persons left on the welcome page or got disconnected from the network due to technical failure, 68 quit during the mood induction or were disconnected due to technical failure, 3 did not answer two or more mood scale items. In addition, six participants were deemed to have interrupted the experiment because an unrealistically long period of time elapsed between their accessing consecutive pages, three were considered click-throughs because of their short overall time of participation, and one participant produced suspicious response effects because he rated each of the mood scales’ adjectives as *completely applicable*. Participants received no reward other than to be offered a results summary. The sample consisted of 67 women (19%) and 279 men (81%). The average age was 29 years ($SD = 8$).

Dependent variables

We gleaned the induction’s effectiveness from participants’ self-assessments of mood on the standardised mood scales *Depressed Mood* and *Elated Mood*. Moreover, the time of filling out the postinduction questionnaire functioned as a behavioural manipulation check. It contains two components that are sensitive to mood influences—the decision latitude and the psychomotor speed of positioning the cursor and clicking the mouse. Previous studies (e.g., Alloy, Abramson, & Viscusi, 1981; Clark, 1983; Sokolowski, 1992) have found a psychomotor retardation in dispirited respondents. Other studies have demonstrated that people in a positive mood

display shorter decision-making times for various tasks than people in a negative mood (e.g., Buchwald, Strack, & Loyne, 1981; Velten, 1968). A genuinely positive mood would have been induced, if the positive group took less time than the CG, whereas the negative manipulation would be truly effective if the negative group took more time than the CG. Given our hypotheses, for each of these dependent measures, we used one-tailed *t*-tests to compare participants' mood in each of the six treatment conditions (V+, V-, P+, P-, R+, R-) with the control subjects' mood (CG).³

Compliance was established by comparing each of the three MIPs' negative and positive conditions with respect to the proportion of invalid participations (cf. the Participants section in this paper for a description of variants of invalid responses). A higher proportion of invalid responses would signal noncompliance. Finally, we assessed the procedures' administration time. Administration time comprised the time interval between calling up the first and submitting the last page of an MIP.

RESULTS

Effectiveness: Scale Elated Mood

As shown in Table 1, the mood in V+ was not significantly more positive than the mood in the CG, $t(109) = 1.15$, $p = .13$, $r = .11$. However, participants in V- were in a more negative mood than the control subjects, $t(110) = -3.08$, $p = .001$, $r = .28$. Participants in P+ were not in a better mood than the control subjects, $t(100) = -.07$, but people in P- were in a more negative mood than those in the CG, $t(104) = -4.77$, $p < .001$, $r = .41$. R+ subjects were not in a better mood than the control subjects, $t(83) = 1.07$, $p = .14$, $r = .12$, and R- subjects were not in a more negative mood than those in the CG, $t(85) = .87$.

Effectiveness: Scale Depressed Mood

V+ participants were not in a better mood than the control subjects, $t(109) = -1.32$, $p = .10$, $r = .13$, but those in V- were in a significantly more negative mood than the controls, $t(98) = 3.20$, $p = .001$, $r = .29$. P+ participants were not in a better mood than the controls, $t(104) = -0.74$, $p = .23$. However, P- participants were in a more negative mood than those in the CG, $t(111) = 4.80$, $p < .001$, $r = .41$. R+ participants were not in a better mood, $t(83) = 0.19$, and R- participants were not in a more negative mood than the control subjects, $t(85) = 0.69$, $p = .24$.

Behavioural measure

Fill-out time for the postinduction questionnaire was not less in V+ than in the CG, $t(109) = 0.07$. However, in V- it was significantly longer than in the CG, $t(110) = 1.63$, $p = .05$, $r = .15$. Participants in P+ did not take less time to fill out the

³ We did not adjust significance levels to correct for multiple testing. These MIPs are prototypes that are intended to be used and tested in further experiments, so a possible Type 1 error can be rectified in future research. In addition, when exploring new research avenues as is the case here, reducing the risk of overlooking a true effect (which could result in the premature abandonment of an MIP) is worth taking the risk of falsely assuming that an MIP is suitable.

TABLE 1

Mood self-reports on two mood scales, fill-out time, invalid datasets, and administration time for three mood induction procedures and an untreated control group

	<i>Velten positive (V+)</i>	<i>Velten negative (V-)</i>	<i>Photos positive (P+)</i>	<i>Photos negative (P-)</i>	<i>Recall positive (R+)</i>	<i>Recall negative (R-)</i>	<i>Control group (CG)</i>
<i>n</i>	57	58	52	61	31	33	54
SES Elated	25.6	17.6	23.2	15.2	25.7	25.3	23.3
Mood (<i>SD</i>)	(10.6)	(10.0)	(7.6)	(8.2)	(9.1)	(11.2)	(9.8)
SES Depressed	11.3	17.4	11.8	18.9	12.9	13.7	12.7
Mood (<i>SD</i>)	(5.5)	(9.2)	(6.7)	(7.8)	(5.3)	(7.7)	(6.0)
Fill-out time (min) (<i>SD</i>)	2:12 (0:38)	2:31 (1:00)	2:20 (0:53)	2:32 (0:59)	2:19 (1:02)	2:19 (0:49)	2:11 (1:09)
Invalid datasets	4 6.6%	10 14.7%	12 18.8%	7 10.3%	26 45.6%	19 36.5%	3 5.6%
Administration time (min) (<i>SD</i>)	4:11 (2:17)	4:35 (2:13)	8:45 (3:25)	9:46 (4:53)	13:22 (10:07)	12:19 (10:01)	–

questionnaire than those in the CG, $t(104) = 0.73$, but those in P- took significantly more time than control subjects, $t(113) = 1.70$, $p = .05$, $r = .16$. Participants in R+ did not take less time than control subjects, $t(83) = 0.54$, and those in R- did not take more time than control subjects, $t(85) = 0.59$, $p = .27$.

Compliance

The proportion of invalid datasets was comparable in the positive and negative conditions across all three MIPs: $\chi^2(1, N = 370) = 0.86$, $p = .35$ (cf. Table 1).

Administration time

The negative and positive conditions of each MIP were similarly time-consuming (cf. Table 1). The Velten procedure was the shortest, followed by the Photo method, which took approximately twice the time. Recall took roughly three times as long as the Velten procedure.

DISCUSSION

This study tested the Velten technique, the display of mood-suggestive photographs, and the recall of autobiographical events for their effectiveness in inducing positive and negative moods on the WWW. The positive variants of the three methods (V+, P+, and R+), did not improve the participants' mood, whereas the negative Velten and Photo method (V- and P-), but not the negative Recall method (R-), successfully deteriorated the mood.

To put these results into perspective, however, effect sizes should also be considered. One possibility is to compare the obtained effect sizes with meta-

analytical effects that are based on the use of cover stories and self-report manipulation checks—just like the effects in our study. Averaged across the two mood scales, $V -$ was as effective as $r = .28$, compared to $r = .43$ in Westermann et al. (1996),⁴ and $r = .25$ in Larsen and Sinnett (1991).⁵ The average effect size for $P -$ amounted to $r = .41$, as opposed to $r = .47$ in Westermann et al. (1996). $V +$ yielded $r = .12$, compared to $r = .30$ in Westermann et al. (1996) and $r = .25$ in Larsen and Sinnett (1991). Thus, this study reflects the common finding that negative mood is more effectively called forth than positive mood. Moreover, in our study as well as in Westermann et al. (1996), $V -$ was less effective than $P -$, and $V -$ was more effective than $V +$. In terms of absolute effect sizes, however, the online MIPs appear to be somewhat less effective than their offline counterparts.

There are several explanations why effects might have fallen short of the meta-analytical ones. First, some meta-analytic effects are overestimated due to questionable calculation rules for within-subjects designs,⁶ and due to publication bias.⁷ Second, in their initial use in this study, the optimal procedural variants of the MIPs, in terms of length, instructions, and stimuli, were probably not yet chanced upon. Therefore, these prototypes might not completely measure up to off-line variants that often have been refined over many years. Finally, random error is generally greater in WWW experiments than in comparable laboratory experiments due to varying Internet connections, different browsers, or more variation in the time of day the participations take place (McGraw, Tew, & Williams, 2000; Shavit, Sonsino, & Benzion, 2001).

A further concern of this experiment was manipulation validity. To examine the manipulations' validity we used the postinduction questionnaire's fill-out time as a behavioural mood indicator, in addition to the self-report mood measures. The patterns observed with the self-reports and with the behavioural measure were similar. However, the behavioural effects were smaller in size. This might be due to several reasons: Smaller effects had already resulted in the meta-analyses by Westermann et al. (1996) and Larsen and Sinnett (1991) when the mood measures were behavioral rather than self-reports. Furthermore, fill-out time might be a

⁴ These and the following mean effect sizes are based on our reanalysis of Westermann et al.'s (1996) data. To obtain mean effects, each individual effect size was Fisher-transformed and weighted by sample size (Hedges & Olkin, 1985, pp. 230–231). Although this introduces minor statistical bias (Glass et al., 1981), all effects were included in this reanalysis.

⁵ Larsen and Sinnett (1991) did not differentiate between negative and positive mood induction.

⁶ Westermann et al. (1996) used Rosenthal's (1991) formula to calculate repeated-measures effect sizes (R. Westermann, personal communication, 15 August, 2001). Dunlap et al. (1996) demonstrated that this calculation rule can lead to massive overestimations.

⁷ Meta-analytical effectiveness scores are likely to suffer from publication bias. Meta-analyses usually comprise both methodological articles examining MIPs' effectiveness and papers investigating the influence of mood on other dependent variables. For methodological articles, publication bias is probably negligible. However, it can be enormous for other studies, because many journals do not publish papers on the impact of mood on other variables if the mood induction did not work. Indeed, Westermann et al. (1996) identified study purpose to be a moderator of effect size. In a reanalysis of Westermann et al.'s (1996) data we found a difference in mean effect size between methodological papers ($r = .37$) and other articles ($r = .48$), which gives a clue as to how much smaller true effects are.

relatively crude behavioral measure because it is subject to variations in the speed of users' Internet connections (due to differences in computer systems, bandwidth, or fluctuations of Internet traffic). Finally, participants' dexterity in handling the mouse differs considerably, which adds more noise to this measure. It is concluded that $V -$ and $P -$ occasioned a genuine mood deterioration. Thus, their effectiveness cannot exhaustively be explained by demand characteristics.

The experiment further revealed that differential compliance with the negative and positive mood inductions was not an issue. However, the *overall* rate of invalid participations in the Recall method was daunting. The strenuousness of recalling and typing life experiences, compared to undergoing the Velten and the Photo method, might be a reason for both the high drop-out rate and ineffectiveness. In addition, participants might have been resistant to (sincerely) describe such intimate experiences. This aversion might have been caused or intensified by the Web-based format of this study: Internet users are generally aware of privacy and security risks (e.g., Bush, Bush, & Harris, 1998). Also, the anonymous and asynchronous type of Web-based communication between participant and researcher might render this technique ineffective. Another reason for the ineffectiveness might lie in how the recall was implemented in this study. Participants were asked to describe their recollections only cursorily, which might not have adequately revived their experiences (Strack, Schwarz, & Gschneidinger, 1985).

In sum, this article has demonstrated that the WWW, in principle, is suitable to be used as a medium for experiments involving the induction of mood. Negative mood can effectively and economically be elicited on-line, with good acceptance on the part of the participants. The induction of positive mood has, so far, been unreliable. Because this research ventured into new territory, further research is needed. The techniques can probably be optimised in length, stimuli, and instructions.

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