

INVITED ESSAY

PUTTING STRESS INTO WORDS: HEALTH, LINGUISTIC, AND THERAPEUTIC IMPLICATIONS

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Summary—When individuals are asked to write or talk about personally upsetting experiences, significant improvements in physical health are found. Analyses of subjects' writing about traumas indicate that those whose health improves most tend to use a higher proportion of negative emotion words than positive emotion words. Independent of verbal emotion expression, the increasing use of insight, causal, and associated cognitive words over several days of writing is linked to health improvement. That is, the construction of a coherent story together with the expression of negative emotions work together in therapeutic writing. Evidence of these processes are also seen in specific links between word production and immediate autonomic nervous system activity. Implications for therapy and for considering the mind and body as fluid, dynamic systems are discussed.

'Then when the others had gone, each man about his business, Robin turned once more to the youth. "Now, lad," said he, "tell us thy troubles, and speak freely. A flow of words doth ever ease the heart of sorrows; it is like opening the waste weir when the mill dam is overfull. Come, sit thou here beside me and speak at thine ease."

The Merry Adventures of Robin Hood (Pyle, 1911)

It is widely acknowledged in our culture that putting upsetting experiences into words can be healthy. Research from several domains indicates that talking with friends, confiding in a therapist, praying, and even writing out one's thoughts and feelings can all be beneficial. The purpose of this paper is to explore why writing and talking about personal experiences can promote psychological and physical health. Specifically, to what degree are the words that we choose linked to our physical and psychological health?

WRITING ABOUT TRAUMATIC EXPERIENCES AND HEALTH

Since 1986, my students, colleagues, and I have been exploring the value of writing and talking about traumatic experiences. Across several studies, we and others have found that individuals who are randomly assigned to write about deeply personal topics for 3–5 consecutive days are subsequently healthier than controls who write about relatively superficial topics. Although each experiment typically has one or more variations, the typical paradigm works as follows.

Subjects, who are tested individually, are randomly assigned to write about either personal experiences (such as "the most traumatic experience of your entire life" or events surrounding coming to college or getting laid off from a job) or control topics (plans for the day, describe an object in a non-emotional way) for 15–20 min a day for 3–5 consecutive days. Once subjects enter the writing cubicles, they are told to write continuously without regard to spelling, grammar, sentence structure, etc. Although subjects are encouraged to turn in their essays, anonymity and confidentiality are assured.

As described elsewhere (e.g. Pennebaker, 1989, 1990), experimental Ss—whether college students or adults—readily disclose deeply personal and emotional topics. Further, the overwhelming number of participants report that the study is highly meaningful and valuable to them.

Across the various studies, it is evident that the writing paradigm is quite powerful in bringing about clinically meaningful effects. Pennebaker and Beall (1986) found that experimental Ss asked

to write about traumatic experiences evidence significant drops in health center visits in the six months after the study compared with various control groups. In a replication, Pennebaker, Kiecolt-Glaser and Glaser (1988) found that experimental *Ss* demonstrated enhanced immune function after the last day of writing compared to controls. As in the initial study, health center visits also dropped for the experimentals but not controls. Using this same basic paradigm, Greenberg and Stone (1992a) found a drop in physician visits for students who wrote about deeply traumatic events compared with *Ss* who either wrote about relatively mild traumas or those who wrote about superficial topics. More recently, Greenberg and Stone (1992b) found that *Ss* who were asked to write about their own traumas as well as about traumas of others subsequently visited physicians fewer times for illness than controls who wrote about control topics. Finally, using a sample of 41 university employees, Francis and Pennebaker (1992a) found that those who wrote about traumas once a week for four consecutive weeks had fewer absentee days and improved liver enzyme function in the two months after writing compared to controls.

An alternative paradigm has required *Ss* to write about more specific events. In two studies, for example, we have asked first semester college freshmen to write about their deepest thoughts and feelings about coming to college or, for controls, about superficial topics (Pennebaker, Colder & Sharp, 1990; Pennebaker, 1991). More recently Spera, Buhrfeind and Pennebaker (1993) examined a sample of 62 recently unemployed professionals to write about either their deepest thoughts and feelings about losing their jobs (experimental condition) or about their specific plans for finding a job (controls). In both of the coming to college studies, freshmen in the experimental conditions evidence improved physical health compared to controls in the 2–4 months after writing. Similarly, both studies found that writing was associated with small but consistent improvements in grade point average from their first to second semesters. In the employment study, 53% of the experimental *Ss* and only 24% of the controls had accepted full time jobs eight months after the completion of the study.

The studies that we have conducted represent only a portion of projects that have demonstrated the health benefits of disclosure. Esterling, Antoni, Kumar and Schneiderman (1990), found that students who wrote essays conveying a great deal of emotion evidenced more efficient immune function than those whose essays failed to reveal emotion. Consistent effects have also been found across several studies that have dealt with the physiological effects of various psychotherapies. Although not a specific test of disclosure, Spiegel, Bloom, Kraemer and Gottheil (1989) found that women suffering from advanced breast cancer who were randomly assigned to nonspecific group therapy lived, on average, 1.5 years longer than those in an information-only control group. Mumford, Schlesinger and Glass (1983) summarized a large number of studies examining the links between psychotherapy and medical use. Overall, when psychotherapy was introduced as part of health maintenance organizations within companies, overall medical utilization and corresponding costs dropped significantly. Most recently, Luborsky, Barber and Jones (1992) summarized an impressive number of psychotherapy outcome studies within medical settings and found that patients who received psychotherapy in addition to surgery or medical treatment fared significantly better than those who relied on the medical treatments alone.

WHY DOES WRITING PRODUCE POSITIVE HEALTH AND BEHAVIORAL EFFECTS?

When we have asked people why writing has made such a big difference to their health and psychological outlook, the answers they give us are rather nonspecific, ranging from “it made me realize who I was” to “it felt good to purge my emotions.” Beginning in 1989, we began a series of studies designed to get a better sense of why writing worked. Our first attempts at deducing why writing was beneficial were all dismal failures.

“Obvious” explanations that failed to explain the value of writing

On the surface, it would appear that writing could boost health because it might lead to healthier behaviors or lifestyles. Analyses of self-reports from several writing studies failed to confirm this explanation. After writing about traumas, people tend to continue drinking, smoking, exercising, and sleeping at rates comparable to control *Ss*. However writing may affect physical health and

psychological well-being, it is not doing so by bringing about drastic changes in health-related behaviors.

Another hypothesis is that by writing, individuals change the ways by which trauma-relevant events are represented in memory or consciousness. This may be true but the only way to test this idea is to use traditional information processing paradigms. For example, in one study, 90 freshmen wrote about coming to college or about superficial topics (Pennebaker, 1991). One week prior to writing and again one month afterwards *Ss* participated in a reaction time (RT) experiment that required them to identify college-relevant vs college-irrelevant words—together with a mind-boggling number of control conditions. Absolutely no effects emerged on the RT measures even though health and grade point average improvements were found. Similarly, *Ss* did not differ in overall accessibility of college vs noncollege words on later tasks. I suspect that the cognitive dimensions we were interested in may have existed but could not be measured with an RT paradigm. That is, most information processing paradigms appear to measure what subjects *can* do when they are challenged in the lab as opposed to what they normally do as they are walking around and thinking in their daily lives.

The third failed hypothesis was that people who got better after writing wrote about different topics than those who did not get better. Superficial content analyses of the overall topics from several studies again failed to yield any links between overall topic and any health or behavioral outcome measures.

Analyses of word usage

Closer inspection of the *Ss*' essays suggested that we may have missed some important dimensions by focusing only on the topics on which *Ss* wrote. Two people, for example, may have written about the death of a grandparent—one could be deeply emotionally and the other superficial. In one case, two students wrote about problems they were having with their roommate at college: one simply noted that her roommate was a bitch and listed all of her roommate's many faults; another person tried to analyze the conflict with her roommate in a deep, self-reflective manner. Perhaps, we reasoned, the secret was in the ways subjects used words.

To explore this idea, we returned to the original essays written in three previous studies: the immune study (Pennebaker *et al.*, 1988), the first coming to college study (Pennebaker *et al.*, 1990), and the second coming to college or RT study (Pennebaker, 1991). For each study, we focused on only those *Ss* in the experimental conditions who had been instructed to explore their deepest thoughts and feelings. For the experimental *Ss*, we computed a composite outcome measure with *z*-scores by adding the primary dependent measures together, such as immune function, drop in physician visits, increases in grades, and self-reports concerning the overall value of the study. We then selected the top and bottom third of *Ss* based on this composite outcome measure for each study. Our final sample, then, was comprised of the *Ss* from each study who tended to improve on all of the outcome measures or who were least likely to show improvement (total $N = 64$, reflecting 208 essays—immune *Ss* wrote for 4 days and college and RT *Ss* wrote for 3 days). It should be emphasized that the bottom third of *Ss* in each of these studies did not actually get sicker. Rather, they were typically indistinguishable from control *Ss* who wrote about superficial topics.

Essays were entered into the computer and corrected for spelling. Martha Francis wrote a comprehensive text analysis program, LIWC (Linguistic Inquiry and Word Counts) that allowed us to derive several word count categories (Francis & Pennebaker, 1992b). Unlike many other text analysis programs that rely on content dimensions (e.g. Gottschalk & Gleser, 1969), LIWC counts words related to emotions and cognitive processing. The primary emotion dimensions included percentage of negative emotion words (e.g. sad, hate, hurt, guilty) and positive emotion words (e.g. happy, joy, peaceful). The primary cognitive dimensions were those suggesting insight or self-reflection (e.g. realize, understand, thought, knew) and use of causal reasoning (e.g. because, why, reason). In addition to these dimensions, we also assessed general text dimensions such as number of words, percentage unique words, etc. Because individuals wrote for 3–4 days, we were able to look at their word usage in general (i.e. averaging across the 3–4 days) as well as changes in word use (i.e. difference from the first to last day of writing).

The primary findings from the LIWC analyses are quite revealing. As depicted in the top graph of Fig. 1, *Ss* whose health improved used significantly more negative emotion words and fewer

positive emotions words than those *Ss* who did not improve. This was a general effect that remained stable over the 3–4 days of writing. Indeed, looking at the changes in emotion words from the first to last day of writing in the bottom panel of Fig. 1, the only trend is that no change *Ss* tended to use more and more positive words than the improve *Ss*. Taken together, *Ss* participating in our writing tasks who evidenced the greatest improvements in physical health following the experiments were the ones who consistently expressed anxiety, sadness, and other words associated with negative feelings. Expressions of happiness and enthusiasm, on the other hand, were more likely to be seen among *Ss* who did not evidence health improvements as a function of the writing exercises.

The cognitive dimensions demonstrated a second, independent effect. As can be seen in Fig. 2, those who improved vs those who did not used virtually the same rates of insight, causal, and other self-reflective cognitive words. However, analyses of changes in these patterns revealed a very different process. Specifically, *Ss* in the improve conditions evolved in their writing from fewer to more cognitive words (see the bottom graph of Fig. 2). The no improve *Ss*, on the other hand, used the various cognitive words at consistent rates over time. These findings, then, suggest that *Ss* who benefited most from the writing paradigm, used words such as “understand,” “realize,” “because,” and “reason” at very low rates on the first day of writing compared to their high use on the last day.

Finally, analyses of non-specific text variables such as verb tense, number of words written per essay, and percentage of unique words tend to support the cognitive word findings. Overall, *Ss* who improved did not differ substantially from those who did not along most text dimensions, with the minor exception of use of future tense (improve *Ss* relied significantly less on future tense). The changes over time, however, revealed a different pattern. Most important are the changes in use of unique words. Unique words refer to the actual number of different words that a person uses in a single essay divided by the total number of words. This measure has been suggested as a crude indicant of psychological coherence. That is, a person focusing on a single topic should use more of the same words than someone whose writing is more scattered. As would be predicted by the

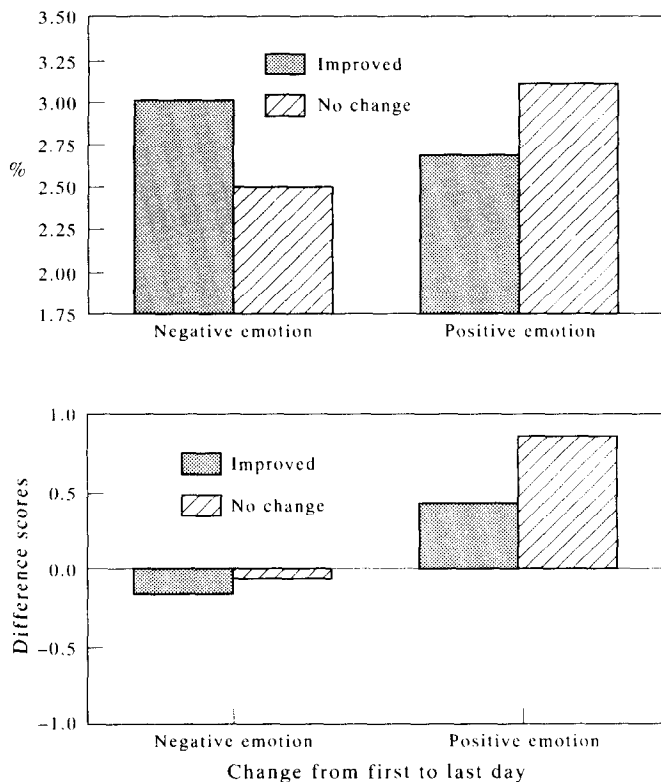


Fig. 1. LIWC emotion word counts.

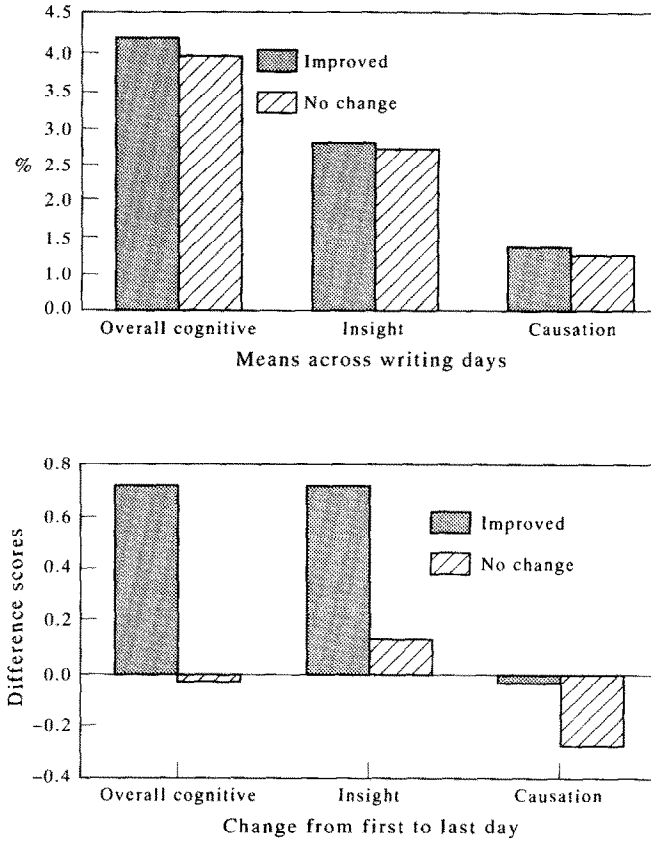


Fig. 2. LIWC cognitive word counts.

cognitive findings, improve *Ss* evidenced a significant drop in unique words over time compared to no improve *Ss*.

Judges' ratings of narrative

The results from the LIWC program are encouraging in suggesting that the disclosure of general negative emotions and the corresponding increase in cognitive dimensions help to predict who improves and who does not. One problem with LIWC is that it can only give us a very rough conception of overall coherence, organization and structure. In order to get a better sense of the quality of the stories about which *Ss* wrote, we enlisted the aid of 104 college student judges, each of whom read 6 of the 208 essays, allowing for 3 independent ratings of each essay. Each essay was rated on the degree to which it conveyed a variety of characteristics—including negative and positive emotions, self-reflection, etc. Most important is that judges also evaluated each essay on the degree to which it was organized, reflected a good story, was well-written, and evidenced signs that the writer essentially accepted the event.

Analyses of the overall levels and changes over time of the negative and positive emotions as well as insight/self-reflection dimensions came out in the same direction as the LIWC analyses (although, by and large, the effects of the judges' ratings were weaker). More interesting were the analyses of the general narrative dimensions. Although there were no differences overall in judges' ratings of organization or storiness, or even of acceptance of events between the two groups, there were striking differences in changes over time. Specifically, *Ss* who improved in health evidenced overall increases in ratings of organization and degrees of acceptance and optimism than those who failed to improve. Indeed, as depicted in Fig. 3, those who did not improve evidenced a gradual deterioration in

their stories. That is, they started their writing sessions with relatively clearly organized stories. Over the days of writing, however, no improve Ss' essays tended to deteriorate along these dimensions.

Moving to the molecular level: the CARMEN machine

The analyses of the general essays paint a picture that both the disclosure of negative emotion and the building of a clear cognitive story are important components of healthy writing. Our most recent project has been to see if we can link specific words or phrases of text to direct autonomic activity. That is, if there are longterm physical effects of using particular words in essays, are there parallel effects at the moment individuals express the words?

By way of background, several studies have recently found that specific autonomic measures are associated with the inhibition and disclosure of thoughts and emotions. Wegner and his colleagues (e.g. Wegner, 1992; Wegner, Shortt, Blake & Page, 1990) find that the experimentally-induced suppression of specific thoughts is associated with increases in skin conductance levels (SCL)—an autonomic index linked to behavioral inhibition. Levenson and his colleagues (e.g. Levenson, Carstensen, Friesen & Ekman, 1991; Gross & Levenson, 1993) have found that the suppression of emotions is also associated with increases in SCL as well as various cardiovascular changes (e.g. heart rate, pulse transit time). In our own work, we find that the general disclosure of deeply traumatic experiences is linked to drops in SCL relative to the same Ss' discussing superficial topics (Pennebaker, Hughes & O'Heeron, 1987). Interestingly, skin conductance appears to be more closely linked to talking about trauma than heart rate among Holocaust survivors (Pennebaker, Barger & Tiebout, 1989) and college students (Pennebaker *et al.*, 1987). None of these studies, however, have focused on specific verbal content and autonomic activity.

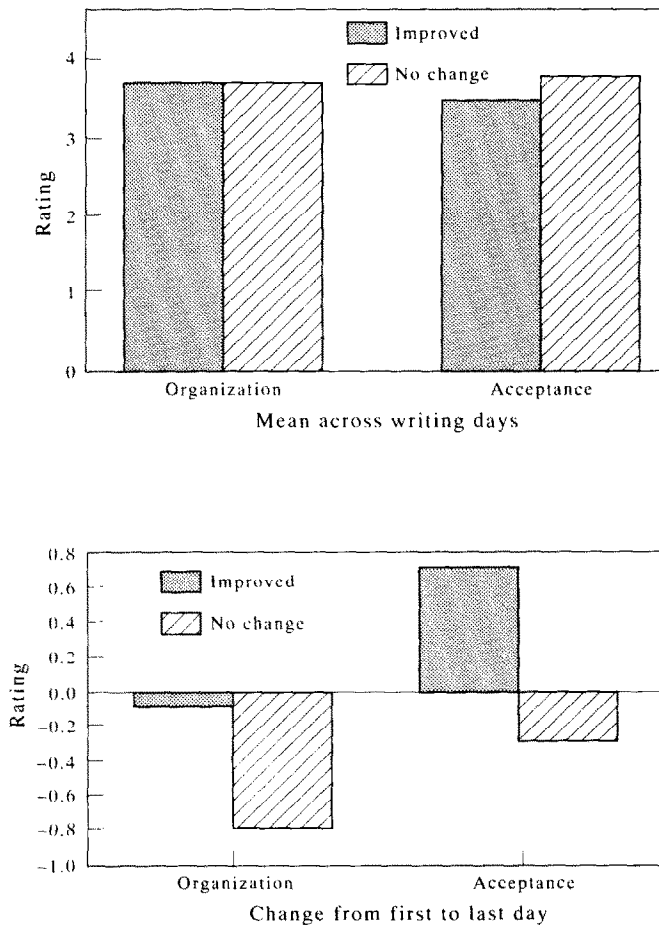


Fig. 3. Judges' ratings of writing styles.

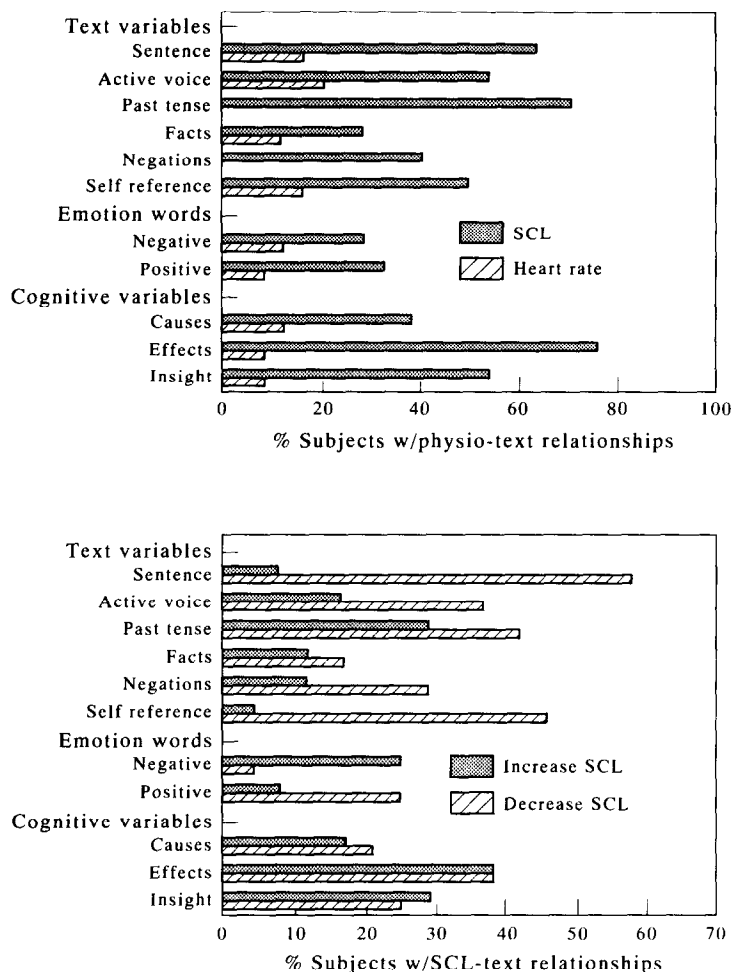


Fig. 4. CARMEN machine results.

In order to address the direct links between word usage and autonomic activity, we devised the CARMEN (Computerized Autonomic Retrieval of Morphemes and Even Neologisms) machine. This apparatus allows individuals to type their deepest thoughts and feelings on a computer keyboard and link each word to the *Ss*' concurrent autonomic levels, such as skin conductance and heart rate (Pennebaker & Uhlmann, 1993). In our studies, individuals type their thoughts and feelings for 15 min. Independent judges then rate each phrase along multiple dimensions based on both word usage (e.g. positive or negative emotion words) and clinical judgment (e.g. use of psychological defenses).

In a recent study of 24 undergraduates who were asked to write about a traumatic topic, each *Ss*' text dimensions were regressed against their skin conductance levels and heart rate (from Hughes, Uhlmann & Pennebaker, 1993). The resulting analyses yielded beta weights for each *S* that allowed us to determine the independent mathematical link between each linguistic dimension and autonomic levels. Interestingly, SCL was much more closely linked to language than was HR. Indeed, virtually all *Ss* had several significant SCL-text beta weights.

As shown in Fig. 4, the majority of the *Ss* evidenced significant relationships with SCL, including word order in the sentence, use of negative emotion and positive emotion words within phrases, causal statements, and insight statements. In general, there were large individual difference in the direction of these significant effects. As can be seen in the bottom graph of Fig. 4, the expression of negative emotions was typically associated with increased SCL and positive emotions with drops in SCL—almost as if expressing something positive was safe and briefly relaxing. Causal and insight phrases were equally powerful in provoking both increases and decreases in SCL.

The effects of the CARMEN machine analyses offer a promising parallel to the LIWC and judges' ratings. The disclosure of negative emotions tends to bring about immediate, short term arousal whereas positive emotions provoke immediate drops in SCL. Cognitive phrases are strongly linked to SCL as well but vary in direction from person to person—a finding that is not surprising given that this dimension is only related to health over time (i.e. change, not overall effect).

IMPLICATIONS AND FUTURE DIRECTIONS

The present studies are important in pointing to some of the reasons why writing or talking about upsetting experiences may be psychologically and physically beneficial. In addition, they hint that certain therapeutic techniques may be more valuable than others. Some of the theoretical and practical implications are summarized below.

The relative independence of emotions and cognitive work

Across the various studies, ratings and/or indices of negative and positive emotions were unrelated to the cognitive dimensions. Both emotional and cognitive factors independently predict improvements in health and changes in autonomic activity. Ironically, these findings suggest that many of the classic battles between catharsis or emotion-based therapies and the more recent cognitive movements are unnecessary. That is, both catharsis and insight appear to be at work, but in different ways.

Some narratives are better than others

The recent social construction (e.g. Gergen & Gergen, 1988) and narrative (Meichenbaum & Fong, 1993) explanatory models are conditionally supported in our findings. However, holding a coherent narrative to explain a traumatic or upsetting experience may not always be healthy at the beginning of therapeutic writing sessions. Movement towards the development of a narrative is far more predictive of health than having a coherent story *per se*. The construction of a story rather than having a constructed story, then, may be the desired endpoint of writing and, by extension, some therapy.

No pain, no gain

Short term autonomic activity appears to predict longterm health improvement. That is, openly expressing negative emotions results in increases in SCL whereas the expression of positive emotions is linked to a letting-go or form of relaxation. In the short run, confronting upsetting experiences may be psychologically painful and physiologically arousing. In the long run, however, the act of psychologically confronting emotionally upsetting events is associated with improved physical and psychological health.

The ability to guide one's own therapeutic writing

Many, perhaps most people are able to guide their own therapy. Writing itself is a powerful therapeutic technique. Without instructions or feedback, Ss in our studies naturally evolve common writing styles that promote physical and psychological health. Of interest is that we may be able to train people to write in certain ways in order to boost the effectiveness of writing. In a recent pilot study, 14 students were asked to write about their deepest thoughts and feelings each day for two weeks. On two days, students were given a list of word categories (negative emotions, insight words, causation words) that they should actively attempt to use in their writing. Although the students noted that their writings were least personal on those days (and also were most difficult to do), they also noted that those writing days were the most valuable and meaningful for them.

The mind and body as fluid, dynamic systems

The body expresses itself linguistically and biologically at the same time. In discussions with voice and movement coaches in the theater, it is clear that people can talk and/or stand in either natural or unnatural ways. When people portray characters that are pompous or arrogant, there are corresponding affectations in language structure, voice tenor, posture, and, I suspect, autonomic and endocrine activity.

In Shakespeare's tragedy, *King Lear*, we see a fascinating evolution in the main character. Initially, the King is loud, boastful and arrogant. In demanding that his daughters proclaim their love for him so that he can decide who should receive the greatest inheritance, he uses complex words and phrases:

'Tell me, my daughters, since now we will divest us both of rule, interest of territory, cares of state, which of you shall we say doth love us most? That we our largest bounty may extend where nature doth with merit challenge.' (I.i, 48–54)

Contrast his use of language in the first act with that later in the play when he learns that two of his manipulative daughters—who initially professed their love to him—have taken all his possessions. It is at this point that he realizes his one honest daughter whom he disowned, Cordelia, is trying to help him. Note the simpler and more personal word use and sentence construction that Lear displays when first seeing the crying Cordelia:

'Be your tears wet? Yes, faith. I pray weep not. If you have poison for me, I will drink it. I know you do not love me, for your sisters have, as I do remember, done me wrong. You have some cause, they have not.' (IV.vii, 71–74)

According to voice coach Patsy Rodenburg (1992), actors typically speak Lear's lines in the first act with a bold and yet affected voice. Lear's entire bearing is rigid and constrained. As his character evolves, his tone of voice becomes more natural, his body movements more fluid. The case of King Lear illustrates both the linguistic and paralinguistic dynamics that we can see when individuals attempt to express themselves. When people hold back their emotions or attempt to present a false impression, it can often be detected in their choice of words as well as in their physiological activity. Shakespeare implicitly knew this. And now, after hundreds of hours of research, we know it as well.

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