

# Physiologic Evidence for the Interpersonal Role of Laughter During Psychotherapy

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**Abstract:** The role of laughter during psychotherapy is poorly understood. This study examined 10 unique sessions of psychodynamic psychotherapy with digital videotape and simultaneous measures of skin conductivity (SC) from patients and therapists. Independent observers coded laugh episodes using published criteria. Observers identified 167 laugh responses. Of the 119 patient laughs, 91 (76.5%) were patient as speaker, compared with 28 (23.4%) as nonspeaker audience. In contrast, of the 48 therapist laughs, only five (10.4%) were therapist as speaker, whereas 43 (90.3%) were as nonspeaker audience. The difference was highly significant ( $p < .001$ ). Physiologic data showed that mean SC level increased regardless of role as patient, therapist, speaker, or audience ( $p < .001$ ). Two-factor analysis of variance indicated that SC change scores were significantly larger when patients and therapists laughed together compared with laughing alone ( $p < .05$ ). The results support an empirically based approach to the study of laughter and the use of psychophysiology as a measure of process during psychotherapy.

**Key Words:** Psychophysiology, laughter, psychotherapy, skin conductance.

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Research on laughter over the period of the last decade has revealed that the role of this universal, stereotyped, species-specific behavior is not primarily related to humor, joking, or ridicule; rather, it serves to moderate social relationships and communication (Provine, 2000). Humans laugh approximately 30 times as often in social settings than in more solitary contexts (Provine and Fischer, 1989). The timing of laughter during conversation is not arbitrary but

highly ordered and consistent. In one sample of more than 1200 laugh episodes involving college students in a student union during conversation, laughter by speaker or audience almost exclusively followed complete statements or questions and that, perhaps surprisingly, speakers laughed more often than their nonspeaker audience (Provine, 1993). In addition, Bachorowski and Owren (2001) found that voiced laughs were significantly more likely to elicit positive responses than unvoiced grunts or pants. Moreover, consistent gender differences in speaker and audience patterns of laughter have shown that males produce more laughter in their audiences, females laugh more in response to male speakers, and increased female laughter is associated with increased partner interest (Grammer, 1990; Provine, 1993). Finally, there is evidence that laughter is a uniquely human activity and is only approximated by chimpanzees and other nonhuman primates (Provine, 2000). This suggests that laughter evolved specifically in early hominids and humans as a means of emotional communication, alliance formation, and social unity (Black, 1984; Darwin, 1872; Owren and Bachorowski, 2001).

The facts that laughter is common, punctuates speech in an ordered nonarbitrary way in social settings, is associated with consistent findings of gender differences, and is uniquely human support the role of laughter as a bidirectional interpersonal communicator of affective information with a likely physiologic and neurobiologic basis (Fry, 2002; Provine, 1996; Wild et al., 2003). Given that many forms of psychotherapy focus on the communication of emotions from patients to therapists, understanding the role of laughter among patients and therapists may offer clues to understanding nonverbal affective communication during psychotherapy.

Much has been written about psychotherapy and humor dating back to Freud's (1938) work relating humor to the unconscious. However, there are few empirical studies that described even the most basic facts about the specific role of laughter during psychotherapy. Shaughnessy and Wadsworth (1992) reviewed the published works on the role of humor in psychotherapy during the period 1970 to 1990. This review begins with Kubie's (1971) controversial position, which is based on anecdotal evidence, that humor may be destructive

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during therapy because of its potential to arrest the patient's stream of thoughts and feelings. Consequently, Kubie suggests that humor should have a limited role in psychodynamic psychotherapy and psychoanalysis. Other authors support the use of humor in psychotherapy. For example, Poland (1971) suggests that humor is associated with a good therapeutic alliance and can be useful for developing insight. A review by Saper (1988) concluded with the balanced theoretical position that when humor is incorporated judiciously and meaningfully into psychotherapy, it can be of value. Unfortunately, reports on laughter and psychotherapy have been hampered by ambiguous definitions (often confusing terms such as *humor*, *joking*, *mirthful laughter*, and *ridicule*), reliance on anecdote or supposition, and poor study design.

In contrast, there is more known about the physiologic effects of laughter outside of psychotherapy (Fry, 1994). Notably, laughter has been shown to increase autonomic activity in general, and specifically to increase respiratory rate, increase muscular activity, and improve oxygen exchange (Fry, 1977, 1992). In addition, research examining the neurobiology of abnormal laughter has consistently implicated subcortical regions associated with the expression and regulation of affect and autonomic arousal (e.g., anterior cingulate, thalamus, hypothalamus; Critchley et al., 2000; Wild et al., 2003). Although laughter in general increases autonomic nervous system activity, there is also some evidence that mirthful laughter in response to humor reduces stress hormones while increasing immune cell activity (Berk et al., 1988, 1989). Given the potential for laughter to stimulate the autonomic nervous system, the present study examined the relationship between psychophysiology and laughter during psychodynamic psychotherapy.

Early applications of psychophysiology to the study of interpersonal aspects of psychotherapy confirmed that therapists and patients were "highly reactive" to each other during psychotherapy (Lacey, 1959). For example, Di Mascio et al. (1955) monitored the heart rate of three patient-therapist dyads over multiple sessions of psychotherapy and identified moments when patient and therapist heart rate varied together in "concordance." Coleman et al. (1956) found further evidence for a "physiologic relationship" between therapist and patient in an in-depth investigation of a single therapeutic dyad. Other studies have reported similar results using different measures and research designs (Di Mascio et al., 1957; Stanek et al., 1973). More recent research has used skin conductance (SC) to assess interpersonal experiences during psychotherapy (McCarron and Appel, 1971). For example, Robinson et al. (1982) found a positive relationship between concordant patient-therapist SC responses and a self-report measure of empathy.

Previous research into laughter and psychotherapy has focused almost exclusively on the patient and anecdotal or simulated evidence of their responses to different types or

uses of humor. However, the saliency, simplicity, and stereotypicality of laughter (compared with humor) make it ideal for psychotherapy research. The present study was designed to characterize laughter during psychodynamic psychotherapy in a naturalistic setting using videotaped sessions and the collection of psychophysiological measures. The laugh episodes were coded using established criteria to allow for direct comparisons with previous research (Provine, 1993). This study examines the frequency of laughter among patients and therapists as speaker and nonspeaker audience during psychodynamic psychotherapy with simultaneous measures of SC from both the patient and therapist. Despite the trends in psychodynamic theory toward a two-person psychology (Kolb et al., 1995), we hypothesized that the pattern of speaker and audience laugh responses would reflect the unique role of the therapist relative to the patient. Specifically, therapists would be less likely to laugh than patients during psychotherapy. We additionally hypothesized that the SC recordings would demonstrate the arousing and interpersonal nature of laughter during psychotherapy.

## MATERIALS AND METHODS

### Participants

Participants included 10 unique and established patient-therapist dyads that are part of an ongoing study investigating the relationship between psychophysiology and empathy. The project is currently being conducted within the Massachusetts General Hospital Psychotherapy Research Program. Patient and therapist participants were recruited from the Massachusetts General Hospital Department of Psychiatry Outpatient Department. Patient participants were adults between the ages of 18 and 65 at the time therapy was initiated and included five males and five females. In each case, patients had seen their present therapist for more than four sessions. The therapist participants included four psychiatric residents, one psychology intern, and five staff psychiatrists. There were three female therapists and seven male therapists.

Patient participants reported no evidence of the following: active psychosis, presence of any medical condition or medication (e.g., anticholinergic medication) that might compromise their mental status or the SC measures, homicidal or suicidal ideation, active substance abuse, or severe character pathology that might significantly interfere with the therapeutic relationship. Six of the 10 patient participants had a clinical diagnosis of major depression, two had a diagnosis of bipolar disorder, and two had a diagnosis of anxiety disorder. All patient participants were clinically stable and without hospitalization during the year leading up to the study. The average age of the patients was 36.3 years ( $SD = 8.6$ ), and they had seen their respective therapists for an average of 72.4 sessions ( $SD = 70.4$ ), suggesting a patient population that was well established in their psychotherapy. Eight of the

10 patients were on psychotropic medication. All participants were kept blind to the goals of the study. Written informed consent was obtained from all participants before the study session.

## Procedures

Each 45 minute full-length psychotherapy session was digitally videotaped by a single camera (Sony Digital 8 DCR-TRV510; Sony Corp. of America, New York, NY) for the purposes of subsequent analysis. Two independent observers were trained to identify and code laugh responses according to established criteria (Provine, 1993). The observers independently reviewed each of the videotaped sessions in their entirety.

A laugh response was defined as any highly stereotyped utterance characterized by multiple forced, acoustically symmetric, similar vowel-like notes separated by a breathy expiration in a decrescendo pattern (Provine, 1993). A laugh episode was defined as the comment immediately preceding a laugh response by either the speaker or nonspeaker audience plus all laugh responses beginning within 1 second after the onset of the first laugh response (Provine, 1993). Each episode was assigned a code with designations for whether the person laughing was the speaker (S) or nonspeaker audience (A); patient (P) or therapist (T); and male (M) or female (F). A response code was added to identify instances where the speaker laughed alone (1), the audience laughed alone (2), or both speaker and audience laughed together during the episode (3). A third party reviewed episodes that were identified by one observer but not the other, and reviewed the disputed episodes to determine whether they met the definition of a laugh episode. Disputed episodes were reviewed and recoded by each observer until 100% agreement was achieved. Observers also coded each episode of laugh-speak (results not reported), the phenomenon of laugh-like sounds that do not interrupt sentence structure and that occur over speech (Provine, 1993).

Physiologic data consisted of continuous SC recordings from both patient and therapist. SC data collection and analysis was accomplished using ADInstruments PowerLab 8SP computer-based modular instrument system with Chart 4.2 Software (ADInstruments, Sydney, Australia). SC level was recorded in microSiemens ( $\mu$ S) using dry Ag-AgCl electrodes attached to an ADInstruments amplifier that uses a constant low-voltage with alternating current excitation. The electrodes were attached to the distal palmar aspect of the third and fourth digits on the nondominant hand. SC activity was sampled at 100 Hz and passed through a 255-point Bartlett triangle for smoothing purposes before statistical analysis. The mean SC level for the 5 seconds immediately preceding initiation of the defining laugh of each episode was calculated for both patient and therapist. In addition, the mean SC level of the first 5 seconds of the defining laugh of each

episode was calculated for both patient and therapist. For the purposes of analysis, SC difference scores were calculated as the difference between the two calculated 5-second SC means for each laugh episode for both patient and therapist.

## RESULTS

The independent observers identified 145 laugh episodes with an interrater agreement of 0.861 ( $\kappa$ ). There were 167 laugh responses during the 145 laugh episodes (allowing for episodes in which both speaker and audience laugh) that were used in the analysis. In 100% of the total laugh episodes, the initial laugh response immediately followed a comment by the speaker, and all laugh responses were in the context of a laugh episode.

### Power Analyses

In this small sample size study, traditional significance testing was complemented by calculations of effect size (Cohen, 1988). The results presented below show mostly moderate to large effects for statistically significant calculations ( $d > .5$ ). In addition, the effect sizes for nonstatistically significant calculations were very small ( $d < .2$ ). For analysis of variance (ANOVA), we report the partial  $\eta^2$  (PES).

### Laughter Analyses

The mean number of laugh episodes per patient-therapist dyad for the psychotherapy sessions was 14.5 (SD = 9.5). Of the 167 total laugh responses during psychotherapy, 96 (57.4%) were from speakers responding with laughter to their own comments, compared with 71 (42.5%) laugh responses from the nonspeaker audience. The ratio of speaker to audience laugh response was 1.33. The mean number of patient laughs was 11.9 (SD = 9.10). The mean number of therapist laughs was 4.8 (SD = 5.36). The difference between the mean number of patient and therapist laughs was statistically significant ( $t [18] = 2.10; p = .05; d = 0.95$ ).

The mean number of laugh responses per session for each of the coded response categories is presented in Table 1. A two-factor ANOVA was used to compare the mean number of laugh responses according to speaker status (patient or therapist) and response category (speaker alone, audience

**TABLE 1.** Mean Laugh Response Code for Patient-Therapist Dyads by Speaker

Speaker	Laugh response code (mean $\pm$ SD)		
	Speaker alone	Audience alone	Both
Patient	7.1 $\pm$ 6.7	2.3 $\pm$ 4.2	2.1 $\pm$ 1.9
Therapist	0.3 $\pm$ 0.9	2.6 $\pm$ 3.2	0.2 $\pm$ 0.4
Mean	3.7 $\pm$ 3.7	2.5 $\pm$ 3.7	1.2 $\pm$ 1.15

alone, or both). This analysis revealed that patients laughed significantly more than therapists ( $F [1,54] = 8.77; p = .005$ ; PES = 0.14). There was no significant difference across response categories when patients and therapists were combined ( $F [2,54] = 2.58; p = .09$ ; PES = 0.09). A significant interaction between the two factors ( $F [2,54] = 5.08; p = .01$ ; PES = 0.16) indicated that the number of laugh responses for the respective categories differed according to who was speaking. Post hoc analysis (Tukey method) revealed that patients produced significantly more laughs alone when speaking compared with therapists ( $p = .001$ ;  $d = 1.4$ ). In contrast, the number of laugh responses by patients and therapists as audience alone ( $p = 1.00$ ;  $d = 0.05$ ) or together ( $p = .87$ ;  $d = 0.10$ ) did not differ according to who was speaking.

Figure 1 shows a comparison of the percentage of total laugh responses for patients and therapists in their role as speaker and audience during psychotherapy. Of the 119 patient laugh responses, 91 (76.5%) were patient as speaker, compared with 28 (23.4%) as audience, whereas of the 48 therapist laugh responses, only five (10.4%) were therapist as speaker and 43 (90.3%) as audience. The difference between the percentage of total laugh response by speaker and audience for patients and therapists was highly significant ( $\chi^2 = 61.13; p < .001$ ).

**Skin Conductance Analyses**

The 5-second mean SC level preceding a laugh response was compared with the 5-second mean SC level after onset of the laugh for each laugh episode ( $N = 145$ ) using paired  $t$ -tests. The mean SC level increased regardless of status as patient ( $t [144] = 6.87; p < .001$ ;  $d = 0.50$ ), therapist ( $t [144] = 4.39; p < .001$ ;  $d = 0.34$ ), speaker ( $t [144] = 5.62; p < .001$ ;  $d = 0.42$ ), or audience ( $t [144] = 5.51; p < .001$ ;  $d = 0.42$ ).

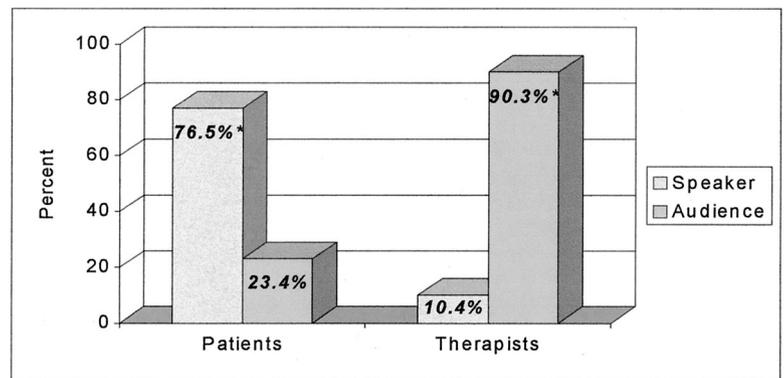
A comparison of SC change scores for laugh episodes with patients and therapists laughing alone (alone) versus laughing together (both) is presented in Figure 2. The mean

SC change score for patients when laughing alone was 0.70  $\mu$ S (SD = 1.33) and when laughing with the therapist increased to 2.45  $\mu$ S (SD = 2.02). This difference was statistically significant ( $t [15] = 2.16; p = .05$ ;  $d = 1.06$ ). In comparison, the SC change scores for therapists when laughing alone was 0.52  $\mu$ S (SD = 0.41) and when laughing with the patient increased to 1.44  $\mu$ S (SD = 1.82). The difference was not statistically significant but produced a large effect size ( $t [7] = 1.30; p = .23$ ;  $d = 0.67$ ). Finally, SC change scores for therapists during a laugh episode showed a significant increase when the patient laughed regardless of whether the therapist laughed ( $t [9] = 2.71; p = .02$ ;  $d = 0.86$ ).

A two-factor ANOVA was used to compare SC change scores according to role (patient or therapist) while laughing (alone or both). The results of this analysis indicated that SC change scores were significantly larger when patients and therapists laughed together compared with when they laughed alone ( $F [1,26] = 5.49; p = .03$ ; PES = 0.17). In contrast, there was no significant difference between patients and therapists SC change scores ( $F [1,26] = 1.08; p = .31$ ; PES = 0.04) and no interaction effect ( $F [1,26] = 1.25; p = .47$ ; PES = 0.02).

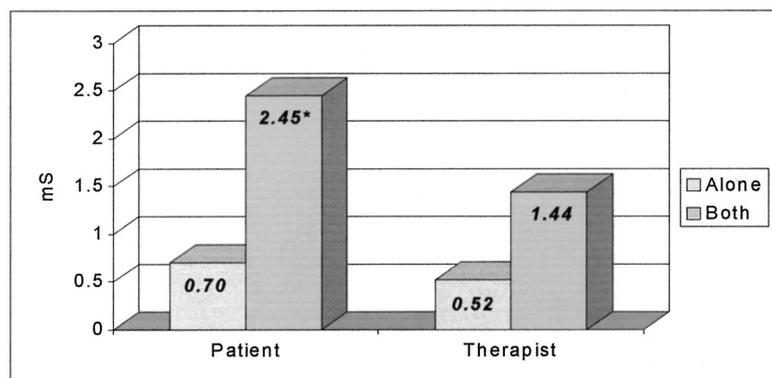
**DISCUSSION**

Laughter was frequently observed in this naturalistic study of psychophysiology and psychodynamic psychotherapy. There were approximately two laugh responses every 5 minutes, and all laugh responses followed a comment from either the patient or the therapist. Patients laughed more than twice as often as their therapists laughed, in support of our primary hypothesis. However, most of laugh episodes were generated by comments made by patients as speaker, not patients as nonspeaker audience. Thus, patients were significantly more likely to laugh in response to their own comments than in response to comments from their therapist. The opposite pattern was observed for therapists. Therapists were much more likely to laugh in response to comments from the patient than in response to their own comments. Finally, the



**FIGURE 1.** Comparison of total laugh responses by speaker and audience for patients and therapists.

\* $p < 0.001$



**FIGURE 2.** Comparison of SC change scores for laugh episodes with patients and therapists laughing alone versus when laughing together.

results of the psychophysiology also support our hypothesis showing that laughter during psychotherapy is consistently arousing for both patient and therapist, regardless of their role as speaker or nonspeaker audience. Moreover, when patients and therapists laughed together, there was a significantly larger increase in the SC change scores compared with when patients and therapists laughed alone. This supports the notion that laughter produces a shared physiologic response.

The psychotherapy literature related to laughter has focused primarily on the putative risks and benefits of humor elicited from patients by therapists. In the present study, whereas patients laughed significantly more often than therapists, most of the total laugh episodes involved the patient as speaker, compared with the much smaller percentage of episodes involving the therapist as speaker. Moreover, when the patient was in the role of speaker, the response was most often the patient laughing alone. In contrast, when the therapist was the speaker, the most common response was again the patient laughing alone. This result does not support the view that humor (appropriate or inappropriate) comes from the therapist (Kubie, 1971; Poland, 1971; Saper, 1988; Shaughnessy and Wadsworth, 1992). The result does support a model whereby laughter most often involves information transmission or communication from patient to therapist.

Some findings in the current study replicate previous results outside of psychotherapy. Provine (1993) found that of more than 1200 laugh responses in college students during casual conversation in a student union, 59% of students were in the role of speaker compared with 41% in the role of nonspeaker audience, for a ratio of the percent speaker to audience laugh response of 1.44. Similarly, in the present study during psychotherapy, the ratio of speaker to audience laugh response was 1.33. This represents a remarkably similar ratio of speaker to audience laughter in two very different populations. However, when the present study is examined for differences between patient and therapist responses as noted, the percentage of speaker laugh responses from patients was greater than seven times more common than the

percentage of speaker laugh responses from therapists. This finding provides additional support for the role of laughter as a form of patient communication during psychotherapy.

One possible explanation for the dramatic difference between the number and nature of patient and therapist laugh responses is the clear social hierarchy of the patient-therapist relationship. Coser (1960) studied the social functions of humor among staff of a psychiatric hospital and found a downward drift of laughter from senior to more junior staff. In other words, senior staff rarely laughed but produced the highest number of laugh-inducing anecdotes per staff member despite their doing the least amount of talking. This supports Fry's (1963) notion that laughter communicates information about dominant versus submissive roles in humans. During psychotherapy, it is possible that patient laughter primarily reflects the social hierarchy of the therapeutic relationship, which would explain why patients laugh more than therapists. This explanation is also supported by the present observation that therapists laughed in response to their own comment only on very few occasions.

Another possible explanation for the large differences between patient and therapist laugh responses is the natural reserve of trained therapists during a psychotherapy session. Unlike patients and college students, in the present study, therapists did not laugh more as speaker than as audience. This supports the long held notion that therapists tend to withhold or suppress their expressions of affect in a therapeutic setting. This suppression of affective communication by the therapist would be appropriate during psychotherapy given the necessary focus on the patient.

The psychophysiology results in this study show a significant increase in the SC change scores for patients and therapists during laugh episodes regardless of their role as speaker or nonspeaker audience. This result supports the role of laughter in stimulating the autonomic nervous system (Fry, 2002). In addition, the finding that the therapists' SC change scores increased significantly when patients laughed regardless of whether the therapist laughed during the episode

provides additional support for the concept of physiologic rapport (Coleman et al., 1956; Di Mascio et al., 1955). It is the role of the therapist during psychotherapy to be empathic and facilitate patient communication without interfering in the dyad. The additional finding that therapists appeared to suppress their laughter in the present study may be a manifestation of this role. Furthermore, the increase in SC response in the therapist during laugh episodes even when the therapist was not laughing may reflect a suppressing of an outward expression despite an inward experience of arousal. The therapist may implicitly and empathically share or understand the experience of the patient laughing without always showing it or having their response detract from the focus of the session, *i.e.*, the needs and information conveyed by the patient. This notion of a sharing of biology during expressions of empathy or sympathy is further supported by recent neuroimaging findings (Carr et al., 2003; Decety and Chaminade, 2003; Farrow et al., 2001).

Finally, the SC difference scores for patients increased more when the therapist laughed with the patient compared with when the patient laughed alone, suggesting a validation or contagion of the shared laugh experience (Provine, 2000). This finding supports the view that laughter during conversation is highly coordinated and that shared laughter is a coconstructed activity in and of itself (Jefferson et al., 1987). This coconstruction of meaning may play a role in developing or supporting the therapeutic bond or alliance that has been shown to correlate with therapeutic outcome in psychotherapy (Martin et al., 2000). Thus, the SC data support an overall arousal effect of laughter, the concept of physiologic rapport between therapists and patients, and an amplification of the physiologic response for patients when both patients and therapists laugh together.

The present study has several limitations that can be addressed in future research. First, the study was not specifically designed to explore laughter in psychotherapy; therefore, many questions remain. For example, because the design was not gender-balanced, well-documented gender differences in laugh responses could not be examined. Moreover, because of the small study sample, the contribution of specific psychopathology or psychotropic medications to the wide variability in the frequency of laugh and SC responses could not be adequately assessed. In addition, the present study does not analyze the verbal content or affective valence during the laugh episodes. It has been noted that social laughter can have a dual-edged meaning of either alienating or bonding and a formal analysis of content would help distinguish between the two (Gardner, 1996). Finally, although the results of the present study support a function of laughter as serving to add additional communicative value to comments in psychotherapy predominantly from patient to therapist, a verbal content analysis would be needed to rule out the use of appropriate or inappropriate witticisms, joking,

and humor. Future studies that include verbal content analysis are needed to look at the type of information communicated with laughter and the longitudinal effects of laughter. These studies could examine whether the pattern of laughter between patient and therapist changes over the course of psychotherapy and is related to established process and outcome measures such as therapeutic alliance, symptom reduction, and level of social functioning.

The results of the present study support an empirically based approach to the study of laughter and the use of psychophysiology as an intersubjective and intrasubjective measure of social interaction in psychotherapy process research. The results also support the growing evidence for the communicative role of laughter most often from patient to therapist. Laughter may be a communication device for affect, and its physiologically arousing nature may partially explain the well-documented contagion effect and the present finding of physiologic amplification of the socially common phenomenon of shared laughter. Although there has been much discussion about the role of humor in psychotherapy and focus on the psychotherapist as the agent of humor, future research on laughter and humor in psychotherapy should more correctly focus on the interpersonal exchange of affective and physiologic information between patient and therapist.

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