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State and trait cheerfulness and the induction of exhilaration

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The present paper examines whether state and trait cheerfulness represent actual and habitual dispositions for the emotion of exhilaration, respectively. In Experiment I, 60 research participants were involved in a 10-minute interaction with a clowning vs. neutral experimenter. Individuals high in trait cheerfulness, as assessed by the State-Trait-Cheerfulness-Inventory (STCI), displayed facial signs of exhilaration with higher frequency, intensity and duration than the low cheerful individuals did. In Experiment II ($N = 60$), the experimenter was instructed to laugh or not laugh at certain preselected scenes while watching a movie. The experimenter's laughter facilitated enjoyment displays among individuals high in state cheerfulness but not among individuals low in state cheerfulness. In both experiments, smiling and laughter predicted the subsequent mood level.

Keywords: Exhilaration, cheerfulness, laughter, humor, facial expression

Research on cheerfulness as a temperamental trait has a long tradition in European and American personality psychology. As early as the beginning of this century, Meumann (1913) discussed cheerfulness as one of 12 basic temperaments (together with the four classic Greek temperaments) which are based on the composition of affective and volitional dispositions. Four of the 12 types result from the combination of the dimensions of pleasure-displeasure (separating cheerful and frivolous from serious and grumpy) and shallow-profound nature (separating grumpy and frivolous from cheerful and serious). In one of the first experiments in differential psychology, Morgan, Mull, and Washburn (1919) demonstrated that cheerful people recall more pleasant terms (and less unpleasant ones) than depressed persons, who showed the opposite pattern.

The Emotion of Exhilaration

The more recent resurgence of interest in state and trait cheerfulness arose in the context of experimental research into smiling and laughter. The behavioral, physiological, and experiential responses to stimuli, such as humor, tickling, and laughing gas, were conceptualized in terms of an emotion concept labeled exhilaration (Ruch, 1993). It was proposed that the term *exhilaration* be used according to its Latin root (*hilaris* = *cheerful*) to denote either the process of making cheerful or the temporary rising and fading out of a cheerful state (Ruch, 1990, 1993). Thus, in contrast to

common language, the "excitement" component is deemphasized in the proposed usage of the term*. While exhilaration may be seen as a facet of the positive emotion of "happiness" (or "joy"), it is probably the facet most strongly aligned with laughter; whereas empirical studies of happiness/joy rarely report its occurrence, laughter is an inevitable response category in studies of exhilaration.

As outlined by Ruch, the concept included the exhilarants (i.e., the stimuli and situations capable of inducing exhilaration), the social and physical circumstances of the situation, as well as *actual* and *habitual* organismic factors facilitating or inhibiting the induction of exhilaration. Within this framework, cheerfulness as a mood state and cheerfulness as a temperamental trait were both assigned prominent roles. Both should be useful in controlling for (i.e., predicting or explaining) individual differences in exhilaratability. High levels of cheerful mood were considered to represent a state of enhanced readiness to respond to an appropriate stimulus with exhilaration and laughter (Ruch, 1990, 1995). It was claimed that a concept of cheerfulness as an enduring disposition is also necessary, since individuals differ habitually in the frequency, intensity, and duration of cheerful mood states as well as in their preparedness to

* Current dictionaries list two meanings for "exhilarate". One is "to make cheerful or merry" and the other "to enliven; invigorate; stimulate" (Webster's Encyclopedic Unabridged Dictionary of the English Language; 1989). The German term (*Erheiterung*) does not include the latter part.

react to an appropriate stimulus with smiling, laughter, and increased feeling of exhilaration (Ruch, 1993).

While cheerfulness as a state and a trait facilitates the induction of exhilaration, it was argued that antagonistic factors have to be considered as well, i.e., states and traits that impair the induction of smiling and laughter (Ruch, 1990). A *serious* frame of mind and a prevalent *bad mood* were hypothesized to be such factors and thus added to the model.

A State-Trait Model of Cheerfulness

Recently, definitions of cheerfulness, seriousness and bad mood as both states and traits were undertaken utilizing a facet approach, and research instruments for their assessment were constructed (Ruch, Köhler, & van Thriel, 1996, 1997). A structural model describing the relationships among the three concepts as well as between states and traits were outlined and tested in several samples. Furthermore, some basic postulates were formulated (Ruch, 1996).

Facet Structure of the Traits

Based on the study of several sources, the three trait concepts were operationalized by generating five, six, and five facets or definitional components for cheerfulness, seriousness, and bad mood, respectively. *Trait cheerfulness*, as an affective trait or temperament, was considered to be made up by the components of a prevalence of cheerful mood (CH1), a low threshold for smiling and laughter (CH2), a composed view of adverse life circumstances (CH3), a broad range of active elicitors of cheerfulness and smiling and laughter (CH4), and a generally cheerful interaction style (CH5). *Trait seriousness* as a habitual quality of one's frame of mind/view of and attitude toward the world was considered to be composed of the elements of the prevalence of serious states (SE1), a perception that even everyday happenings are important and deserving of thorough and intensive consideration (SE2), the tendency to plan ahead and set long-range goals (SE3), the tendency to prefer activities for which concrete, rational reasons can be produced (SE4), the preference for a sober, object-oriented communication style (SE5), and a humorless attitude about cheerfulness-related matters (SE6). Finally, *trait bad mood* is basically composed of the predominance of three mood states and their respective behaviors. These components are a generally bad mood (BM1), sadness (i.e., despondent and distressed mood; BM2), and ill-humoredness (i.e., sullen and grumpy or grouchy feelings; BM4). Two further facets are specifically related to the sad (BM3) and ill-humored (BM5) individual's prototypical behavior in cheerfulness evoking situations. (see Ruch et al., 1996 for a more detailed treatment of the trait definitions).

Table 1 gives the factor structure of the facets of the

traits as assessed by the facet trait form of the State-Trait-Cheerfulness-Inventory (STCI) in the total samples of Ger-

Table 1.

Oblique solution reference structure (and primary intercorrelations) of the trait facets in the German and US sample.

	Cheerfulness		Seriousness		Bad Mood	
	Germa	US	Germa	US	Germa	US
<i>factor corre</i>						
Cheerfulness	1.00	1.00				
Seriousness	-.34	-.37	1.00	1.00		
Bad Mood	-.46	-.59	.31	.38	1.00	1.00
<i>trait facets</i>						
CH1	.66	.51	.05	.09	-.23	-.29
CH2	.75	.67	.00	.01	-.03	-.02
CH3	.47	.51	.17	.08	-.35	-.20
CH4	.71	.68	-.06	-.09	.03	.03
CH5	.78	.70	-.04	-.05	.03	.01
SE1	-.09	-.05	.58	.60	.06	.08
SE2	.20	.10	.75	.66	.14	.21
SE3	.07	.12	.74	.76	-.01	-.06
SE4	-.03	-.10	.77	.75	-.18	-.14
SE5	.00	.04	.75	.64	-.11	.04
SE6	-.28	-.31	.59	.44	.03	-.05
BM1	-.07	-.05	-.12	.00	.79	.68
BM2	.01	-.04	-.06	-.01	.80	.67
BM3	-.26	-.28	.19	.07	.51	.45
BM4	.00	.00	.04	.09	.78	.68
BM5	-.26	-.23	.22	.19	.37	.40

Notes. German sample: $N = 1666$ (968 female); mean age = 34.42 years ($SD = 14.79$, range = 17 to 87 years); American sample: $N = 1483$ (848 females, 439 males, 191 unspecified); mean age = 23.64 years ($SD = 8.83$, range = 17 to 87 years).

mans and Americans tested so far. The three factors explain 69.1% (German) and 68.9% (American sample) of the variance.

Facet Structure of the States

Empirical analyses of the *state concepts* included the study of the homogeneity of the descriptors in both inter- and intraindividual variation (i.e., item factor analyses computed across subjects and across situations), the identification of sub-clusters, and the demonstration of the sensitivity of items for mood alterations (Ruch et al., 1997). Two components of *state cheerfulness* were distinguished: a more shallow and outwardly directed *hilarity* (which merges felt *actions tendencies*, such as being *ready to laugh* or to *have some fun* with states of feeling merry and chipper) is separated from those items reflecting *cheerful mood*. *State seriousness*, understood as a current quality of the frame of

Table 2.

Oblique solution reference structure (and primary intercorrelations) of the state facets in the German and US sample.

	Cheerfulness		Seriousness		Bad Mood	
	German	US	German	US	German	US
<i>factor correlations</i>						
Cheerfulness	1.00	1.00				
Seriousness	-.48	-.23	1.00	1.00		
Bad Mood	-.57	-.65	.47	.26	1.00	1.00
<i>state facets</i>						
cheerful mood	.69	.70	.09	.05	-.16	-.04
hilarity	.79	.74	-.02	-.02	.07	.03
earnestness	-.19	-.11	.63	.85	.00	-.21
pensiveness	.22	.29	.71	.77	.20	.25
soberness	-.02	-.12	.81	.77	-.22	-.05
sadness/melancholy	.00	-.01	.00	.00	.76	.70
ill-humoredness	-.06	.00	-.08	-.04	.75	.71

Note. $N = 1666$ (German) and $N = 1483$ (American sample; for more details see Table 1).

mind, was found to be more heterogeneous; three clusters of *earnestness*, *pensiveness*, and *soberness* appeared to be identifiable in the empirical analysis. Finally, *state bad mood* is an affective construct fusing the two elements of *sadness/melancholy* and *ill-humoredness*. Both were seen as important facets of exhilaratability, because their presence might impair or inhibit the generation of positive affect, albeit for different reasons. While an ill-humored person (like the serious person) may not *want* to be involved in humor and cheerful interaction, the person in a sad mood may not be *able* to do so even if he or she would like to be. Also, while the sad, gloomy, or downhearted person is not antagonistic to a cheerful group, the ill-humored, sullen, crabby, or cross one may be.

Table 2 gives the factor structure of the facets of the states as assessed with the standard state form (STCI-S<30>) in the total sample of Germans and Americans tested so far. The three factors explain 84.3% (German) and 82.5% (American sample) of the variance.

Tables 1 and 2 confirm the expectations about the relationship among the three concepts; cheerfulness correlated negatively with seriousness and, more highly so, with bad mood, while seriousness and bad mood were positively correlated themselves.

Finally, a joint factor analysis of the 30 items of the standard state form and the 60 items of the standard trait form (i.e., STCI-S<30> and STCI-T<60>) yielded six factors; cheerfulness, seriousness, and bad mood emerged both

as trait and state factors with the homologous concepts correlating positively (Ruch et al., 1997). Thus, homologous states and traits are distinguishable from each other.

While a temporal stability of the traits is assumed, the three states of cheerfulness, seriousness, and bad mood are expected to oscillate around a mean mood level which differs interindividually according to the individual's location on the homologous trait. Indeed, the trait scores remained relatively stable across the time interval of four weeks ($r_{tt} = .77$ to $.86$, $N = 103$), while the test-retest correlation for the states was rather low (.33 to .36). Exposure to certain mood sensitive conditions (experimentally manipulated or naturally occurring) raised or lowered certain states systematically (Ruch et al., 1997). The sensitivity to change can also be demonstrated at the level of individual items. Table 3 indicates how well the five items of the cheerful mood and hilarity facets reflect intentionally induced or naturally occurring changes in state cheerfulness.

Table 3 shows that the discriminatory power of the items is not uniform across the induction procedures. For example, attending a 5-minute demonstration of a humor experiment seemed to primarily affect the hilarity component (items 6 through 10) leaving level of cheerful mood (items 1 to 5) relatively unchanged. Among women participating in carnival festivities all elements of state cheerfulness seem to be strongly elevated and inhaling nitrous oxide does elevate state cheerfulness even when compared against a control condition (inhaling pure oxygen).

Table 3.
Sensitivity of items for reflecting alterations in state cheerfulness.

Items	Nitrous oxide ¹	Cheerful audiotape ²	Clowning experimenter ³	Lost soccer game ⁴	Watching experiment ⁵	Carnival festivity ⁶
I am in a mirthful mood	.14	.43**	.79**	-1.28*	.21	1.04***
I am in an elevated mood	.72**	.13	.71*	-2.07***	.14	1.01**
I am cheerful	.72***	.26‡	.96**	-2.16***	.12	.81**
I'm walking on air	.98**	.32	.66‡	-1.58**	.29*	1.12***
I am in good spirits	.36*	.48*	.97**	-1.74**	.29‡	1.17***
I feel chipper	.49***	.41***	.68	-.74	.55*	1.88***
I could laugh at the drop of a hat	.68**	.30	1.26**	-1.48**	.61***	1.02***
I feel merry	.14	.27*	1.22***	-1.07	.59***	.69*
I am ready to have some fun	.19‡	.52***	.69**	-1.45*	.26*	1.19***
I am amused	.36**	.59***	1.29***	-.93	.59***	.97***

Notes. The effect size was determined by dividing the difference between means (post measure minus pre measure, or--in case no pre measure exists--minus control group) by the standard deviation of the pre measure (or control group). The P-value is corrected for changes in a control group (where available).

¹ before and after inhaling nitrous oxide vs. pure oxygen ($n = 20$).

² listening to audiotape with interviews of cheerful vs. neutral quality ($n = 48$).

³ before and after interaction with a clowning ($n = 30$) vs. neutral experimenter ($n = 30$).

⁴ male soccer fans before and after an easy to win but lost soccer match ($n = 9$).

⁵ before and after watching a 5-min humor experiment ($n = 46$).

⁶ carnival festivities ($n = 29$) vs. control activity ($n = 29$).

‡ $p < .05$ (one-tailed); * $p < .05$; ** $p < .01$; *** $p < .001$.

Cheerfulness and the Induction of Exhilaration

There are several assumptions associated with the state-trait model of cheerfulness, several of them being not yet tested (Ruch, 1996). For example, it is assumed that the traits represent the disposition for the respective states; e.g., individuals high and low in trait cheerfulness will differ with respect to the frequency, duration, and intensity of occurrences of state cheerfulness. Moreover, it was hypothesized that the state-trait relationship extends to the dimension of "robustness" of mood; i.e., the tendency of individuals high in trait cheerfulness to maintain a high level of state cheerfulness (and retain a low level of state bad mood) in the presence of factors conclusive to a negative mood, while the individuals low in trait cheerfulness more likely will "lose humor" (i.e., get grumpy and out of cheerful mood) when facing adversity (for some experimental evidence for the validity of this hypothesis see Ruch & Köhler, in press a, in press b).

The present article deals with the two very basic assumptions that both state and trait cheerfulness moderate the induction of exhilaration. Thus, it will be examined whether individuals high and low in trait cheerfulness, as assessed by the STCI-T, indeed differ from each other with respect to the facility with which exhilaration (as assessed via facial and

subjective indicators) is induced. While extraversion has been confirmed to be a predictor of positive affect and laughter (Hepburn & Eysenck, 1989; Ruch, 1994; Rusting & Larsen, 1997) one might expect that a more specific affect-related concept like trait cheerfulness will be equally well or even more predictive of exhilaration than the global super-factor is. Thus, in the first experiment subjects will be exposed to an exhilarating or neutral interaction with the experimenter and it will be examined whether trait cheerfulness and extraversion predict individual differences in frequency and intensity of smiling and laughter.

The second experiment will specifically examine the relationship between state cheerfulness and exhilaration. While cheerfulness as a mood state (or a more tonic change in mood) is separated conceptually from the emotion of exhilaration (as a temporary, more intense rise in cheerful state observable in behavior, physiology, and emotional experience) they are not seen as independent from each other. On the contrary, a reciprocal relationship between state cheerfulness and exhilaration is assumed; the presence of a cheerful state facilitates the induction of exhilaration and an accumulation of episodes of exhilaration may lead to a longer-lasting increase in the level of cheerfulness (and decrease in state seriousness and bad mood). Also, if the induction of exhilaration fails (e.g., when a joke is told that is

perceived as tasteless), the cheerful state may be lowered and state bad mood enhanced.

Thus, in the second experiment individual differences in baseline level of state cheerfulness will be utilized to predict differential responsiveness to funny videotapes and the laughter of a model. In both experiments the amount of exhilaration induced will be used to predict post induction levels of state cheerfulness.

Finally, since not all smiles and laughs indicate positive affect, in both experiments the distinction among enjoyment displays and nonenjoyment displays (as proposed by Ekman, Friesen, & O'Sullivan, 1988) will be applied. Furthermore, smiling and laughter will be treated as representing different levels of intensity of exhilaration; laughing occurring at higher levels of exhilaration, and smiling being typical of lower levels. This assumption is based on prior research showing that laughter, as compared to smiling, is accompanied by a stronger contraction of the facial muscle involved in both expressions, is of longer duration, and is shown at jokes judged by the person laughing to be funnier (Ruch, 1990; Sumitsuji, Inoue, Tanaka, & Takahashi, 1986).

Experiment I: Trait Cheerfulness as a Disposition for Exhilaration

Since the hypotheses to be tested also include individual differences in intensity, a more massive induction of exhilaration is required; one that induces responses at the level of laughter and not only smiling. Therefore, an *in vivo* induction of exhilaration in a controlled social setting will be preferred to canned stimuli since pretesting has shown that the degree of exhilaration inducible by this setting exceeds the effects of canned material (funny tapes, slides with cartoons) used in prior experiments by far.

Methods

Research participants

Sixty paid non-psychology students (30 females and 30 males) volunteered to participate in this experiment. Mean age was 23.33 years ($SD = 4.40$, min = 18, max = 45 years). They were randomly assigned to one of the two experimental groups.

Procedure

The core of the experiment was an interaction between participants and the experimenter which started after half an hour into the experiment and lasted about 10 minutes. Half of the participants experienced the experimenter clowning around and asking nonsense questions, while the other half

participated in a neutral conversation kept highly parallel to the other dialogue with the exception that the jocular element was missing.

Overview. Participants were welcomed by the female experimenter and informed that the experiment would consist of several parts in which they would fill in questionnaires, answer questions and tests, and judge slides which need to be selected for a later main experiment. Participants were tested individually. After filling in three questionnaires, and when participants were about to rate the slides, the experimenter said that she forgot to administer one further test and she needed to go to the next room to get it. The standardized procedure to induce exhilaration began upon reentering the room, lasted for 10 minutes and ended when the experimenter left the room again. Then the participants proceeded with the remaining experimental tasks (e.g., viewing and rating of slides, filling in questionnaires) not of interest here. When debriefed, they were paid DM 10 and were informed about the aim of the experiment. They were also informed about the videotaping and asked for permission to use the tapes. All subjects gave consent to have their tapes analyzed.

Induction of exhilaration. Subjects sat in a comfortable chair when the experimenter came into the room. In the experimental condition (*clowning experimenter*) she wore funny clothes and used several props aimed at cueing laughter and cheerfulness/hilarity. She involved the participants into a "test" containing a mixture of serious and nonsense questions and meaningful and silly test items, and during the whole dialogue and tasks several unexpected laughter-provoking things happened. This sequence was ended by asking the participant to remember a very funny event in their life. In the control condition (*neutral experimenter*) partly the same questions were asked (with the non-serious ones replaced by meaningful ones) and highly similar tasks were given, which, however, lacked the amusing element. At the end they were asked to memorize a neutral event. Due to prior training, the experimenter's behavior appeared quite natural although being highly standardized.

Instruments and Measurement

Instruments. Mood states were assessed prior to and after the interview with the state part of the STCI (i.e., the STCI-S<30>), measuring state cheerfulness, seriousness, and bad mood with 10 items each utilizing a four-point answer format. The component trait form (STCI-T<106>), measuring trait cheerfulness, seriousness, and bad mood with 106 items in a four-point answer format, was administered at the beginning of the experiment together with the Eysenck Personality Questionnaire-Revised (EPQ-R; Eysenck, Eysenck, & Barrett, 1985). The German version of the EPQ-R is a 102 item questionnaire answered in a yes/no

format. It contains four scales: Psychoticism, Extraversion, Neuroticism, and Social Desirability.

Facial measurement. Measurements were made from color videotapes, which provided a close-up, head-on view of the subject's face and shoulders. The camera was placed behind a one-way mirror in an adjacent room. Facial measurement was based on the Facial Action Coding System (FACS; Ekman & Friesen, 1978) which is an anatomically based, comprehensive, objective technique for measuring all observable facial movement. Frequency, intensity, and duration of action units (AUs) relevant for exhilaration and the identification of nonenjoyment smiles were coded. Additionally, the occurrence of laughter was coded based on the audible reactions recorded with the help of a highly sensitive hidden microphone.

Frequency of exhilaration was defined by the total number of enjoyment displays; i.e., joint symmetric actions of zygomatic major (AU12; "lip corner puller") and the orbicularis oculi muscles (AU6; "cheek raiser"). A composite index of behavioral *intensity of exhilaration* was derived by combining the *facial* (five intensity levels) and *vocal* (three intensity levels) data for the three most intense stimuli during the dialogue. The *duration* of exhilaration was recorded (for the same responses) for the time span from onset to the first offset (*duration of response*) and, additionally, in case of multiple apexes, until the offset of the last apex (*duration of episode*) of the AU12. These three measurement points were when the participant first noticed the experimenter reentering the room (in a funny outfit and cheerfully vocalizing), when the experimenter sat down on a chair with a noise, and when the experimenter opened a box and the interior jumped out ("jack-in-the-box"-gag). While all subjects of the experimental group showed a facial response to these situations, only a few individuals in the control group smiled during these situations. These smiles might have been socially motivated or, if humorous, for different and unintentional reasons. Therefore, the intensity and duration data will be analyzed only for the experimental group.

Results

Is Trait Cheerfulness a Disposition for Exhilaration?

A 2x2 ANOVA with type of dialogue and trait cheerfulness (high vs. low; median split) as independent variables was computed for *frequency of exhilaration* (cell n s = 14, 15, 15, and 16). The clowning experimenter elicited more enjoyment displays than the neutral experimenter, $F(1,58) = 49.15$, $p < .0001$; however, this effect was stronger for those high in trait cheerfulness than for the low scorers, $F(1,56) = 2.91$, $p = .047$. While high and low trait cheerful individuals did not differ during the neutral interview ($F[1,56] = .178$, n.s.), habitually cheerful individuals showed more enjoyment displays when exposed to the

clowning experimenter than low cheerful subjects, $F(1,56) = 8.020$, $p = .0064$). This interaction is given in Figure 1.

Insert Figure 1 about here.

Furthermore, the groups of low and high trait cheerful individuals (of the experimental group) differed with respect to *intensity* ($F[1,28] = 4.749$, $p = .0379$), *duration* of first exhilaration response ($F[28] = 3.90$, $p = .0581$) and *duration* of exhilaration episode ($F[1,28] = 4.970$, $p = .0340$) in response to the clowning experimenter. Subjects with high scores in trait cheerfulness showed exhilaration in higher intensity ($M = 6.40$) and longer duration (first response: $M = 6.75$; whole episode: 9.09) than habitually low cheerful individuals (intensity: $M = 5.05$; duration of response and whole episode: $M = 4.73$ and 6.20, respectively).

Trait cheerfulness affected the latency for remembering a funny experience ($F[1,28] = 5.53$, $p = .0260$); on the average those high in trait cheerfulness started telling the story after 27.6 seconds whereas the low cheerful people did not start before 53.3 seconds. There was the obverse effect for retrieving the neutral scene ($F[1,28] = 10.92$, $p = .0026$). In the control group it took much less time ($M = 6.1$ s) for the low scorers to retrieve the neutral scene than the high scorer ($M = 6.2$ s).

Does Trait Cheerfulness Moderate the Mood Changes?

The correlations between pre and post measures do indicate differential effects of the clowning experimenter on state cheerfulness. In the experimental group the stability of state cheerfulness is low ($r = .39$, $p < .05$) indicating that the experimenter's behavior caused different changes for different people. There was no such effect for state seriousness (SE: $r = .65$) and bad mood (BM: $r = .76$; all $p < .001$) and the pre-post correlations for homologous scales in the control group indicated a high stability of mood (CH: $r = .84$; SE: $r = .68$; BM: $r = .89$; all d.f. = 28; $p < .001$) suggesting that nothing much happened that affected mood differentially. Thus, it needs to be examined whether trait cheerfulness moderates changes in cheerful mood.

The mood enhancing effects of the experimenter's behavior. A 2x2 ANOVA with *type of dialogue* (neutral vs. clowning experimenter) and trait cheerfulness (median split; low vs. high) as independent variables, and the difference scores in mood state (post-pre) as dependent variables showed that the experimenter's role was an effective procedure for inducing state cheerfulness ($F[1,56] = 17.075$, $p = .0001$). The participants exposed to the clowning experimenter reported a significantly stronger increase in cheerful state ($M = 6.97$) than the ones with the neutral experimenter ($M = 1.63$) did. While there was also a stronger decrease in serious frame of mind ($F[1,56] = 10.856$, $p = .0017$), and bad mood ($F[1,56]$

= 4.674, $p = .0349$) in the experimental group ($M_s = -6.23$ and -2.43 ; control means: -2.33 and $-.40$), these effects disappeared when the pre-post-differences in state cheerfulness were used as a covariate.

While for trait cheerful individuals the treatment indeed led to a stronger increase in state cheerfulness in the experimental group than in the control group ($F[1,56] = 14.757$, $p = .0003$), for participants low in trait cheerfulness the treatment was significant as well ($F[1,56] = 4.134$; $p = .0468$), with the difference in effectiveness not being significant ($F[1,56] = 1.462$, $p = .2317$) suggesting that trait cheerfulness does not moderate the treatment-induced mood changes. However, inspection of the scatter plots indicated that several trait cheerful subjects had a very high baseline level of state cheerfulness and hence the intervention could not raise the level of cheerfulness much. Comparing only the subsample of individuals with below-median baseline scores in state cheerfulness shows that the trait cheerful individuals ($n = 6$; $M = 13.5$) responded to the treatment with a stronger increase in state cheerfulness than the low scorer ($n = 11$; $M = 6.9$) in trait cheerfulness did, $F(1,26) = 6.525$; $p = .0168$.

Is there a Reciprocal Relationship between State Exhilarability and Exhilaration?

Correlations between the STCI-S scales of both testing times and the facial indices of exhilaration (frequency, intensity, and duration) were computed for the experimental group and are given in Table 4.

Does mood state predict exhilaration? Table 4 shows that mood state did not predict the frequency, intensity, or duration of enjoyment displays during the whole interaction with the clowning experimenter. Due to the massive intervention one can assume that state cheerfulness changed quickly and therefore the pre-scores might serve as predictors

for the first responses only but not for later ones. Indeed, mood states before the interview did predict the response to the *first* laughter-provoking situation (state cheerfulness: $r = .45$; d.f. = 28; $p < .05$; state seriousness: $-.52$; $p < .01$; but: state bad mood = $-.29$; ns); participants in a cheerful and nonserious state laughed more when they first took notice of the experimenter reentering the room. These effects remained when the effects of the homologous traits were partialled out ($r_s = .39$ and $.36$, respectively; both d.f. = 27; $p < .05$) indicating that this is an effect of the state and not a "disguised" trait effect.

Does exhilaration predict subsequent mood states? Table 4 shows that intensity and duration (but not frequency) of facial indicators of exhilaration predicts subsequent cheerful mood state. Additionally, those who showed more intense exhilaration were also less serious afterwards. Since the intervention contained nonsensical elements it would not be surprising if the degree of state seriousness would be reduced, too. However, this coefficient was not significant ($r = .35$; d.f. = 27) once the effects of state cheerfulness (post scores) were partialled out. Thus, it is the peak intensity experiences that altered the mood state and less so how often individuals smiled. Intensity ($r = .32$; $p = .088$) and duration ($r = .42$; $p = .0190$; d.f. = 28) of exhilaration episodes were also correlated with amount of change in state cheerfulness.

Extraversion and Trait Cheerfulness

Extraversion and trait cheerfulness were highly correlated in the present sample ($r = .72$, d.f. = 58; $p < .0001$). In order to compare the predictive validity of both constructs in the experimental group, correlations with the parameters of exhilaration were computed and turned to be higher in all cases for cheerfulness than for extraversion (the latter ranging between $.07$ and $.31$). Moreover, partialling out the effects of the other predictor reduced the coefficients for extraversion to

Table 4.

Correlations of the pre and post measures of mood states and the facial indicators of exhilaration.

Facial exhilaration	STCI-S<30> pre			STCI-S<30> post		
	CH	SE	BM	CH	SE	BM
Total frequency	-.01	.07	-.14	.35	-.22	-.16
Intensity	.27	-.21	-.24	.63***	-.42*	-.35
Duration response	.05	-.06	-.09	.37*	-.26	-.15
Duration episode	-.00	-.05	-.16	.47**	-.26	-.22

Notes. $n = 30$. CH = cheerfulness, SE = seriousness, BM = bad mood.
* $p < .05$; ** $p < .01$; *** $p < .001$.

about zero (frequency: $-.01$; intensity: $-.02$, duration of response: $-.15$; duration of episode: $-.14$; all d.f. = 27, all ns). Trait cheerfulness kept its predictive power for intensity of exhilaration ($r = .38, p < .05$) and duration of episode ($r = .33, p < .10$) and while the coefficients for frequency ($r = .27$) and duration of first response ($r = .29$) became insignificant, they still were numerically markedly different from zero. Finally, both concepts predicted frequency of enjoyment displays in the control group, with trait cheerfulness ($r = .34; p = .0689$) yielding the higher coefficient than extraversion ($r = .29, ns$).

Discussion

Three conclusions can be drawn from the present study. First, trait cheerfulness was confirmed to represent a habitual disposition for frequency, intensity and duration of the emotion of exhilaration. This confirms the assumption that trait cheerful individuals seem to have a habitually lowered threshold for the induction of smiling and laughter. Trait cheerfulness also moderated mood changes; among those who were not in a cheerful mood before the induction of exhilaration, the trait cheerful individuals gained more from the treatment than the low cheerful individuals did. Second, there is evidence that trait cheerfulness is a better predictor of intensity of exhilaration than extraversion. This supports the assumption that for the study of exhilaration a specific emotion-related trait might be of higher utility than the more global superfactor. However, given the small sample size this finding clearly needs replication.

Both conclusions receive support from a study using nitrous oxide ("laughing gas") as an exhilarant (Ruch & Stevens, 1995). Cheerful mood increased under nitrous oxide for trait cheerful individuals as compared to placebo (inhaling pure oxygen) and baseline measures ($p < .001$), which did not differ from each other indicating that placebo control was successful. No mood-enhancing effect could be observed for low trait cheerful individuals. Furthermore, the analysis of facial expression showed that trait cheerful individuals smiled and laughed more often than low trait-cheerful individuals did ($p = .01$). Extraversion was positively related to mood changes and facial indicators of exhilaration, but again it yielded lower coefficients.

Third, the proposed reciprocal relationship between cheerful mood and exhilaration yielded at least partial confirmation. The intensity of exhilaration affected the subsequent mood level; individuals who displayed intense exhilaration reported higher levels of state cheerfulness after exposure to the clowning experimenter than those that were less amused. Except for the first response, however, state cheerfulness was not a predictor of exhilaration suggesting that in the case of massed induction of exhilaration the utility of the baseline assessment of state cheerfulness is limited.

A successful examination of this hypothesis therefore

either needs a repeated (but non-obtrusive) assessment of mood state* or precautions need to be taken that the level of cheerful mood does not change much. There is ample evidence that cheerful mood remains relatively stable over the course of an experiment. For example, while no amusement was intended in the control group, smiling due to other reasons occurred rather frequently ($M = 6.4$), but nevertheless the observed pre-post correlation was high ($r = .84$). Likewise, interindividual differences in state cheerfulness were very stable ($r = .90$) when participants worked on some tests for 35 minutes (Ruch, 1995) and even when they saw humorous slides for 25 (average coefficient across 4 conditions: $.82$) and 45 minutes (average coefficient: $.66$) in an inter-stimulus interval of 40 seconds (Ruch, 1990). Thus, one can assume that the individuals' level of state cheerfulness remains relatively stable over the induction stage when a massed induction of exhilaration is avoided. Therefore, in the next experiment the rate of responses and their intensity will be kept low as a precaution against accumulating effects on mood change.

Experiment II: State Cheerfulness as a Disposition for Exhilaration

Several studies have demonstrated the relevance of aspects of the social situation in the induction of laughter (for a review, see Chapman, 1983). For example, based on prior "mere-presence" research (Zajonc, 1965, 1980) which demonstrated that the mere presence of a person increases the level of arousal, which, in turn, facilitates the dominant response and suppresses nondominant responses, Chapman and collaborators verified that the mere presence of a person increases the rate of smiling and laughter in response to humor. However, Ruch (1990) argued that whether or not laughter is the dominant response should depend on the subject's actual state. More precisely, since high levels of cheerful mood were considered to represent a state of enhanced readiness to respond to an appropriate stimulus with exhilaration and laughter, it was hypothesized that only in-

* Darwin (1872, p. 212) assumed for a person in high spirits or a cheerful state that "though he may not actually smile, [he] commonly exhibits some tendency to the retraction of the corners of his mouth". Indeed coding of facial actions of subjects watching funny movies in prior experiments (e.g., Ruch, 1995) led to the informal observation that during stages of high density of punch lines the subjects' enjoyment displays did not entirely fade out but remained at elevated levels at a constant intensity for extended periods of time (largely exceeded the upper limit of duration of felt smiles; Frank & Ekman, 1993) and then rose again in response to a new punch line. It remains to be examined whether these more tonic changes in zygomatic major (and orbicularis oculi) action represent elevated levels of state cheerfulness (in particular so the component of hilarity).

dividuals in a cheerful mood should profit from the mere presence of a person. Indeed, the mere presence condition facilitated the induction of exhilaration only among those being in a cheerful state, whereas there was no such effect for non state cheerful individuals (Ruch, 1990). Furthermore, the relevance of cheerfulness seems to be contingent on a minimal social situation; state cheerfulness turned out to be predictive of facial indicators of exhilaration only if another person was present in the room, and had no predictive power during solitary situations (Ruch, 1990).

Among the many factors facilitating laughter, the presence of a laughing model seems to be one of the most effective ones (Chapman, 1976, 1983). A laughing confederate increases the frequency and duration of smiling and laughter while a non-responsive confederate decreases the rate of laughter. Therefore, Experiment II examines the facilitating effects of the laughter of an experimenter. However, contrary to prior studies it is expected that the laughter's contagious quality will be moderated by state cheerfulness; those with an actual disposition for exhilaration (i.e., the state cheerful individuals) will respond more readily to such an intervention than those whose actual state is not congruent with exhilaration. Furthermore, unlike prior studies of socially facilitated laughter that can be criticized for not controlling for type of smile shown by subjects, care will be taken that no false or masking smiles will be mixed with enjoyment displays. If the responses elicited by the laugh of the model were voluntarily produced (i.e., due to conformity or social pressure), then these displays should contain more frequently signs of false smiles (e.g., missing involvement of the orbicularis oculi, asymmetric contraction of the zygomatic major muscles, or be based on different muscles than the zygomatic major; see Frank & Ekman, 1993).

Methods

Research participants

Sixty female non-psychology students volunteered to participate in this experiment and were paid DM 24 for their services. Mean age was 22.47 years ($SD = 2.98$, min. = 19, max. = 31 years).

Procedure

During the core part of the experiment participants saw a videotape composed of selected segments from six funny movies. During the last three movies the experimenter was either merely present (but did not laugh or do other mood enhancing things) (*control condition*) or laughed at certain preselected scenes (*laughing experimenter*).

Overview. Participants were tested individually by one of

the two female experimenters. During the first session participants were told that the experiment is mainly aimed at pretesting different sorts of material for a later main experiment. Then they filled in the trait measures and the STCI-S.

One week later, at the beginning of the main experiment the participants were seated in a comfortable chair in front of a TV. They were informed that they will be presented six short funny movies and instructed to rate them according to several criteria at the end of each movie (when a blue screen appeared for 2 minutes). Then the experimenter left the room and, while outside, she drew a number that determined the assignment of the participant to one of the two experimental groups. She returned just at the beginning of the fourth movie, sat down behind the subject, and began to read silently. The control condition fulfilled the criteria for a "mere presence"-paradigm (see Guerin, 1986) with the exception that the experimenter and not a stranger was present. The experimental condition was different in two ways. First, when reentering, the experimenter said that the next movies are her favorites. Second, at six different times she laughed audibly to a given scene. There was at least one minute between these punch lines and laughter of very high intensity or long duration was avoided to prevent strong mood changes to occur. Pilot tests indicated that participants perceived the experimenter's laughter as natural and not faked.

At the end of the experiment the subjects were asked to rate 27 salient scenes from the movies. When debriefed, they were informed about the aim of the experiment and about the videotapes made; all subjects gave consent to have their tapes analyzed.

Material

The movies. Segments were taken from six movies considered to be representative of three humor types (incongruity-resolution, nonsense, and sexual humor; cf. Ruch, 1992). For example, a segment from Monty Python's *Meaning of Life* was chosen to be one of the two representatives of the nonsense category. For each film a longer segment (of on the average 10 minutes) was selected that gave multiple occasions for laughter.

Evaluation of films. Participants rated on seven-point Likert scales to what extent they experienced the basic emotions of happiness, surprise, sadness, anger, anxiety, disgust, and contempt when watching each movie. Furthermore, degree of funniness and aversiveness of each movie was assessed.

Evaluation of selected scenes. Participants were asked to rate the degree of funniness and aversiveness of 27 funny scenes on two seven-point Likert scales. They were provided the exact transcripts of the events leading to the funny incident including the punch line. There were 12 scenes from the first half of the experiment and 15 from the second half

(including the six when the experimenter laughed).

Instruments and Measurement

Instruments. A pilot version of the STCI-S was used that contained all the items for state cheerfulness but only nine of the final bad mood and seriousness scales. Mood states were assessed immediately prior to the first movie and after the sixth movie. At the beginning of the experiment subjects answered the German version of the EPQ-R and the Affect Intensity Measure (Larsen & Diener, 1987). The trait part of the STCI was not yet available at that time.

Facial measurement. Again, facial behavior was videotaped through a one-way mirror from an adjoining room and vocalizations were recorded with the help of a hidden microphone. Frequency, symmetry/asymmetry and intensity of action units relevant for the identification of enjoyment displays (AU12, AU6, AU7) were coded, as were other types of smiles (AU13, AU14, AU20), and actions associated with laughter (AU23, AU24, AU25, head movements, body movement).

Scores for *frequency* and *intensity* of facial exhilaration were derived for the 27 scenes described above. The intensity spectrum comprised three levels of smiling (intensity of AU12 in enjoyment displays) and two levels of laughter (level I: vocalization, level II: vocalization plus head and/or body movements).

Results

Are the elicited responses genuine or false? The analysis shows that enjoyment displays did generally occur. There were altogether nine responses in the experimental group that were "smiles" involving additional actions in the mouth region (e.g., AU13, AU14, AU15, AU20) and therefore were not counted as enjoyment displays. However, there were also six such responses in the control condition providing no support for the hypothesis that the experimenter's laughter induces phony or--in response to the two more macabre scenes--masking smiles.

State Cheerfulness, Experimenter's Laughter and Exhilaration

Interindividual differences in state cheerfulness remained relatively stable (pre-post correlations of .58 and .73 for the control and experimental group, respectively; all d.f. = 28; $p < .001$) justifying the use of a baseline assessment of state cheerfulness as a predictor for responses later in the experiment. Several 2x2 ANOVAs with experimenter behavior (laughing/no laughing) and state cheerfulness (high vs. low; median split) as independent variables were computed for the facial (frequency and intensity of exhilaration) and verbal responses to the six scenes to which the experimenter laughed

at (cell $ns = 13, 14, 16,$ and 17).

Effects of experimenter's laughter. The results show that the manipulation was effective; participants in the experimental groups displayed enjoyment more frequently ($F[1,56] = 14.082$; $p = .0004$) and intensely ($F[1,56] = 14.644$; $p = .0003$) than the control group, and even judged the respective scenes as funnier ($F[1,56] = 4.795$; $p = .0327$). There was virtually no pre to post change in mean level of state cheerfulness (diff = .17) in the control group but a significant increase in the experimental group (diff = 2.07; $F[1,29] = 5.975$; $p = .0208$). However, in both groups there was a considerable variance in post-pre differences ($SDs = 4.63$; 5.88 ; min. = -13 ; max. = 16) which need to be explained.

The moderating role of state cheerfulness. However, state cheerfulness moderated the effects of the treatment on facial behavior. While the experimenter's laughter facilitated enjoyment displays in the experimental group (frequency: $F[1,56] = 16.101$; $p = .0002$; intensity: $F[1,56] = 6.494$; $p = .0136$), the treatment did not have a significant effect in the control group (frequency: $F[1,56] = .647$; $p = .4246$; intensity: $F[1,56] = .038$; $p = .8462$). (See figure 2 for the results of frequency of enjoyment displays).

Insert Figure 2 about here

The laughter of the experimenter appears to be contagious in as much it almost doubles the rate of laughter of the participants; there were .53 laughs in the control group but 1.33 laughs in the experimental group. Mann-Whitney U tests (corrected for ties) indicate an effect of the treatment for the group of state cheerful ($z = -2.50$; $p = .0123$) individuals while the treatment did not significantly increase the rate of laughter among the non state cheerful individuals ($z = -1.45$; $p = .12$). While state cheerful participants tended to recall the scenes as funnier ($F[1,56] = 2.938$; $p = .0920$), state cheerfulness did not moderate the effects of the treatment on verbal evaluation of the scenes.

Does the effect of experimenter's laughter generalize to other scenes? There was no overall difference between the control group and the experimental group in response to the nine selected scenes *not* accompanied by experimenter's laughter ($F[1,56] = .061$ and $.806$ for frequency and intensity, respectively). Also, while the means for the subgroup of individuals in a cheerful state were in the same direction as before, the effects failed to be significant (frequency: $F[1,56] = 3.260$; $p = .1662$; intensity: $F[1,56] = 3.640$; $p = .0615$). Thus, the intervention of the experimenter did work well for the current scene but it gradually faded out thereafter. Still, in the experimental group the cheerful individuals showed enjoyment displays more often ($F[1,56] = 8.962$; $p = .0041$) and in higher intensity ($F[1,56] = 4.844$; $p = .0319$) than non cheerful individuals.

Does mood state predict exhilaration during solitude? Mood

level before presenting the films was correlated with the verbal and facial responses to the 12 selected scenes and the evaluation of the first three films (that were shown in solitude) for the total group of sixty as well as the two experimental groups separately. Cheerful mood did not correlate with any of the parameters of exhilaration (coefficients for the total group ranged from .02 to .15; d.f. = 58) and also seriousness and bad mood were not predictive. However, rated funniness of selected scenes, rated funniness of the three films and rated happiness were correlated with frequency and intensity of facial behavior (range of correlations from .34 to .66; all at least $p < .01$), indicating the convergence of the different indicators of positive affect.

Does exhilaration predict subsequent mood states? Correlations between verbal and facial indicators of exhilaration during the experimental stage (films 4 to 6) and mood level after the end of the movies were computed next (see Table 5).

Again, facial indicators of exhilaration predicted subsequent level of cheerful mood. Rated funniness of the three films was predictive as well, but correlated more highly with state seriousness and bad mood. However, verbal and facial indicators of exhilaration were not dissociated; the correlations between rated funniness and frequency and intensity of exhilaration were sufficiently high ($r_s = .62$, and $.64$, respectively; d.f. = 28; $p < .001$). It should be mentioned that the parameters of exhilaration were more highly correlated with the post-measures than with the pre-measures of mood; i.e., the correlation between exhilaration and subsequent mood can not be accounted for by pre-existing differences in mood level.

Verbal and facial indicators of exhilaration during the first three films did not predict level of cheerful mood at the end of the experiment (coefficients between .04. and .21; d.f. = 58; all *ns*).

Can the effect of cheerful mood be accounted for by personality? Extraversion and baseline levels of state cheerfulness were positively correlated ($r = .43$; d.f. = 58; $p < .001$), however, extraversion was not correlated with facial indicators of exhilaration and did not eliminate the effects of cheerfulness when used as a covariate. Likewise, affect intensity did not account for the effects of state cheerfulness and was not a powerful predictor itself. Frequency of exhilaration during the first film was a powerful covariate (i.e., accounted for exhilaration during the second set of films); however, in essence it did not change the interaction. Taking these results together one can rule out the alternative explanation that the effects of cheerful mood are accounted for by these two trait variables or any other variable that determined the amount of exhilaration during the first three films.

Discussion

Experiment II provides support for the basic claim that state cheerfulness represents an actual disposition for exhilaration. Only individuals in a cheerful mood showed an enhanced readiness to join the experimenter's laughter or smile more often. This result is in line with prior findings using different assessment methods. An early study by Young (1937) found a positive correlation of .28 between (retrospectively reported) cheerful mood during the last 24 hours and the amount of laughter during that time span. Ruch (1990, 1995) found an index of cheerfulness (derived from a multidimensional mood adjective list) to be a predictor of exhilaration (assessed by means of FACS and facial-EMG) than the more general scales of elation or positive affectivity.

However, the present study does not allow statements about a causal role of state cheerfulness in the induction of exhilaration because the results do stem from correlational data and no experimental variation of the state was undertaken. The joint consideration of (experimentally varied) state and trait cheerfulness will not only allow for an disentangling of the effects (and a separate estimation of the predictive power) but also to study whether they have additive or interactive (e.g., in the form of a state-trait congruence) effects on the laughter threshold. However, while Experiment II demonstrated that the precautions taken were effective in keeping pre-experimentally existing individual differences in cheerfulness relatively stable across the experiment, nothing much is yet known about the temporal stability of experimentally enhanced or lowered state cheerfulness. It is likely that not only the experimental variation of state cheerfulness but also the subsequent regression is moderated by trait cheerfulness.

The results of both experiments confirm that subsequent mood level and changes in mood are depending on the degree of exhilaration induced. Thus, massed induction of

Table 5.
Correlations of enjoyment of films, facial indicators of exhilaration and the post measures of mood states.

	Cheerfulness	Seriousness	Bad mood
Facial exhilaration			
Frequency	.57***	-.38*	-.50**
Intensity	.48**	-.32‡	-.38*
Evaluation of film:			
Funniness	.34‡	-.45*	-.41*
Aversiveness	-.34‡	.23	.22
Happiness	.23	-.30	-.14

Notes. $n = 30$.

‡ $p < .05$ (one-tailed); * $p < .05$; ** $p < .01$; *** $p < .001$.

exhilaration increases and the failure to find humor amusing reduces the subsequent level of cheerfulness.

While the present experiments provide some support for the validity of state and trait cheerfulness for the study of exhilaration and laughter, the utility of the concepts can not be judged only on the basis whether they predict laughter. The empirical evidence for other hypotheses associated with the state-trait model of cheerfulness are presented elsewhere (Ruch & Köhler, in press a, in press b).

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Table headings

Table 1.

Oblique solution reference structure (and primary intercorrelations) of the trait facets in the German and US sample.

Table 2.

Oblique solution reference structure (and primary intercorrelations) of the state facets in the German and US sample.

Table 3.

Sensitivity of items for reflecting alterations in state cheerfulness.

Table 4.

Correlations of the pre and post measures of mood states and the facial indicators of exhilaration.

Table 5.

Correlations of enjoyment of films, facial indicators of exhilaration and the post measures of mood states.

Figure captions

Figure 1.

Frequency of enjoyment displays during the interaction with the neutral vs. clowning experimenter for individuals high and low in trait cheerfulness.

Figure 2.

Frequency of enjoyment displays during scenes when the experimenter did vs. did not laugh for individuals high and low in state cheerfulness.



