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Exhilaration and Humor

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The Emotion of Exhilaration

The study of the emotion of exhilaration originated in the study of positive affective responses to humor. "Exhilaration" was introduced as an emotion construct aimed at integrating the various responses occurring at the levels of behavior, physiology, and emotional experience (Ruch, 1990a). A prior concept, the so-called "humor response," was too narrowly defined and did not adequately represent the affective nature of the response to humor. Typically, the term "humor response" denoted the perception of a stimulus as funny, sometimes also including such overt responses as smiling and laughter. However, the physiological changes occurring, as well as other elements of emotional experience, were not covered. Furthermore, the term "humor response" is misleading, in that it gives the impression that exhilaration is a response unique to humor; this might have resulted from the failure to investigate humor in the context of other stimuli yielding similar responses, such as tickling or nitrous oxide (Ruch, 1990b).

The term "exhilaration" is of Latin origin (hilaris means "cheerful") and is used here in its original sense to denote the process of making cheerful or the temporary rise in cheerful state. Whereas in contemporary dictionaries "to exhilarate" is also defined as "to make cheerful, laugh, merry, glad, or joyous," it also means "to enliven" or "to make excited." Some definitions give even more emphasis to the "excitement" component than to the "cheerfulness" component, and in common language the meaning of the term is sometimes restricted to the high end of the excitement continuum. However, as the term is used here, the excitement component is deemphasized. Although high levels of excitement are involved in strong exhilaration (e.g., in an outburst of laughter at a very arousing joke revealed by a surprising and clever punch line), intermediate and low levels of excitement can also occur. Thus, although the present definition of "exhilaration" may deviate slightly from the understanding of this term in common language, the term is preferred to other related terms. The shortcomings of potential alternative terms, such as "amusement" or "mirth," are discussed by McGhee (1979).

Wundt's (1874/1903) descriptive dimensions of feelings may help to characterize exhilaration. In his three-dimensional model containing the axes pleasantness-unpleasantness, excitation-quietness, and strain-relaxation, exhilaration might be described as a pleasurable, relaxed excitation. Within taxonomies of emotion categories, exhilaration may be seen as a facet of the positive emotion of happiness (or joy). Within the family of positive emotions, exhilaration may be the one most strongly aligned with laughter; whereas empirical studies of happiness rarely report its occurrence, laughter is an inevitable response category in humor studies.

Exhilaration should be separated conceptually from cheerfulness as a mood state or a more tonic change in mood. A cheerful mood is characterized by a longer duration, less fluctuation in intensity, and greater independence from an eliciting stimulus. Single incidents of exhilaration are of short duration and have a marked timing; typically, there is a more or less steep onset, a pronounced apex, and a generally less steep offset. Although conceptually different, exhilaration and the state of cheerfulness should be studied together, since it can be hypothesized that there is a reciprocal relationship between them. A cheerful state facilitates the induction of exhilaration, and an accumulation of exhilaration responses may lead to longer-lasting changes in the level of cheerfulness. 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.

Thus, "exhilaration" may be defined as an emotion construct denoting a temporary increase in a cheerful state that is observable in behavior, physiology, and emotional experience, and that occurs in response to humor, but also to other stimuli.

Description of Exhilaration

Behavior

Exhilaration may be observed in facial behavior, gestures, and posture. Whereas milder forms of exhilaration are reflected only in facial displays, body movements and changes in gesture or posture also occur at more intense levels of exhilaration.

Smiling. The smile of exhilaration is produced by the contraction of two pairs of facial muscles: the zygomatic major and the orbital part of the orbicularis oculi. The action of the former muscle produces the facial appearance perceived as "smiling"; it pulls the lip corner obliquely up and back, and deepens the furrow running from the nostril to the lip corner. The orbicularis oculi muscle lifts the cheeks upward and draws the skin toward the eyes from the temple and cheeks. It narrows the eye opening and may cause "crow's feet" wrinkles to appear at the outer corner of the eye opening (Ekman & Friesen, 1982). Although electromyographic (EMG) studies show that both muscles are typically involved in the smile of exhilaration, in smiles of lower intensity the facial display may contain only signs of contraction of the zygomatic major muscle (Ruch, 1990a).

Several facial changes occur in reactions that are on the border-line between a big smile and a laugh. The lips can be opened or not, the teeth may be shown or not, and the jaw can be opened or not. Sometimes there is an audible expulsion of air or a single-syllable "ha" vocalization. The air usually escapes through the mouth, but if the jaw is not opened it does so through the nose.

Laughing. The contraction of the zygomatic major and the orbicularis oculi (pars orbitalis) muscles also forms the core of the laughter of exhilaration. The exact number of additional muscles involved in laughing is not yet known. However, the following muscles have been shown to enhance EMG activity during laughing: levator labii superioris, risorius, mentalis, depressor anguli oris, and orbicularis oris (Sumitsuji, 1967). Activity of the buccinator and depressor labii inferioris muscles is also likely. The actions of some muscles are coordinated with respiration and vocalization. Their contraction (as well as relaxation) helps to let the air stream out through the mouth. Such actions include the opening of the lips and jaw, a radial opening of the mouth, and perhaps also a stretching of the lower jaw. Some researchers claim that during laughing every facial muscle is innervated to some degree (Dearborn, 1900; Heller, 1902); this has been shown for the masseter (Santibañez-H. & Bloch, 1986), the chewing muscle whose relaxation initially helps to lower the jaw.

Gesture and Posture. With increasing intensity of laughter, movements of the trunk and the limbs may occur as well as changes in posture. They were described in detail by Darwin (1872), Hall and Allin (1897), and others. However, we are still lacking a comprehensive description of laughter - one that separates elements of the expressive pattern from merely associated secondary movements and from attempts to regulate the intensity of the emotion. Some movements serve other actions. For example, throwing back the head facilitates the expulsion of air through the throat. Other gestural and postural changes, such as the vibrations

of the trunk and shoulders, simply reflect effects of the forced respiration movements of the diaphragm and abdominal muscles.

While phasic discharges (albeit of low intensity) from the muscles of the arm (brachioradialis) and the legs (rectus femoris) can be observed during laughter (Santibañez-H. & Bloch, 1986), there is generally a lowering of muscle tonus (Paskind, 1932). This may cause the laughing person to hold on to something, sit down, or (primarily in children) lie down on the floor (Hall & Allin, 1897). Clinical studies report a complete loss of muscle tension during laughing (e.g., in narcolepsy). Also, incontinence may occur. Bloch, Orthous, and Santibañez-H. (1987) postulate that two dimensions of posture discriminate between different emotions - namely, tension-relaxation and approach-avoidance. Whereas both laughing and crying are displayed in a relaxed posture, they are separated by the second dimension; the former is characterized by approach and the latter by avoidance.

Smiling and laughter typically represent different levels of intensity of exhilaration; Laughing occurs at higher levels of exhilaration, and smiling is typical of lower levels. Also, different intensities of smiling reflect different degrees of exhilaration. As compared to smiling, laughter is accompanied by a stronger contraction of the zygomatic major muscle, is of longer duration, and is shown at jokes judged by the person laughing to be funnier (Ruch, 1990a; Sumitsuji, Inoue, Tanaka, & Takahashi, 1986). Also, laughter always gradually fades out as a "smile" and may also be preceded by it (Pollio, Mers, & Lucchesi, 1972). This occurs smoothly rather than abruptly, and thus underscores the assumption of a quantitative relationship between smiling and laughing. Within a single laughing act, the duration of the actual vocalization period(s) is rather short; the purely facial stages (especially in the offset of the facial action) constitute roughly two-thirds of the total duration.

Exhilaration smiles rarely last longer than 4 seconds, and single acts of laughter seldomly exceed 7 seconds (Ruch, 1990a). EMG recordings yield longer durations, however, since (especially in the offset of the facial actions) slight contractions of the muscles go undetected by observational methods.

Physiology

Exhilaration, especially in its more intense forms, has several response components. Among them, disruption of the normal breathing pattern and the emission of sounds are the most characteristic features. It is the vocalization component that gave laughter its name; the verb "laugh" ("hlehhan", in Old English) is of echoic (sound-imitating) origin. The study of the neurophysiological conditions of exhilaration covers the brain structures involved and the neurohormonal activity.

Respiration. A respiration cycle consists of inspiration, inspiration pause, expiration, and expiration pause. There are approximately 14 such cycles per minute during resting periods, and the duration of expiration (including pause) exceeds the duration of inspiration (inspiration-expiration ratio = .60). During laughter the respiration rate remains within the boundaries of the resting state; however, the predominance of expiration over inspiration increases. The inspiration-expiration ratio ratio during laughter (Feleky, 1916, .30; Bloch, Lemeignan, & Aguilera, 1991, .38) is lower than in any other emotional state studied.

Whereas the respiration muscles during exhaling are normally passive, there is a forced expiration during laughter. The depth of respiration increases, mainly because of the stronger expiration, but also because of a deeper inspiration. The amplitude during laughter may be up to 2.5 times higher than the amplitude during resting respiration. The characteristic elements

of laughter, the "ha-ha" cycles, occur during expiration and are produced at a low lung volume (Bright, Hixon, & Hoit, 1986) but a high transdiaphragmatic pressure (Agostoni, Sant'Ambrogio, & Portillo Carrasco, 1960). Normally these cycles are initiated around functional residual capacity (i.e., at the lung volume after a normal expiration) and terminate close to residual volume (i.e., the air volume remaining in the lung after maximal expiration) (Bright et al., 1986; Lloyd, 1938). These saccadic movements are superimposed on the normal expiration movement and are of low amplitude and high frequency. Most likely they are due to the contraction of the diaphragm (Agostoni et al., 1960) and the abdominal muscles (Santibañez-H. & Bloch, 1986).

Vocalization. In an early survey on laughter, Hall and Allin (1897) found that the sounds emitted during laughter are extremely diverse, including all vowels and many consonants, but also voiceless laughter. The sound most generally emitted was described as "he-he" passing over to "ha-ha." A similar range of vowels can be expected for the laughter of exhilaration, since the facial expression of exhilaration (lip corners backward and upward) and the widely opened mouth (to let the air stream out) leave little room for articulation. Variations may exist with respect to the degree of the vertical opening of the mouth, resulting in a change of the vowel from */e/* (slightly opened mouth) to */a/* (widely opened mouth). Indeed, Habermann (1955) reports that the laughter of exhilaration is most frequently based on an */a/*, but also on /ɑ/ and /ɛ/; or on fluent changes between them. The occurrence of other vowels (such as o or u) appears to be incompatible with a free expression of exhilaration and may indicate other emotional qualities, attempts to regulate the intensity of exhilaration, or a comment on its expression.

Laughter frequently begins with the initial sound */h/* (Habermann, 1955). This unvoiced palatal sound is produced when air is pressed up from the lungs and passes a not (fully) closed glottis. The closure of the vocal fold is prerequisite for the vibration of the vocal chords and the production of a voiced sound. There are approximately seven such "ha" syllables during laughter at a rate of five per second (Boeke, 1899; Mowrer, LaPointe, & Case, 1987; Provine & Yong, 1989). Because of the lack of articulation, there are more syllables per second than during normal speech. The pitch of the laughing sounds is characteristic, too. The early study by Boeke (1899) revealed that there is an increase in level and variation of fundamental frequency (F_0) (which is a major determinant of perceived pitch) during laughter as compared to speech.

Cardiovascular and electrodermal activity. Characteristic cardiovascular changes and fluctuations in electrodermal activity (EDA) can also be observed during laughter, perhaps triggered by the altered respiration pattern. Heitler (1904) was the first to report an acceleration of the heart rate. These changes are more pronounced than during other emotional responses (Santibañez-H. & Bloch, 1986), but last only for the duration of the laughing act (Fry & Savin, 1988). Smiling is not usually accompanied by respiration changes; however, a heart rate increase of 5 beats per minute has been observed during spontaneous smiling in infants (Emde, Campos, Reich, & Gaensbauer, 1978), and an increase of 2.5 beats per minute has been noted during voluntary smiling in adults (Levenson, Ekman, & Friesen, 1990). Diastolic and systolic blood pressure both increase during laughter (Fry & Savin, 1988). Peripheral blood volume has also been shown to change between a smile and a laugh (Sumitsuji et al., 1986). There are massive changes in EDA during laughter (Averill, 1969;

Hagfors, 1970). However, EDA changes also occur during funny scenes when subjects are not laughing, suggesting that they cannot be fully accounted for by the respiration changes.

Hecker (1873) observed that pupil dilation occurs during laughter induced by tickling, as well as humor. The "brightening" of the eyes was described by Darwin (1872) and Piderit (1858). Lacrimation (tearing) may also occur, perhaps more frequently in females and in younger ages. However, lacrimation during laughter remains to be studied.

Some insights regarding the neurophysiological basis of exhilaration come from studies of pathological laughter (excessive laughter, epileptic laughter, forced laughter), microcephalic children, intracranial stimulation, brain-damaged patients, and hemisphere differences in normals. Reviews of the literature indicate that many brain regions are involved in the production of the exhilaration response (Duchowny, 1983; Müller & Müller, 1980; Ruch, 1990a).

Various hypotheses regarding the effects of laughter on endocrine secretion have been proposed in the last few years. These hypotheses include, for example, effects on immune functioning, release of hormones, catecholamines, or endorphins (e.g., Berk et al., 1989; Dillon, Minchoff, & Baker, 1985; Levi, 1965). Some of these hypotheses are supported by preliminary data; however, conclusive evidence is still missing.

Experience

A systematic analysis of the experience of exhilaration is still lacking. However, as with other emotions, the awareness of one's own actions and action tendencies, of physiological changes, and of the feeling structure must be considered, along with the awareness of the situation's meaning structure and the perception of stimulus properties of the exhilaration-inducing stimulus.

Dimensions of feeling. The description of exhilaration as a pleasurable, relaxed excitation suggests that all three of Wundt's (1874/1903) dimensions contribute to the feeling state. Most elicitors of exhilaration may also induce unpleasurable states; for example, both humor and tickling can be aversive. However, if the induction of exhilaration is successful, the resulting state will typically be a highly pleasurable one. Exhilaration is a state we enjoy being in. The excitation component of the feeling state relates to the perception of intensity of the behavior activated and its physiological concomitants. As noted in the introduction, exhilaration is not restricted to the high end of the excitement continuum, but also occurs at intermediate and low levels of excitement. Finally, the experience of exhilaration is characterized by relaxation. During laughter there is a relaxed posture and a typically lowered muscle tone, associated with a reduced readiness to respond attentively or with planned behavior to changes in the surroundings. The laughing person has been described as abandoning himself or herself to the body response (Plessner, 1941), and as being in an unprotected state (Zutt, 1939). Crile (1915) noted that one never sees purposeful acts and laughter together; laughter and goal-oriented behavior are incompatible (Apter & Smith, 1977).

Thus, in contrast to negative emotions such as anger or anxiety, the excitation during laughter occurs at a relaxed basis. The physiological changes occurring during laughter do not prepare the individual for "fight or flight;" in this respect, they are more or less purposeless. This is noteworthy, since several studies report that the physiological changes during laughter usually exceed the ones for the other emotions studied (Feleky, 1916; Hagfors, 1970; Santibañez-H. & Bloch, 1986). In contrast, happiness - at the level of smiling - appears to be

accompanied by the smallest amount of physiological changes, compared to the other emotions studied (Levenson et al., 1990).

Whereas there are low levels of strain during the emotional response, a buildup of strain or tension and its abrupt relief may precede the release of exhilaration (Sroufe & Waters, 1976; Wilson, 1979). In humor, attention is paid to the eliciting event, and it is processed seriously until it is discovered that it is "just fun." The sudden annulment of seriousness (Frijda, 1986) and disengagement from prior problem-solving-like activity may be related to the feeling of "lightness" ascribed to amusement or exhilaration (Lyman & Waters, 1986).

The definition of exhilaration as a temporary rise in cheerful state underscores the fact that the intensity of the emotional experience changes over time. Typically, there is a sudden and intense increase in cheerfulness, followed by a more or less pronounced plateau and a prolonged fading out of the emotional tone.

Perception of stimulus properties. Finally, the perceived properties of the eliciting stimulus also contribute to the experience. In the case of humor, individuals are confronted with a stimulus that contains incongruous, contradicting, or opposing elements. This incongruity - for instance, the final part of a punch line - is unexpected and initially perplexing. Some effort is required to discover that the incongruity makes sense from another perspective, and even after this discovery various degrees of incongruity usually remain. Such terms like "funny," "humorous," "comical," or "witty" are used to denote the perceived properties of stimuli causing us to engage in such playful processing of incongruity. The second meaning of the term "funny" as "strange," "odd," "curious," or "puzzling" underscores the fact that incongruity does not exclusively lead to exhilaration.

Traditionally, humor research focused on the perception of qualities of the stimulus. Therefore, the subjects were typically asked to judge the degree of "funniness" of a stimulus rather than the degree of exhilaration or amusement induced by it. Studies show that these two judgements do correlate very highly with each other, but there may be also conditions (e.g., in repeated exposure experiments) where stimulus-based and emotion-based judgments diverge (Ruch, 1990a).

Emotional experience, behavior and physiology. Exhilaration behavior, physiological changes, and emotional experience are positively intercorrelated; that is, increased intensity in one component of exhilaration goes along with increased intensity in the other two components. At the behavioral level the intensity ranges from an invisible or barely visible contraction of the zygomatic major and orbicularis oculi muscles, through various degrees of smiling, single expulsions of air, and a fully developed laughing pattern, to the most extreme forms of laughter. The intensity of emotional experience and the complexity of physiological changes should vary accordingly. The data obtained so far support this assumption (e.g., Averill, 1969; Ruch, 1990a; Sumitsuji et al., 1986). For example, for any individual studied there is a highly consistent pattern in the amount of smiling/laughing the person displays in response to a set of jokes and cartoons, and the funniness ratings (as an index of the experience of exhilaration) given (Ruch, 1990a). The average correlation of .70 may underestimate the strength of this relationship. However, the form of this relationship varies from individual to individual. For example, whereas the minimal funniness of a joke necessary to induce smiling is low for individuals in a cheerful mood, a noncheerful individual displays smiling only at jokes perceived to be very funny (Ruch, 1990a). Not surprisingly, the computation of a correlation across individuals varying in cheerful mood yields low to moderate coefficients, which, according to McGhee (1977), typically range between .30 and

.40. Other factors, such as intoxication with alcohol (Weaver, Masland, Kharazmi, & Zillmann, 1985), the presence of others, or personality variables, may have a similar moderating effect - which, however, should not be ascribed to a discordant response pattern.

Antecedents

Exhilaration can be elicited by a variety of stimuli. The induction of exhilaration normally is imbedded in a more or less complex situation, and therefore several social and physical factors may influence the success of the induction. Furthermore, organismic factors may also facilitate or inhibit the release of exhilaration; these factors may relate to temporal states or to habitual traits.

Elicitors of Exhilaration

Humor. Humor (in the form of jokes, cartoons, funny stories or films, comedy, parody, practical jokes, music, pantomime, etc.) is a reliable elicitor of exhilaration. However, humor itself is not an emotion (McGhee, 1979). In experimental studies, slides with cartoons or videotapes with funny films are generally used. The use of jokes and cartoons as an induction procedure, as compared to tapes allows for better control over both the actual eliciting event and the quality of the responses induced. Furthermore, because of their brevity, many stimuli can be used, and a taxonomy-based selection allows a reduction in the variance reflecting differential humor preference. However, the degree of exhilaration induced is usually lower than that obtained by funny videos.

Numerous theories have been proposed to explain the perceived funniness of humor (for a review, see Keith-Spiegel, 1972). Structural properties as well as content contribute to the exhilarating effects of humor. However, these key ingredients cannot be varied independently of each other in intact jokes or cartoons. Therefore, beginning with Ertel (e.g., Ehrenstein & Ertel, 1978), the experimental verification of the effects of structure and content in humor has been undertaken with "artificial" humor stimuli. This may take, for example, the form of sequences of words deviating from proper grammatical sequences (Ehrenstein & Ertel, 1978), adjective-noun pairs varying in semantic distance (Godkewitsch, 1974), computer-drawn caricatures with various degrees of exaggeration (Rhodes, Brennan, & Carey, 1987), or a weight-judging paradigm (Deckers, 1993). In studies of intact jokes, one can undertake a differential priming of the two meanings of a key word in a joke (Wilson, 1979), or a priming of the theme of the jokes to follow (Goldstein, Suls, & Anthony, 1972).

Such studies demonstrate the importance of an intermediate degree of incongruity. Although incongruity is a necessary condition for humor, it is not a sufficient one. Sheer incongruity may also lead to puzzlement and even to aversive reactions. To account for this, such variables as the resolution of the incongruity (Suls, 1972), the acceptance of unresolvable incongruity, or the "safeness" of the context in which the incongruity is processed (Rothbart, 1976) have been proposed. Adding sexual content to humor or increasing the salience of the joke themes has been shown to increase funniness (Ehrenstein & Ertel, 1978; Goldstein et al., 1972). However, personality variables also influence the extent to which structural and content properties are optimal for the induction of exhilaration (Ruch, 1992).

Tickling. According to Hecker (1873) and Wundt (1874/1903), tickling is the most common elicitor of laughter other than humor. Chimpanzees also show a facial display, a

respiration pattern, and vocal sounds comparable to those associated with human laughter when being tickled or expecting to be tickled.

From their survey on laughter, Hall and Allin (1897) concluded that the areas where children are most ticklish are the following: soles of the feet, under the arms, the neck, under the chin, the waist and ribs, and the cheeks. Whereas tickling is done manually in natural settings, in experimental studies the application of a tickle stimulus is undertaken by means of a feather, a brush (Hecker, 1873), a wad of cotton (Ruggieri & Milizia, 1983), or a constructed apparatus (Weisskrantz, Elliot, & Darlington, 1971). The typical feeling during tickling does not appear immediately after the onset of stimulation, but only after a period of latency in which the tactile sensation is present. This is followed by a variable phase of a pleasurable tickle sensation, which may change again into a phase of merely tactile sensation (Ruggieri & Milizia, 1983). The unpredictability of the pattern of the stimulation plays a critical role in the perception of tickle; self-application of a tickle stimulus is less effective, since the person has a plan about the movements to be carried out which then corresponds to the perceived stimulation (Weisskrantz et al., 1971). The tickle perception also habituates after repeated application of the stimulus (Hecker, 1873; Weisskrantz et al., 1971).

Nitrous oxide. Nitrous oxide (N_2O, the "laughing gas") is a colorless, nonflammable gas that has a sweet, almost mentholated taste. Even before it began to be used as an anesthetic, its exhilarating, laughter-inducing effects were known and offered for public entertainment. William James (1882) described its effects and the frequent occurrence of elation, laughter, or the urge to laugh. These effects were also reported in more recent experimental studies (Harris, Zucker, & Lynn, 1974; Steinberg, 1956). The effects last for the duration of the time the gas is inhaled. The concentration of N_2O can be varied experimentally by mixing it with O_2. Despite these optimal properties for experimentation, N_2O has not yet been used as an induction procedure in experiments studying exhilaration.

Even at doses too low to induce laughter, N_2O produces some effects that are typically ascribed to laughter, such as muscle relaxation and the appearance of delta and theta waves in the electroencephalogram (Pozzessere et al., 1982). The study of the uptake of N_2O in various regions of the brain was proposed for answering the question of the location of a "laughing center" (Niethammer, 1983).

Other Stimuli and Situations. Exhilaration may also occur in response to other stimuli and situations. The laughter of others can be exhilarating itself; exhilarated laughter is catching. Exhilaration may occur during various forms of motor play (e.g., dancing, running, jumping, or chasing), although as McGhee (1979) points out, these states are not experienced as humorous. Exhilaration may accompany the breaking of taboos, or doing something that is forbidden or secret (Hall & Allin, 1897; McGhee, 1979). As with other emotions, imagination of exhilarating events or their retrieval from memory may release the emotion; these techniques have been tried out already (Bloch et al., 1987; Prerost, 1989), and might be used as experimental induction procedures.

More work must be completed to find the elicitors of exhilaration most suitable for experimental purposes. It has to be considered that the exhilarating potential of any given stimulus differs from individual to individual, and across different ages or developmental levels (e.g., Sroufe & Waters, 1976).

Facilitating and Inhibiting Factors

Social influence. The induction of exhilaration may be moderated by a variety of social factors. The effectiveness of humor may depend on who tells the jokes and whether this person is liked or not. The moderating effect of the personal relationship upon reactions to the source of stimulation may even be stronger in the case of a tickle stimulus. In general, the presence of a "play signal" (McGhee, 1979) facilitates the induction of exhilaration. It communicates to the recipient that a message should be received in a playful rather than a serious mode.

Several experiments have examined audience effects on humor-induced smiling and laughter (Chapman, 1983). The variables studied include the presence of a laughing versus a nonlaughing model, seating position, proximity, crowding, eye contact, age difference between subjects, and whether groups of strangers or friends were tested. Several of these factors have been quite powerful in enhancing the frequency or duration of smiling and laughing. However, no separation of different sorts of smiles and laughter was undertaken. The increased frequency of smiling in the presence of a laughing model, for example, may have been attributable to the appearance of "false" smiles (Ekman & Friesen, 1982).

Social factors are effective in facilitating the induction of exhilaration even when reduced to a minimal intensity. Several studies show that the mere presence of another person is sufficient to facilitate humor-induced smiling and laughter (Chapman, 1983). However, this effect was found to be restricted to individuals in a cheerful mood (Ruch, 1990a). Maybe an implicit (physically not present) audience is sufficient to facilitate exhilaration. Subjects tested solitarily smile more when they assume that a friend is also taking part in the same experiment in another room (Fridlund, 1991), and "canned laughter" (simulating a laughing audience) added to tape-recorded jokes increases exhilaration behavior (Chapman, 1973). However, accumulation of facilitating factors does not have summative effects; subjects accompanied by a mirthful confederate displayed less humor-induced laughter when "canned laughter" was present than when it was absent (Donoghue, McCarrey, & Clement, 1983).

Situational cues may also inhibit the expression of exhilaration or of certain forms of exhilaration by activating "display rules." Display rules are acquired during socialization, and they tell the individual when, where, and with whom exhilaration may be expressed. For example, most people learn that it is not appropriate to exhibit exhilaration at the misfortunes of others; in solemn places; or during religious ceremonies and rites, dignified addresses, and other serious occasions. Also, such rules may dictate that mild exhilaration may be displayed, but intense forms should be avoided. Thus, social regulations concerning the expression of emotions may apply to positive as well as to negative emotions.

Psychoactive drugs and alcohol. Alcohol and psychoactive drugs such as hallucinogens, opiates, and stimulants also affect the threshold for induction of exhilaration (Raulin, 1900; Siegel & Hirschman, 1985; Stearns, 1972). They may have facilitating or inhibiting effects, depending on the dose. Intoxication induced by these substances may lead to elation or euphoric mood. In this state of intoxication, even negligible or minimal stimuli may become potent elicitors of exhilaration, and the degrees of exhilaration induced in this state typically cover the high end of the intensity continuum.

Little is known about intoxication-induced exhilaration. Siegel and Hirschman (1985) note that laughter is perhaps the most conspicuous and yet most ignored feature of intoxication with psychoactive drugs. Since the laughter is often inappropriate, it is considered silly and not worthy of serious attention. The most frequent references to drug-induced laughter are found in the cannabis literature. The early study by Stoll (1947) on small doses of LSD

documents the appearance of euphoric mood, exhilaration, and laughter triggered by minimal stimuli during the use of this drug. Similar effects have been postulated for alcohol (Stearns, 1972), but they lack experimental verification. Alcohol does not seem to raise the frequency of humor-induced exhilaration responses, but appears instead to increase the relative proportion of laughter among all exhilaration responses exhibited (Ruch, 1990a). Alcohol may alter the preference for type of humor preferred (Weaver et al., 1985).

Mood and personality. The success of the induction of exhilaration also depends on temporal and habitual organismic factors. Among the temporal organismic factors, such physiological variables as degree of sympathetic arousal, health status, or exhaustion may moderate the effectiveness of the stimulus. Moreover, being in a goal-oriented state (Apter & Smith, 1977), thoughtful, or preoccupied with serious problems may increase the threshold for the induction of exhilaration.

A cheerful mood facilitates the induction of exhilaration. Subjects' level of state cheerfulness, assessed immediately before the induction stage, predicted frequency, threshold, and intensity of humor-induced exhilaration behavior in two studies (Ruch, 1990a). State cheerfulness turned out to be a better predictor of exhilaration than other closely related (e.g., elation) or broader (e.g., positive affectivity) positive mood states. Negative mood states did not predict exhilaration. Cheerfulness also moderated the effects of intoxication with alcohol on the induction of exhilaration. However, state cheerfulness is only predictive of exhilaration if another person is present in the room (even when engaged in a different activity), and has no predictive power during solitary situations (Ruch, 1990a).

Personality characteristics may facilitate the induction of exhilaration as well. Everybody is in a cheerful state now and then. However, individuals differ with respect to the frequency, duration, and intensity of occurrence of these states. Such habitual differences might be best accounted for by a "cheerfulness" trait, which can be subsumed under the higher-order temperament dimension of extraversion-introversion (Eysenck & Eysenck, 1985). Research remains to be initiated on the predictive power of trait cheerfulness; however, extraversion has been shown to predict frequency and intensity of humor-induced exhilaration behavior (Ruch, 1990a).

Effects of Exhilaration

On the one hand, exhilaration is the outcome of the combined effects of a stimulus and of facilitating factors. On the other hand, its appearance may in turn have effects on the organism and the social environment. However, since in present research humor is generally used to induce exhilaration, these effects are typically attributed to humor rather than to (humor-induced) exhilaration. Such attributions neglected the possibility that most of the effects are contingent on the successful induction of exhilaration, and that presentation of humor may also lead to indifferent or even negative affective states.

If the induction of exhilaration is successful, the individual is in a state of pleasurable, relaxed excitation. This state is incompatible with a variety of states differing in one or more of the Wundtian dimensions (i.e., with states characterized by unpleasantness, quietness, and/or strain/tension). Hence fostering the appearance of exhilaration may help to mitigate, suppress, interrupt, or even permanently replace a variety of negative states. For example, humor and laughter have been used in the counterconditioning of anger responses (Smith, 1973), and in systematic desensitization of fear (Ventis, 1973). Other hypotheses postulate that

humor and laughter buffer stress, reduce discomfort or pain, lower tension, or are otherwise beneficial for mental and physical health. Some of these effects have been ascribed to postulated neurohormonal changes occurring during laughter, such as the release of endorphins or the enhancement of immunocompetence.

As noted earlier, the accumulation of exhilaration responses may lead to longer-lasting elevation of cheerful mood. Sharing humor and laughter is considered to strengthen the in-group bonds and to facilitate communication. The successful use of humor can induce a relaxed atmosphere in the group. Furthermore, the value of humor and its exhilarating effects has been discussed in a variety of fields. For example, humor is applied in mass media advertisement, in the industrial selling process, at work, in the classroom, in textbooks, in the promotion of learning and creativity, in psychotherapy and counseling, in health visiting, in the health professional-patient interaction, and so on.

The belief that humor and exhilaration are beneficial for humans is documented in sayings, proverbs, and folk wisdom. Potential health benefits have also been mentioned in scientific writings for a long time. More recently, Cousins's (1979) claim to have cured himself of a normally terminal disease by heavy doses of laughter and Vitamin C has helped to spread such beliefs in the general public. However, the scientific research has only begun (e.g., Martin & Lefcourt, 1983) and is starting to absorb much activity in contemporary humor research.

Concluding remarks

Because of its recent conceptualization, exhilaration has not been studied as intensively as other emotions. Hence several basic issues have yet not been resolved and are open for investigation. However, exhilaration provides a common basis for various phenomena of different disciplines that have hitherto been studied in isolation. Specifically, it ties the study of humor into general emotion research. It adds another facet to the positive emotions, which are treated in a less differentiated way than the negative emotions. Finally, the promotion of the emotion of exhilaration may raise the level of awareness for phenomena in different fields that have previously been overlooked or not considered worthy of scientific enquiry.

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