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Chapter 3

LANGUAGE, EMOTION, AND HEALTH: A SEMIOTIC PERSPECTIVE ON THE WRITING CURE

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ABSTRACT

The writing cure, otherwise known as expressive writing, is widely accepted as an effective intervention. Hundreds of studies have shown that writing about one's thoughts and feelings for 3 days, with at least 15 minutes a day, has beneficial effects on physical and mental health. Yet, after more than two decades of research, there remains a large gap between evidence and explanation for the phenomenon. The problem, we suggest, lies in the general neglect to gain a deeper understanding of the basic building blocks of the writing cure, namely language. This vacuum can be filled by Peircean semiotics. Peirce's triadic circuitry of the sign is explicated and applied to the development of a taxonomy of expressions of self and emotions. This taxonomy has been implemented by a pattern matching language analysis program, SSWC (Sundararajan-Schubert Word Count) to test our theory-based predictions of the health consequences of language use. Two empirical studies of the writing cure that utilized SSWC for textual analysis are presented as demonstration of the heuristic value of applied semiotics.

The writing cure has had an impressive track record since its first introduction by Pennebaker (Pennebaker, 1985; Pennebaker and Beall, 1986) in the eighties. For the past two decades, hundreds of studies have shown that writing about one's thoughts and feelings has beneficial effects on physical and mental health (Frattaroli, 2006). But why? What is it about language that its utilization for emotion expression has consequences for health? This question has never been addressed by the extant theories of the writing cure (e.g., Bootzin, 1997; King, 2002; Pennebaker, Mayne, and Francis, 1997). An explanation that seems to have the most empirical support (Frattaroli, 2006) is emotion exposure theory (Sloan and Marx, 2004), which by considering language use as an

instance of exposure therapy tells us more about the latter than language per se. Another widely accepted explanation is narrative structure (Smyth, True, and Souto, 2001), which claims that verbal expression facilitates the transformation of experiences and memories into a structured “story” (Pennebaker and Seagal, 1999). But Graybeal, Sexton, and Pennebaker (2002) found no correlation between narrativity and health benefits. The use of different types of words has also been investigated (Campbell and Pennebaker, 2003). The finding is that the use of emotion words was not consistently correlated with self-reported emotionality, and that “style words”—such as function words and pronouns—were more relevant to health status. Not based on any linguistic theory, such ad hoc distinctions of language use seem arbitrary, albeit empirically supported. To date, expressive writing remains a black box, in the words of Laura King: “First, expressive writing has health benefits. Second, no one really knows why” (King, 2002, p. 119). The problem, we suggest, lies in the general neglect to gain a deeper understanding of the basic building blocks of the writing cure, namely language. This vacuum can be filled by Peircean semiotics.

The exposition of Peircean semiotic consists of five sections. The introduction sets the stage by casting the language and health equation in the context of Shannon’s ideal code, which is informationally the most complex and energetically the least costly. Peirce’s triadic circuitry of the sign is subsequently introduced as an algorithm of complexity that extends Shannon’s information theory. Next, we introduce a language analysis program, SSWC (Sundararajan-Schubert Word Count), which implements a proposed taxonomy, derived from Peircean semiotics, of different types of language use with varying degrees of complexity. The penultimate section presents two empirical studies that showed how language analysis by means of SSWC can shed some light on the language and health connection across different conditions. The conclusion discusses the potential contributions of Peircean semiotics to theory and research on the writing cure.

INTRODUCTION

Consistent with Heidegger’s dictum that “Man lives in language, as language” (cited in Ott, 1972, p. 169), Charles Sanders Peirce claims that the sign user and the sign have coalesced at a deeper level: “the word or sign which man uses *is* the man himself Thus my language is the sum total of myself” (Peirce, 1931-58, Vol.5, paragraph 314, emphasis in the original). It is this semiotic perspective that provides solid theoretical grounding for the language and health equation, rendering efficiency of the sign and health status intimately related. In the following investigation, we are guided by three insights that may be derived from Peircean semiotics: a. language is a sign, in the present context, a representation of emotion information; b. the quality of the sign matters for the sign user, in the present context, the quality of emotion representation has health consequences. Lastly, the quality of emotion representation can be modeled by the triadic circuitry of the sign.

The quality of the sign is a central concern of Charles Peirce (Sundararajan, 2008, Colapietro, 1989), but he did not spell out clearly the ramifications of this for the language and health equation. To investigate this question, we may situate the language and health connection in a larger context—the relationship between information and energy. The intimate connection between information and energy is suggested by Metcalfe and Mischel (1999), who have postulated two systems of emotion—“a cool, cognitive ‘know’ system and a hot, emotional ‘go’ system” (p. 3)—corresponding to information and arousal, which,

according to both Berlyne (1960) and Estes (1972), constitute two essential functions of any stimulus. Metcalfe and Mischel (1999) claim that the cool system is “complex”, whereas the hot system is “simple” (p. 4). This point can be further elaborated by the inverse relationship between information and energy.

Energy is governed by the law of conservation, whereas information is concerned with successful transmission, which requires complexity, in terms of order and organization, to be successful. The inverse relationship between the two has been suggested by a number of writers. According to Shannon (Campbell, 1982), information with a high degree of order and organization renders energy useful or efficient, analogous to the cool system of Metcalfe and Mischel (1999), whereas entropy (disordered information) renders energy costly analogous to heat or the hot system of Metcalfe and Mischel (1999). David Bohm (1994) envisions a progression toward the optimal display of meaning in a representation that is informationally the most complex (satisfying the condition for transmission) and energetically the least costly (satisfying the principle of conservation). Consistent with the finding that psychophysiological arousal was associated with language disturbance as measured by reference errors (Burbridge, Larsen, and Barch, 2005), Metcalfe and Mischel (1999) claim that there is a compensatory and curvilinear relationship between level of activation/arousal and the degree to which complex, integrated behavior is possible. Extending this hypothesis, Labouvie-Vief and Marquez (2004) propose that dysregulated strong emotional activation results in “degradation” of complex representations (see also Labouvie-Vief, 2003). The causal chain can go either way: Higher degree of order or complexity in representation may either contribute to or result from regulated activation of emotion. Conversely, loss of complexity in representation may either contribute to or result from dysregulated activation. For instance, Zinken, Sundararajan, Butler and Skinner (2006, August) found a positive correlation between anxiety/depression and degradation of syntax in the writings of the clinical population.

Cast in the information and energy framework, the language and health connection becomes a testable equation: language representations that are informationally complex can be expected to be associated with the energy efficient cool system, whereas loss of complexity in language representation, the energy costly hot system. To test this hypothesis, we need to be able to measure the degree of complexity in language representations.

Complexity in language representation can be understood in terms of Shannon’s ideal code (Campbell, 1982), which consists of an optimal blend of two opposite tendencies of information--variety and accuracy—resulting in the notion of redundancy as reliable variety. But Shannon’s ideal code lacks specificity. For an algorithm of complexity that maps out explicitly the dynamisms involved, we turn to the semiotic notion of the sign, according to Charles Peirce.

PEIRCEAN SEMIOTICS

What is a sign? “A sign is an object which stands for another to some mind,” says Peirce (cited in Fisch, 1982, Vol. 3, p. 66). Central to Peircean semiotics is the claim that a representation is always representation to a mind, which generates interpretations referred to as “interpretant.”

Thus a sign consists of three elements: object, the sign proper, and interpretant. The interaction among these terms constitutes sign relation, which is a complex structure known as the triadic circuitry of the sign.

The Triadic Circuitry of the Sign

A triadic circuitry is implied in the following definition of the sign as “Anything which determines something else (its interpretant) to refer to an object to which itself refers (its object) in the same way, the interpretant becoming in turn a sign, and so on ad infinitum” (Peirce in Hoopes, 1991, p. 239). This can be illustrated by the sunflower.

A sunflower is not a real sign, but a proto-sign or representamen: “If a sunflower, in turning towards the sun [*object*], becomes by that very act fully capable . . . of reproducing a sunflower [*interpretant*] which turns in precisely corresponding ways toward the sun, and of doing so with the same reproductive power, the sunflower would become a Representamen [proto-sign] of the sun” (Peirce, 1961, 1: 274). This formulation seems to have anticipated what we know of DNA today. But the function of DNA is only a proto-sign. To be a full fledged sign, the interpretant has to be a mental, rather than a biological process. Nevertheless, the sunflower scenario has summed up the basic triadic structure of the sign, in which the relation between interpretant and object is an equivalent translation of the original sign-object relation. The Peircean notion of equivalent representation (Parmentier, 1994) is compatible with Shannon’s notion of redundancy as reliable (equivalent) variety (translations). But reliable variety in information or equivalent representation in signs is an achievement, not a given as is the case with DNA, because it is a process that entails a dynamic integration of opposites.

The notion of integration in representation (Bucci, 1995; Teasdale and Barnard, 1993), and health (Krystal, 1988) has had a long tradition in psychology. The unique contribution of Charles Peirce (Hoopes, 1991) lies in making it clear that integration is a far more dynamic process than simply the combination of opposites. Integration is best understood in terms of complexity, which in dynamical systems theory is characterized by bipolar feedback (Sabelli, 2005). According to Sabelli (2005), a bipolar (both positive and negative) feedback which generates information is characterized by coexistence or alternation of synergy and antagonism.

The bipolar feedback in signs may be understood in terms of that between two opposite tendencies of information—accuracy and variety. This interplay of accuracy and variety is manifest in Peirce’s claim that the semiotic process involves “two infinite series, the one back toward the object, the other forward toward the interpretant” (Peirce cited in Parmentier, 1994, p. 10). Parmentier (1994) explains:

. . . the sign relation is constituted by the interlocking of a vector of representation pointing from the sign and interpretant toward the object and a vector of determination pointing from the object toward both sign and interpretant. (p. 25)

These two movements of the sign—one feeding forward generating an infinite series of interpretants; the other feeding backward pointing toward the object—can be graphically illustrated:

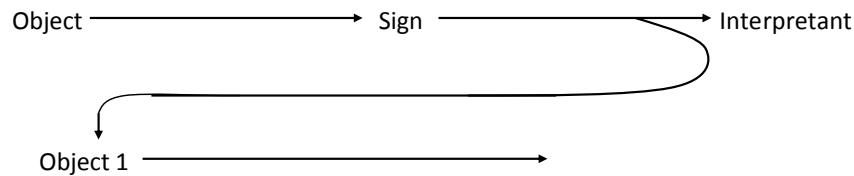
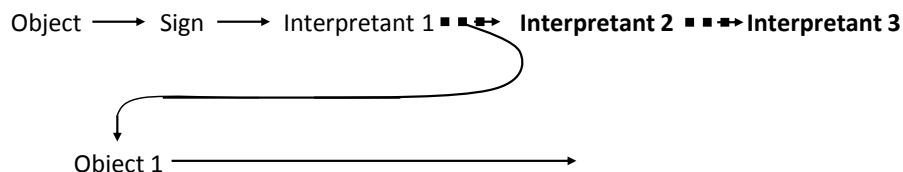


Figure 1a. The triadic circuitry of the sign.

In the feeding forward movement, the sign gives rise to the interpretant, which in turn acts like a sign to influence the next interpretant, ad infinitum. The feeding back loop is referred to by Wiley (1994) as a “reflexive undertow” (p. 27), which is manifest in the reentrant loops from the interpretant to the sign and the object. Corresponding to these two movements are two important functions of the sign: effector and sensor.

The effector function of the sign serves the purpose of variety by generating a potentially endless series of interpretations. By contrast, the sensor function of the sign monitors the accuracy of representation. This is done by the reflexive feedback loop that makes sure that the relation between interpretant and object is an equivalent translation of the original sign-object relation. These two movements of the sign that serve the two fundamental requirements of information--variety and accuracy—are hierarchically structured: The feeding forward movement is “upshifting”; the reflexive loop is “downshifting” (Lee, 1997, pp. 131-132).

The upshifting movement to a symbolic level is experience distant, as the interpretant is one step removed from the object—a price it pays to capitalize on the generation of variety through interpretations. The downshifting movement is experience near, as it privileges fidelity to experience at the risk of rigidity or frugality in cognitive elaborations. Optimal sign function requires proper coordination or integration of these opposing tendencies. But integration may fail. For instance, the upshifting movement of interpretation may generate an increasingly experience distant interpretants, when the process becomes de-coupled from the reflexive movement back to experience. This is illustrated in the default processing of Figure 1b.



Note. In bold: default processing.

Figure 1b. Lack of integration in default information processing.

Cognate Ideas in Psychology

Complexity as modeled by the triadic circuitry of the sign is consistent with Don Tucker’s (2007) core to shell formulation of the neural structure, which is summed up succinctly by Johnson (2007):

The limbic core, with its dense interconnections and emotional valences, would present us with a holistic, feeling-rich, emotionally nuanced grasp of a situation. The more modular and highly differentiated sensory and motor regions of the shell (cortical) structure would permit the discrimination and differentiation that we call conceptualization. (pp. 100-101).

The integration between the subsymbolic limbic core and the symbolic-cortical systems is referred to by Tucker (2007) as a “vertical integration” which is defined as a “recursive processing” (p. 223) that consists of movements in two opposite directions: limbifugal and limbipetal.

Limbifugal movement refers to Core to Shell connection: This is the feedforward movement toward increasing differentiation into specific and concrete forms.

Limbipetal movement refers to Shell to Core connection: This is the feedback, reentrant loop toward integration and self-modification.

Together, limbifugal and limbipetal movements constitute one cycle of the recursive processing referred to as vertical integration: The result of neural network patterns traversing in both directions is the emergence of meaning. The connection between the two systems is not necessarily smooth and automatic. As Tucker (2007) points out, the relationship between the two systems is dialectical (as is characteristic of bipolar feedback):

The consolidation process across the linked networks from shell to core is dialectical in that an inherent opposition of structural forms—fused versus separated—exists between the core and shell. . . . Each wave in the cycle of abstraction traverses this conflict in some way. In those rare optimal instances of the human mind, the dialectic is extended, recursive, and progressive. (pp. 224-225)

The notion of vertical integration is consistent with the hierarchical, staged model of memory (Conway and Pleydell-Pearce, 2000), which suggests that a retrieval strategy of “moving across rather than down the memory hierarchy” (Williams, Barnhofer, Crane, Hermans, Raes, Watkins, and Dalgleish, 2007, p. 136) constitutes failure in integration, as is illustrated in the default functioning in Figure 1b. A case in point is the truncated search of overgeneral retrieval of autobiographical memory that individuals suffering from depression, PTSD, or related disorders are found to be especially prone to. These individuals tend to capitalize on categorical memories (Birthdays make me happy) at the expense of event specific details (contextual details of a particular birthday). Cast in the framework of the triadic circuitry of the sign, the truncated search strategy of these individuals is a case of the lack of integration between the two movements of the sign: the experience-distant symbolic mode characteristic of the interpretant is running on overdrive, un-constrained by the reflexive undertow (Wiley, 1994) back to experience.

Theory Based Predictions on Language and Health

To recapitulate, the triadic circuitry of the sign consists of a bipolar feedback (Sabelli, 2005), characterized by mutual synergy and antagonism, between two opposite movements of the sign--generation of variety through symbolic, experience distant interpretation, on the one

hand; and monitoring of accuracy through the reflexive undertow (Wiley, 1994) back to experience, on the other. The result of this dynamic integration of two opposite movements is a fully developed sign, which according to Peirce consists of three modes of representation—icon, symbol, and index--each contributing uniquely to the overall efficiency of the sign (Deacon,1997). The icon embodies a relationship of contiguity between the representation and its object to ensure fidelity in representation; the symbol is one step removed from the object of representation to facilitate further elaboration through interpretations; and the index is a reference loop that counterbalances the abstract tendency of the symbol by calling attention to the object of representation. Equipped with these three modes of representation, a fully developed sign is therefore capable of integrating its multiple functions of representation--the concrete expression of experience (a function of the icon), understanding through elaboration and interpretation (a function of the symbol), and validation of subjective experience (the indexical function that calls attention to the object of representation).

Consistent with this model of representation is Clore and colleagues' (Clore, Ortony, and Foss,1987) structural definition of *bona fide* emotion concepts in terms of three referential foci—internal, mental, and affective: “the best examples of emotion words would be ones that refer to internal (as opposed to external) conditions, those that refer to mental (as opposed to physical) conditions, and those that have a significant focus on affect” (p. 752). The affective expression is iconic; the mental representation is symbolic; the internal focus is reflexive. Integration of these multiple referential foci in *bona fide* emotion concepts approximates a fully developed sign, according to Peirce, or the ideal code, according to Shannon, or to give the screw another turn, what is referred to by Pennebaker (1989) as high level thinking. However, as indicated by the foregoing analysis, optimal representations are an achievement rather than a given.

Since optimal representation of experience is dialectic at its very core, it requires the integration of two antithetical types of language use--one experience near (A), the other experience distant (B). The mutual constraint, characteristic of bipolar feedback, of A and B results in proper distance from experience (Scheff, 1979), which consists of the following types of language use:

- A. attention to affect;
- B. facilitative mental distance from experience.

Less than optimal representations of self and emotions are hypothesized to be symptomatic of a lack of integration of the two movements of the sign, with each going to extreme due to lack of mutual restraint, resulting in:

- C. under-distance from experience;
- D. over-distance from experience.

Based on the foregoing analysis of the inverse relationship between complexity in information and energy cost, the shifting balance between cool and hot systems in different types of language use is predicted to be as follows: Informationally complex, optimal representations of self and emotions (A and B) are predicted to be dominated by the cool system; loss of complexity in less than optimal representations of self and emotions (C and D)

is associated with activation of the hot system. We hypothesize that when the cool system is in dominance, the hot system is neutralized, resulting in the following effects:

- a) Health benefits.
- b) Information for free: An efficient sign is one that processes information at minimum energy cost. With complete neutralization of the hot system, emotion can be processed as simply information, with minimum arousal. This hypothesized low energy cost of the cool system is consistent with Damasio's (1999) notion of feelings as involving the "as if body loop," which bypasses the body proper, partially or entirely, a mechanism that "saves both time and energy" (p. 281).

By contrast, the hot system is hypothesized to have varying degrees of health costs, depending on its regulation by the cool system:

- a) Partially neutralized activation: The hot system is neutralized to some extent by the cool system, resulting in a reduction of activation.
- b) Regulated activation: Activation is evident, but with benefit outweighing the cost. This hypothesis is consistent with the notion of integration of hot and cool systems according to Metcalfe and Mischel (1999), who claim that the former can be harnessed in the service of the latter, for instance regulated activation of the hot system may boost working memory.
- c) Dysregulated activation: When the hot system dominates and the cool system is inhibited, resulting in health cost.

SSWC: TOWARD A TAXONOMY OF SELF AND EMOTIONS

Based on the above formulation of the sign, a taxonomy of verbal expressions of self and emotions has been implemented by a pattern matching language analysis program, SSWC (Sundararajan-Schubert Word Count)(for a study of construct and external validity, see Sundararajan and Schubert, 2005). This program consists of fifteen categories of verbal expressions of self and emotions. The reason why representations of the self are included in our taxonomy of affective lexicon is because any emotion expression invariably involves the self (Lambie and Marcell, 2002).

We further propose that representations of the self are not confined to the first person pronoun "I" but extend to pronouns in general (it, they, you, and so on). This assumption is supported by the neuroimaging results which showed that self-relatedness evaluation involves a wide neural network, which relates any represented object to the representing subject (Legrand and Ruby, 2009).

For categorization of affective lexicon, we have consulted Lane (1991), and Clore, et al. (1987). The fifteen categories of self and emotions are grouped into the above mentioned four types of language use:

Optimal Representation of Emotion

Categories of language use that constitute optimal representation are expected to be under the sway of the cool system.

A. Attention to Affect

The following categories of expressions show an integration of three foci of reference in representation: mental, internal, and affective.

Affect Focal (happy/sad): These are the *bona fide* emotion terms. Dictionary for this category is based primarily on the affect-focal terms of Clore et al. (1987).

Valence focus (miserable/pleasant): This category indexes the valence dimension of emotions. Dictionary for this category consists of the word list of pleasant and unpleasant affect in Barrett and Russell (1998). Also included are word lists with highest scores on the Depth and Evaluation dimensions in Averill (1975, p. 17).

B. Facilitative Mental Distance from Experience

The basic premise of the Peircean semiotics is that the relationship between any two terms is always mediated by a third term. The inclusion of the third term--the other-- is what creates a mental distance from experience, which is necessary for the proper regulation of emotions. An element of the other is present in all of the following categories:

Detached Self (someone, they): This category is an index of the third person perspective, which reflects a detached intentional stance toward personal experiences.

Reflexive Self (ourselves, itself): The reflexive self has a triadic structure of self-other-self, which is a self to self recursiveness looping through the other. This triadic self-other-self recursivity entails the integration of two lower dimensional structures of self representation: self as identity ("I" and "me") and self as other ("they").

This category consists of two types of expressions: One is expressions of self-referentiality such as "itself." "Myself" however is excluded from this category, because representation of the self in this category is not an atomic self (an "I"), so much as an extended self that includes the other, a "we" (Wiley, 1994). The category of *Reflexive Self*, therefore, includes expressions--such as "our own," or "each other"--that evince a looping of the self through the other, resulting in an extended self.

External Attribution (sexy, wonderful): This category is based primarily on terms referred to by Clore et al. (1987) as "external conditions." The referential focus of these words is on the external attributions of the emotional states, a mode of processing which is hypothesized to constitute a facilitative mental distance that reduces the intensity of affect.

Less Than Optimal Representation of Emotion

Categories of language use that constitute less than optimal representation are expected to be under the sway of the hot system.

C. Under-Distance from Experience

This refers to a state of immersion in experience (Lambie and Marcel, 2002), resulting in representations that are deficient in mental reflection (Frijda, 2007).

Affected Self (me, “making me . . .”): This category indexes the perception of the self not as doer, but as being done to. This passive self is enmeshed in the experience, lacking the mental distance for reflection.

Somatic (headache): The dictionary for this category is based primarily on the word list of “physical and bodily states” in Clore et al. (1987). Words under this category are instances where the referential focus is primarily on the physical rather than mental or psychological conditions. Such representations are what Peirce refers to as indices. “An index is a sign which would, at once, lose the character which makes it a sign if its Object were removed, but would not lose that character if there were no Interpretant” (Peirce cited in Hoopes, 1991, p. 239). Peirce gives the example of the bullet-hole as a sign of a gun shot to show that indices have direct physical connections to the signified, a connection independent of an Interpretant: “for without the shot there would have been no hole; but there is a hole there, whether anybody has the sense to attribute it to a shot or not” (Peirce cited in Hoopes, 1991, p. 240). By the same token, the assumption behind somatic complaints such as “hungry” is that they are indications of some physiological change, a condition that “truly” exists, regardless of whether it is recognized/interpreted as such or not. From the Peircean perspective, this alleged independence from the Interpretant explains why words denoting somatic concerns are usually deficient in their impetus for symbolic elaborations.

Violent Words (kill, rape, swear words): This category is composed of words of violent action and obscenities, which may be considered verbally acting out behaviors. This type of language use is deficient in mental reflection.

Emotion as action (love/hate, used as verb): Dictionary for this category consists of twenty-one “noncausative verbs” (such as love, hate, used as verb, in active, not passive, voice) from Clore et al. (1987, pp. 763-765). When emotion is represented as action, self reflexivity is missing. Peirce has noted that when a child wants to move a table, he is likely to be so absorbed in what he wills as to be oblivious to himself: “Does he think of himself as desiring, or only of the table as fit to be moved?” (1931-58, Vol. 5, paragraph 230). The same applies to expression of emotion as action. For instance, in “I hate him,” the emoter is not self-reflexive, as his or her attention is absorbed by the qualities of the person as “fit” to be hated, no less than a table as “fit to be moved.” Frijda (2005) makes a similar observation concerning infatuation as an instance of the first-order experience, where one is enthralled by a person’s attractiveness, and considers “I love her” as an objective fact. Frijda goes on to say that in the immersed consciousness of the first-order experience, no subjectivity, no reference to the self is involved.

Suffering (devastated, traumatized): This category consists of verbs in passive voice--words that designate the extreme pole of the victim stance, which suggests a lack of psychological distance from the experience.

High Activation (excited, nervous): Words in this category are hypothesized to be indications of direct activation, unmitigated by any mental distance from experience. Dictionary for this category is based primarily on the word list of activated affect in Barrett and Russell (1998).

D. Over-Distance from Experience

Over-distance is defined as a defensive mental distance that compromises the fidelity of emotion representations by limiting the access to or the scope of experience. It may be part and parcel of the evaluative emotional processing, which has been found to be associated with reactivity (Low, Stanton, and Bower, 2008).

Focal Self (I, myself, my own): The linguistic use of “I” is indicative of focal attention to the self system, which is referred to by Kihlstrom, et al. as “an organized knowledge structure that stores what one knows about oneself. This would include semantic knowledge about one’s physical and personality attributes, social status, and the like” (Kihlstrom, Mulvaney, Tobias, and Tobis, 2000, P. 67, note 1). Antithetical to the experiencing self, this representation of the self is hypothesized to entail direct access to semantic memory (Forgas, 2001), which detracts resources from online processing of emotional information.

Denial (“doesn’t bother me”): This category is composed of expressions that indicate a distancing strategy that minimizes or represses the emotional impact of the experience.

Affect Non-Focal (cry, understanding): Dictionary for this category is based primarily on the affect non-focal terms in Clore et al. (1987). It consists of representations in which the referential focus has shifted from affectivity to cognitive and behavioral components of the experience. Also included in this category are clichés, such as “depressed” (Lane, 1991). It is hypothesized that a preponderance of *Affect Non-Focal* terms are the result of heuristic information search strategies and motivated processing as an attempt to control and limit the scope and impact of one’s affective experience (Forgas, 2001). This hypothesis finds supportive evidence in one study (Sundararajan and Schubert, 2005), in which factor analysis revealed high loading of *Affect Non-Focal* terms on a factor called Emotional Management.

Low Activation (bored, drowsy): Dictionary for this category is based primarily on the word list of deactivated state in Barrett and Russell (1998). High frequency use of this type of expressions could be an indication of apathy or withdrawal as a result of the cool system coming de-coupled from the hot system, according to Metcalfe and Mischel (1999).

All the above categories are presented in terms of percentage, out of the total word count, of words that fall into a specific category. In addition, SSWC computes three global categories:

Word Count: The raw score that serves as an index of the length of the text.

Core Affect: The percentage, out of word count, of the sum total of words that fall into the following categories: *Valence Focus*, *High Activation*, and *Low Activation*.

Expressions of Self and Emotions (E): The percentage of the sum total of words used in all the SSWC categories minus Core Affect. Here we are following the advice of Russell (2003) to treat E and Core Affect separately.

EMPIRICAL STUDIES

To test this semiotic model of language and health, we re-analyzed two empirical studies of the writing cure. According to Metcalfe and Mischel (1999), the balance between the cool and hot systems is determined by stress and developmental phase, in addition to the individual’s self-regulatory dynamics. The first study which used provoked stress to measure

reactivity can shed some light on the shifting balance between the two systems in the expressive writing of adults. The second study which consisted of children's writing addresses the developmental implications for our proposed model of language and health.

Group difference has been the main focus in studies of the writing cure, but this approach masks the individual differences in language use, as Fivush, Marin, Crawford, Reynolds, and Brewin (2007) point out rightly. To go beyond this well beaten path, we selected for our analysis two studies which had null results in terms of group differences—both control and expressive writing groups improved at follow up. The null results help to cast the issue of language and health into one urgent and sharply focused question: What good does expressive writing do? As Fivush, et al. (2007) took the individual differences approach to follow up on this question (see Study 2 below), we go one step further by situating the question of language use in the context of the information and energy trade off. From this perspective, the instruction set of expressive writing that urges the participants to write about their deepest thoughts and feelings can be expected to promote complexity in information, or in Pennebaker's (1989) term, high level thinking, and thereby enhance the cool system of emotion. This hypothesis is put to test in the following two studies.

Study 1

Study 1 is a reanalysis of an unpublished study (Graybeal, 2004, Study 2), which recruited 86 college undergraduates whose parents were divorced and who were randomly assigned to a control or experimental group ($n=43$ each). The former was instructed to write--on two occasions, 30 minutes each--about time management; the latter, their deepest thoughts and feeling about their parents' divorce. Participants were also interviewed about the most upsetting aspects of their parents' divorce, both before and after writing, in order to assess their reactivity to provoked stress. The hypothesis was that the Expressive Writing group, relative to the controls, would show decreased reactivity to stress at the final interview, one month post writing. This was not supported empirically. Results showed that both groups improved after the writing exercise--they were less distressed, improved their mean performance on the working memory task, and exhibited fewer psychological symptoms. To shed some light on this conundrum, we used SSWC to re-analyze the data.

Outcome Measures

To measure the participants' reactivity to provoked stress, a comprehensive battery of tests were used in the original study, including measures of physiological arousal (such as heart rate, skin conductance, and blood oxygen level), self reports of emotional upset (such as questionnaires and mood scales), measures of physical and psychological health (self reports of illness, and symptom checklist), and measure of cognition (working memory tests). From this battery of tests, the following measures were selected because of their robustness (Graybeal, 2004):

max HRd (maximum level of heart rate difference from the baseline),

restact (Degrees to which activities been restricted due to illness in last 2 weeks),
 SUDSpk (Subjective Units of Distress, peak score),
 sick2m (frequency of being sick for last 2 months),
 WM (working memory).

All these measures were taken during or at the end of the interviews, pre- and post-writing.

Besides the above measures used in the original study, we added physician's visits from Health Center data, which are coded as follows:

Dr2m (frequency of health center visits within 2 months post writing).

Dr12m (frequency of health center visits post writing, two months to a year).

RESULTS

Over View

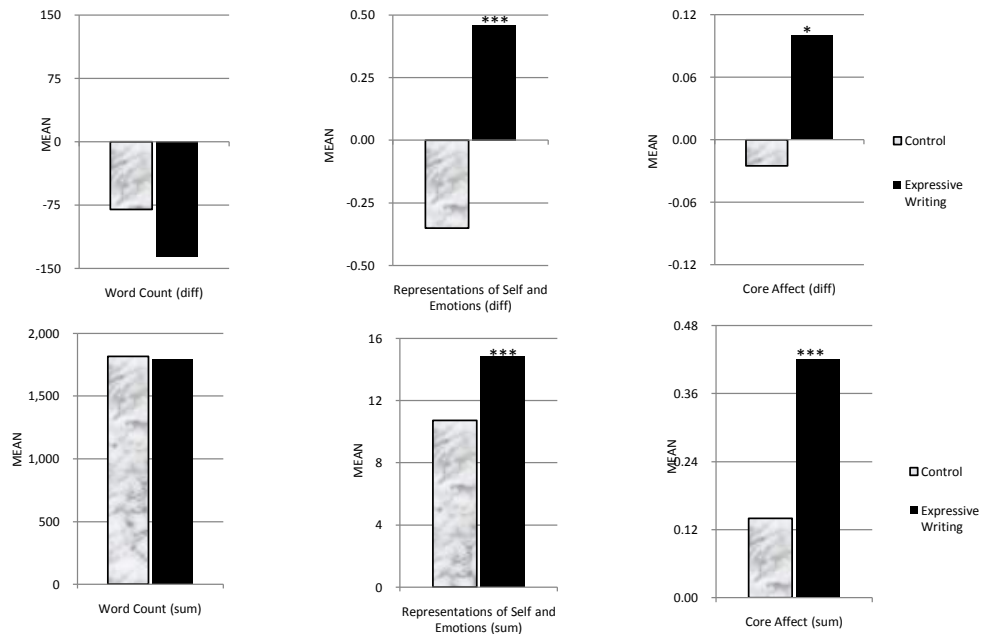
Language use: As shown in Figure 2, the two groups wrote very differently, as measured by the SSWC variables.

Word Count: No significant difference was found between the two groups, neither in terms of the sum total of words produced across the writing days (Figure 3, lower left panel), nor in terms of any significant correlation between length of text and outcome measures (Figure 4a). Furthermore, judging by the difference score of word count between the writing days, both groups wrote less on the second day of writing (Figure 3, upper left panel).

<i>SSWC Variables (with tokens)</i>	<i>Expressive Writing group</i>	<i>Control group</i>	<i>Significance</i>
	<i>Mean (SD)</i>	<i>Mean (SD)</i>	
<i>Attention to Affect</i>			
Affect Focal (happy/sad)	1.33 (0.45)	0.33 (0.24)	***
Valence Focus (miserable)	0.30 (0.18)	0.03 (0.05)	***
<i>Facilitative Distance from Experience</i>			
Reflexive Self (ourselves)	0.47 (0.19)	0.19 (0.20)	***
Detached Self (someone)	1.70 (0.80)	0.44 (0.30)	***
External Attribution (sexy)	1.22 (0.43)	0.60 (0.30)	***
<i>Under Distance from Experience</i>			
Affected Self (me)	2.49 (0.82)	1.33 (0.64)	***
Violent Words (swear)	0.07 (0.08)	0.01 (0.04)	***
Somatic (headache)	0.02 (0.05)	0.14 (0.11)	***
Suffering (traumatized)	0.02 (0.03)	0.00 (0.01)	In
Emotion as Action (love/hate, used as verb)	0.46 (0.26)	0.14 (0.16)	***
High Activation (excited)	0.09 (0.09)	0.06 (0.18)	*
<i>Over Distance from Experience</i>			
Focal Self (I, myself, my own)	6.29 (1.03)	7.18 (1.30)	***
Affect Non-Focal (cry, understand)	0.72 (0.33)	0.36 (0.22)	***
Denial ("doesn't bother me")	0.05 (0.06)	0.01 (0.03)	***
Low Activation (bored)	0.03 (0.05)	0.05 (0.06)	Ns

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. Ns=Not significant at .05. In=Invalid comparison due to low baseline.

Figure 2. Study 1 (N=86), group comparison, based on weighted mean across writing days, on variables of SSWC (Sundararajan-Schubert Word Count), by writing task.



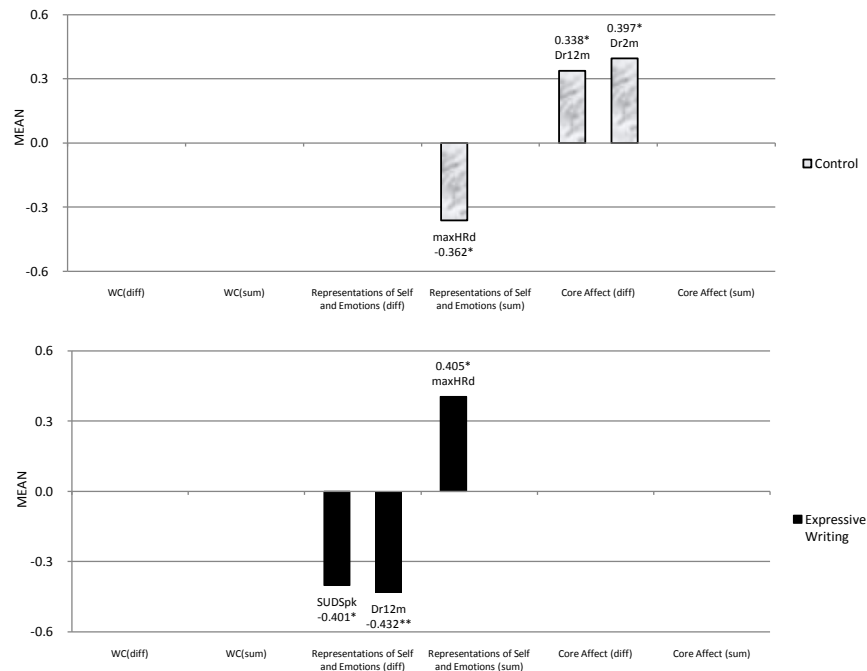
Note. diff=difference score between the writing days (Day2–Day1). sum=weighted mean across the writing days (Day1+Day2). * $p<.05$, ** $p<.01$, *** $p<.001$.

Figure 3. Study 1, group differences in global variables of SSWC (Sundararajan-Schubert Word Count), by writing task.

Expressions of Self and Emotions (E): As shown in Figure 3, the Expressive Writing group had significantly ($p<.001$) more output of E, in terms of weighted mean across writing days, than the Control group. The two groups also differed significantly in terms of difference score between the writing days, with the Expressive Writing group increased, while the control group decreased, their output of E on the second day of writing.

As shown in Figure 4a, both groups benefited from higher percentage of E: The higher percentage of using E, the less likely for the individual in the Control group ($r=-.36$, $p<.05$) to show heart rate increase at the final interview, indicating decreased reactivity. Not so for the Expressive Writing group, in which higher percentage of E was associated with increase in heart rate at follow up ($r=.41$, $p<.05$). However, the salutary effect of self and emotion expressions (E) was also evident for the Expressive Writing group, when difference score between the writing days is examined. Higher percentage of E on the second day of writing was correlated with a decrease in self reported stress (SUDS, $r=-.40$, $p<.05$) at the final interview, and a decrease in the frequency of health center visits ($r=-.43$, $p<.01$) from 2 months post writing to a year. This pattern is consistent with the observation (Pennebaker and Beall, 1986) that expressive writing increases stress in the short term, but produces health benefits in long term.

Core Affect: As shown in Figure 3 (far right, lower panel), the Expressive Writing group had significantly ($p<.001$) more output of Core Affect than the Control group. The two groups also differed significantly ($p<.05$) in terms of difference score between the writing days, with the Expressive Writing group increasing, while the control group decreasing, their output of Core Affect on the second day of writing.



Note. diff=difference score between the writing days (Day2–Day1). sum=weighted mean across the writing days (Day1+Day2). SUDSpk=subjective units of distress, peak score. maxHRd=difference in maximum level of heart rate from baseline. Dr2m=frequency of doctor’s visit within 2 months post writing. Dr12m=frequency of doctor’s visit post writing, two months to a year. * $p<.05$, ** $p<.01$, *** $p<.001$.

Figure 4a. Study 1, partial correlations, between outcome measures and global variables of SSWC (Sundararajan-Schubert Word Count), for (top) Control and (bottom) Expressive Writing groups.

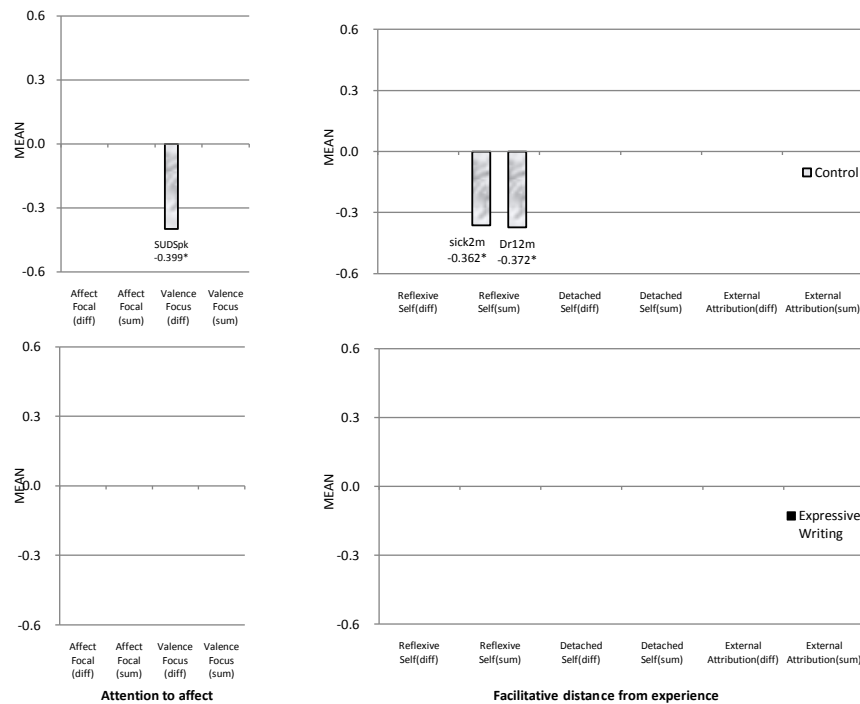
As shown in Figure 4a, weighted mean across writing days had no significant correlations with outcome measures for both groups. However, for the Control group only, change scores between the writing days were positively correlated with the frequency of health center visits in the two months after writing ($r=.40$, $p<.05$), as well as two months to a year post writing ($r=.34$, $p<.05$).

Results for components of optimal emotion representation—attention to affect and facilitative distance from experience—are shown in Figure 4b.

Attention to Affect

Affect Focal (happy/sad): As Figure 4b shows, no significant correlations of this variable were found with outcome measures for both groups.

Valence focus (miserable/pleasant): As Figure 4b shows, no significant correlations of this variable were found with outcome measures for the Expressive Writing group. For the Control Group, increased use of *Valence focus* from day 1 to day 2 of writing was related to decreased reactivity at the final interview, as measured by self-reported stress (SUDS, $r=-.40$, $p<.05$).



Note. diff=difference score between the writing days (Day2–Day1). sum=weighted mean across the writing days (Day1+Day2). SUDSpk=subjective units of distress, peak score. sick2m=frequency of being sick for the last 2 months. Dr12m=frequency of doctor’s visit post writing, two months to a year. * $p<.05$, ** $p<.01$, *** $p<.001$.

Figure 4b. Study 1, partial correlations, between outcome measures and *Components of Optimal Emotion Representation* in SSWC (Sundararajan-Schubert Word Count), for (top) Control and (bottom) Expressive Writing groups.

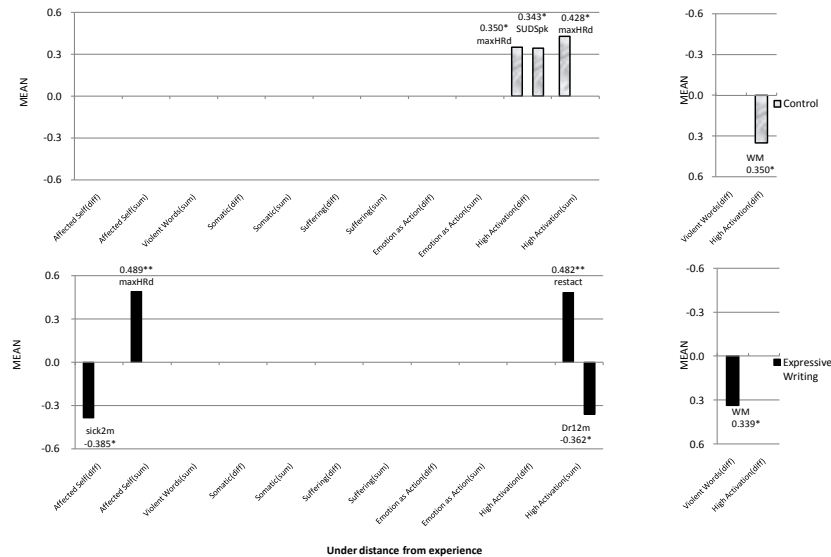
Facilitative Distance from Experience

Reflexive Self (ourselves, itself): No significant correlations of this variable emerged for the Expressive Writing group. For the Control Group, increase in the sum total of this variable across the writing days was associated with both decreased self-reported frequency of being sick for the last 2 months post writing ($r=-.36$, $p<.05$), and decreased health center visits ($r=-.37$, $p<.05$), two months to a year post writing.

Under Distance from Experience

Affected Self (me, “making me . . .”): For the Expressive Writing group, increase in the sum total of this variable across the writing days was associated with more reactivity at the final interview, as evidenced by a positive correlation with heart rate ($r=.49$, $p<.01$). However, progressive increase of this type of expression from day1 to day 2 of writing was negatively correlated ($r=-.39$, $p<.05$) with self-reported frequency of being sick for the last 2

months. This category had no significant correlations with outcome measures for the Control group.



Note. diff=difference score between the writing days (Day2–Day1). sum=weighted mean across the writing days (Day1+Day2). maxHRd=difference in maximum level of heart rate from baseline. restrict=Degrees to which activities been restricted due to illness in last 2 weeks. SUDSpk=subjective units of distress, peak score. sick2m=frequency of being sick for the last 2 months. Dr12m=frequency of doctor’s visit post writing, two months to a year. WM=working memory (reversed scale such that improvement is shown as downward bar; impairment as upward bar). * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 4c. Study 1, partial correlations, between outcome measures and *Under Distance* categories of SSWC (Sundrarajan-Schubert Word Count), for (top) Control and (bottom) Expressive Writing groups.

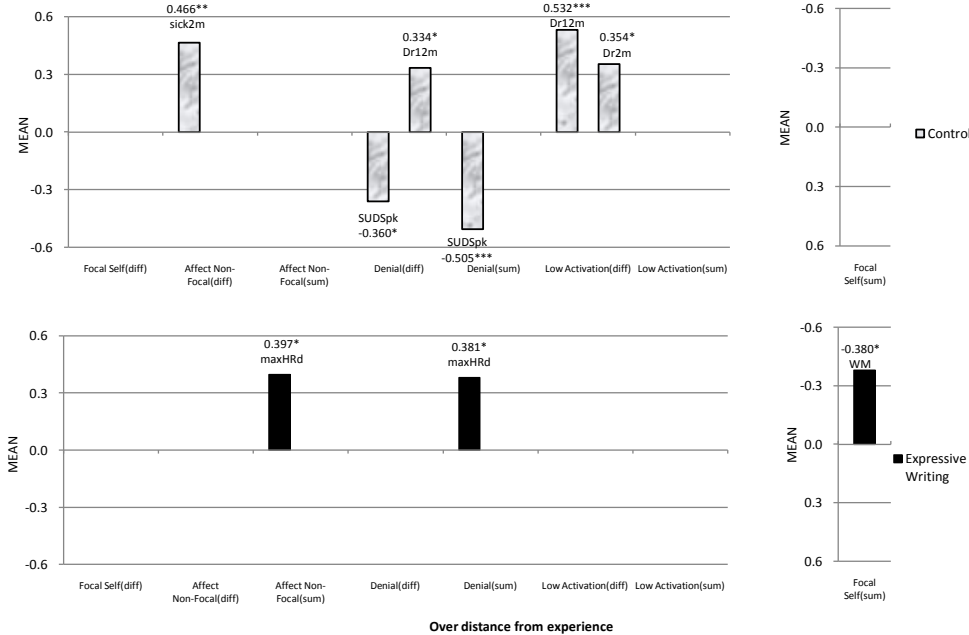
Violent Words (kill, rape, swear words): For the Expressive Writing group, an increase, from day 1 to day 2 of writing, of this variable was positively correlated with improvement in working memory ($r = .34$, $p < .05$), post writing. No significant correlation of this variable was found for the Control group.

High Activation (excited, nervous): For the Expressive Writing group, increase in the sum total across writing days of this variable was strongly and positively correlated ($r = .48$, $p < .01$) with self-reported extent to which activities had been restricted due to illness in the last 2 weeks. On the other hand, it was not without health benefits, as evidenced by a negative correlation ($r = -.36$, $p < .05$) with the frequency of health center visits two months to a year post writing. For the Control group, increase in the sum total across writing days of this variable was positively correlated with increased heart rate ($r = .43$, $p < .05$). Progressive increase, from day 1 to day 2 of writing, of expressions of high activation was positively correlated with the health costs of increased heart rate ($r = .35$, $p < .05$), and self reported stress ($r = .34$, $p < .05$), on the one hand, and with the health benefit of improved working memory post writing ($r = .35$, $p < .05$), on the other.

Over Distance from Experience

Focal Self (I, myself, my own): For the Expressive Writing group, the more one made use of this variable, as evidenced by weighted mean across writing days, the less likely was one to perform well on working memory ($r=-.38$, $p<.05$) at follow up. This memory impairment could be due to the high self focus characteristic of rumination (Watkins and Teasdale, 2001). No significant correlation of this variable with outcome measures was found for the Control group, a writing condition which probably did not invite ruminative reflections as much as the expressive writing condition that focused on stressful autobiographical memories.

Affect Non-Focal (cry, understanding): For the Expressive Writing group, weighted mean of the use of this variable was positively correlated with increased heart rate ($r=.40$, $p<.05$), an indication of reactivity, at the final interview. For the Control group, progressive increase, from day 1 to day 2 of writing, in this type of expressions was strongly and positively correlated with an increase in self reported frequency of being sick for the past two months post writing ($r=.47$, $p<.01$).



Note. diff=difference score between the writing days (Day2–Day1). sum=weighted mean across the writing days (Day1+Day2). maxHRd=difference in maximum level of heart rate from baseline. SUDSpk=subjective units of distress, peak score. sick2m=frequency of being sick for the last 2 months. Dr12m=frequency of doctor's visit post writing, two months to a year. Dr2m=frequency of doctor's visit within 2 months post writing. WM=working memory (reversed scale such that improvement is shown as downward bar; impairment as upward bar). * $p<.05$, ** $p<.01$, *** $p<.001$.

Figure 4d. Study 1, partial correlations, between outcome measures and *Over Distance categories* of SSWC (Sundararajan-Schubert Word Count), for (top) Control and (bottom) Expressive Writing groups.

Denial (“doesn’t bother me”): For the Expressive Writing group, weighted mean of the use of denial was positively correlated with increased heart rate ($r=.38$, $p<.05$), an indication of reactivity, at the final interview. For the Control group, the more one used expressions of denial, as evidenced by weighted mean, the less likely was one to report stress, as evidenced by strong negative correlation with SUDS ($r=-.51$, $p<.01$). But the health cost of *Denial* comes through in the change score, which showed that those who progressively used more denial, from day 1 to day 2 of writing, tended to report less stress ($r=-.36$, $p<.05$) at the final interview, but had more health center visits ($r=.33$, $p<.05$), two months to a year post writing. This is consistent with the protocol of repression (Weinberger, 1990), which is characterized by a combination of temporary relief of subjective stress, on the one hand, and long term health cost, on the other.

Low Activation (bored, drowsy): No significant correlations of this variable were found for the Expressive Writing group. For the Control group, those who used progressively more expressions of low activation, from day 1 to day 2 of writing, tended to have more health center visits, both within two months post writing ($r=.35$, $p<.05$) as well as two months to a year post writing ($r=.53$, $p<.001$).

DISCUSSION

Overall, there was no major discrepancy between the two groups in terms of the shifting balance of cool and hot systems associated with various categories of language use. Both groups showed higher activation with the use of less than optimal representations—in the case of under distance categories (figure 4c), both groups were able to reap a mixture of cost and benefit, with the latter outweighing the former as characteristic of regulated activation; whereas in the case of over distance categories (Figure 4d), both groups evinced dysregulated activation at follow up.

There was however a group difference in nuance attributable to instruction set. In light of the fact that the controls did not have any guidance as to how to express their emotions, whereas the Expressive Writing group was instructed specifically to do so, the differences between the two writing conditions may thus fall along the divide between automatic versus controlled processing (Philippot, Baeyens, and Douilliez, 2006)—the latter, but not the former, can be expected to extend or reinforce the cool system. This is our tentative answer to the question: What good does expressive writing do? Cool system effect may explain some subtle differences in outcome between the two groups.

Consider first the sum total of E (expressions of self and emotions). For controls, higher proportion of E was related to reduced reactivity at follow up (Figure 4a). In contrast, being told to explicitly write about emotions might have increased sensitivity to arousal for the Expressive Writing group, which therefore reaped a mixture of health cost and benefit post writing, with benefit outweighing the cost—temporary increase in heart rate at the final interview, but long term reduction in health center visits post writing (Figure 4a). This is an example of regulated activation, a boon that can be expected from the cool system. But the most common effect of the cool system is neutralization of the hot system. For instance, increased frequency of Core affect from day 1 to day 2 was associated with health cost at

follow up for the Control group, but not for the Expressive Writing group (see Figure 4a), possibly due to the cool system effect of the instruction set, which neutralized the hot system.

Another case in point is optimal emotion representation (Figure 4b), which can be expected to be associated with cool system effect. The cool system effect of this type of language use was manifest, for the Control group, in terms of reduced health center visits and decreased subjective experience of stress, whereas for the Expressive Writing group, it was manifest in the efficiency of sign use, which consists of letting information proliferate maximally- as evidenced by significantly more output on *attention to affect* and *facilitative distance* variables than the controls (see Figure 2)—while keeping energy cost at the minimum, such that no health cost or benefit showed up on the ledger (see Figure 4b).

Study 2

This is a reanalysis of a published study of children's expressive writing (Fivush, et al., 2007), in which 9 to 13-year old children engaged in three consecutive days of writing, for 15 to 20 minutes each day, under emotional and non-emotional instructions (n=56 each)--the former were asked to write about their deepest thoughts and feelings; the latter about how they spend a typical day.

Outcome Measures

The following outcome measures were completed by the children one day before writing, and again two months after writing:

The Birlson Depression Inventory: a self-report on childhood depression (DEP).

The Spence Children's Anxiety Scale: a self-report on childhood anxiety (ANX).

The Children's Somatisation Inventory: a self report on psychophysiological symptoms such as headaches, dizziness, and so on (PHY).

The Strengths and Difficulties Questionnaire: The sum of the items of this questionnaire measure the child's overall difficulties. The questionnaire was filled out by the child and the teacher, resulting in two versions, the child's (CSD) and the teacher's (TSD), respectively.

Similar to study 1, both groups benefited from writing, showing lower anxiety, depression, difficulties and somatic symptoms from baseline to follow-up, in comparison to the non-writing group. With that finding already established in a prior study (Reynolds, Brewin, and Saxton, 2000), the authors proceeded to analyze individual differences in writing.

Surprisingly children who discussed emotions and explanations more in their narratives subsequently showed higher levels of depression and anxiety. The authors attributed this to children's lack of language skills to benefit from expressive writing. To further investigate this phenomenon, we used SSWC to re-analyze the texts. In Study 2, we included children who did not complete all three diary entries, resulting in a slightly larger sample size (n=115; emotional instruction, n=58; non-emotional instruction, n=57) than the original study (n=112).

RESULTS

Over View

Language use: Similar to Study 1, the two groups of children wrote very differently, as measured by the SSWC variables (Figure 5).

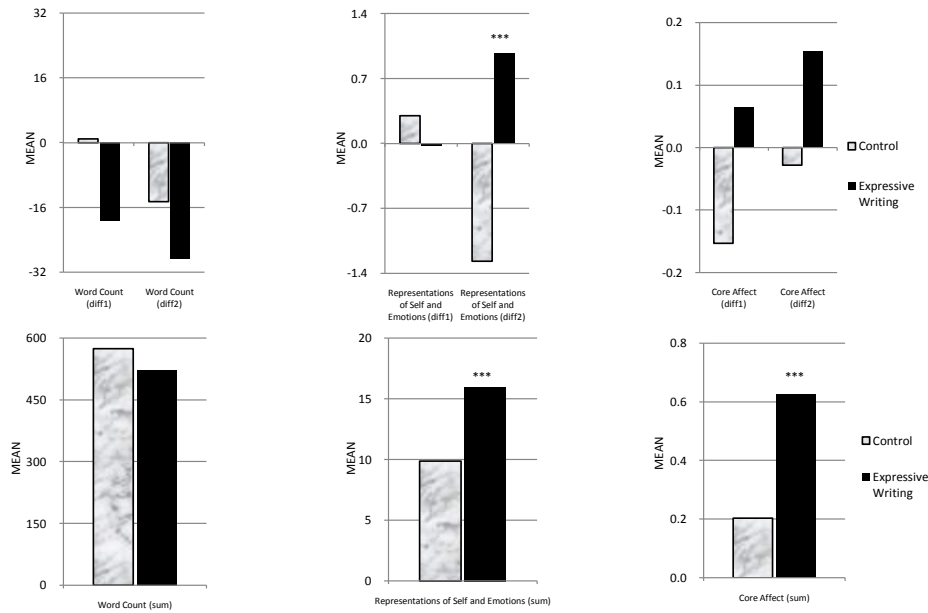
Over all, children wrote in similar ways as adults (Study 1, Figure 2), especially with regard to over-distance type of language use. It is in the under-distance type of language use that some differences emerged: Children, in both writing groups, had higher output than their counterpart in the adult sample (Figure 2) on *High Activation* and *Violent Words*. While children showed no group difference in the frequency of use of *Somatic* category, both groups had higher output on this category than the adult sample (Figure 2), in which controls significantly outperformed the Expressive Writing group. The group differences in children can be summed up in Figure 6.

As shown in Figure 6, the two writing groups of children did not differ in word count, but differed significantly in representations of self and emotions as well as core affect. The over all patterns of group difference in the child sample (Figure 6) are quite similar to the adult counterpart (Figure 3), in both weighted mean as well as difference scores, if we interpret the day 1 to day 2 difference in the adult sample (Figure 3) as equivalent to that between day 2 to day 3 in the child sample (Figure 6)—in both the Control group decreased output while the Expressive Writing group increased output, on the last day, on core affect and the expressions of self and emotions.

<i>SSWC Variables (with tokens)</i>	<i>Expressive Writing group</i>	<i>Control group</i>	<i>Significance</i>
	<i>Mean (SD)</i>	<i>Mean (SD)</i>	
<i>Attention to Affect</i>			
Affect Focal (happy/sad)	1.56 (0.86)	0.43 (0.65)	***
Valence Focus (miserable)	0.37 (0.44)	0.04 (0.09)	***
<i>Facilitative Distance from Experience</i>			
Reflexive Self (ourselves)	0.22 (0.27)	0.43 (0.42)	***
Detached Self (someone)	1.63 (1.20)	0.64 (0.50)	***
External Attribution (sexy)	1.11 (0.66)	0.69 (0.64)	***
<i>Under Distance from Experience</i>			
Affected Self (me)	3.17 (1.35)	1.33 (0.92)	***
Violent Words (swear)	0.36 (0.47)	0.10 (0.26)	***
Somatic (headache)	0.17 (0.27)	0.18 (0.29)	Ns
Suffering (traumatized)	0.02 (0.08)	0.01 (0.05)	In
Emotion as Action (love/hate, used as verb)	0.40 (0.44)	0.15 (0.29)	***
High Activation (excited)	0.22 (0.33)	0.10 (0.20)	***
<i>Over Distance from Experience</i>			
Focal Self (I, myself, my own)	6.29 (1.03)	7.18 (1.30)	***
Affect Non-Focal (cry, understand)	0.72 (0.33)	0.36 (0.22)	***
Denial ("doesn't bother me")	0.05 (0.06)	0.01 (0.03)	***
Low Activation (bored)	0.03 (0.05)	0.05 (0.06)	Ns

Note. * $p < .05$, ** $p < .01$, *** $p < .001$. Ns=Not significant at .05. In=Invalid comparison due to low baseline.

Figure 5. Study 2 (N=115), group comparison, based on weighted mean across writing days, on variables of SSWC (Sundararajan-Schubert Word Count), by writing task.



Note. diff1=difference score between the writing days (Day2–Day1); diff2=difference score between the writing days (Day3–Day2). sum=weighted mean across the 3 writing days. * $p < .05$, ** $p < .01$, *** $p < .001$.

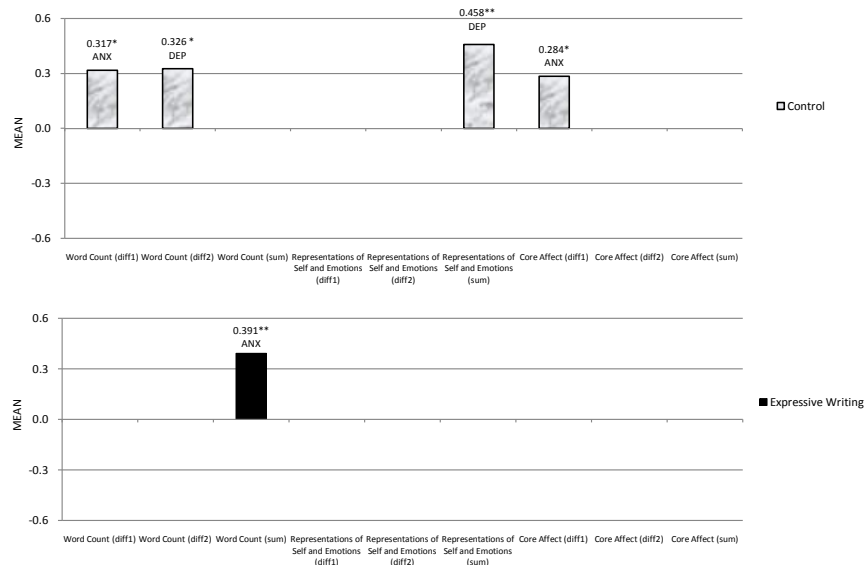
Figure 6. Study 2, group differences in global variables of SSWC (Sundararajan-Schubert Word Count), by writing task.

However, unlike Study 1, children's word count had health consequences, as shown in Figure 7a.

Word Count: For the Expressive Writing group, weighted mean of word count across three writing days was positively correlated ($r = .39$, $p < .01$) with the child's anxiety at follow up two months post writing. For the Control group, increase in word count on the second day and the third day of writing were positively correlated with anxiety ($r = .32$, $p < .05$) and depression ($r = .33$, $p < .05$), respectively, at follow up.

Expressions of Self and Emotions (E): For the Expressive Writing group, no significant correlation was found between outcome measures and the percentage of E. For the Control group, percentage of E was strongly and positively correlated ($r = .46$, $p < .01$) with depression at two months follow up.

Core Affect: For the Expressive Writing group, no significant correlation was found with outcome measures. For the Control group, an increase in expression of Core Affect from day 1 to day 2 of writing was positively correlated ($r = .28$, $p < .05$) with anxiety post writing.



Note. diff1=difference score between the writing days (Day2–Day1). diff2=difference score between the writing days (Day3–Day2). sum=weighted mean across the 3 writing days. ANX=outcome measure of anxiety. DEP=outcome measure of depression. * $p < .05$, ** $p < .01$, *** $p < .001$.

Figure 7a. Study 2, partial correlations, between outcome measures and global variables of SSWC (Sundararajan-Schubert Word Count), for (top) Control and (bottom) Expressive Writing groups.

Results for components of optimal emotion representation—attention to affect and facilitative distance from experience—are shown in Figure 7b.

Attention to Affect

Affect Focal (happy/sad): For the Expressive Writing group, weighted mean of *bona fide* emotion terms was negatively correlated ($r = -.31$, $p < .05$) with somatic symptoms post writing.

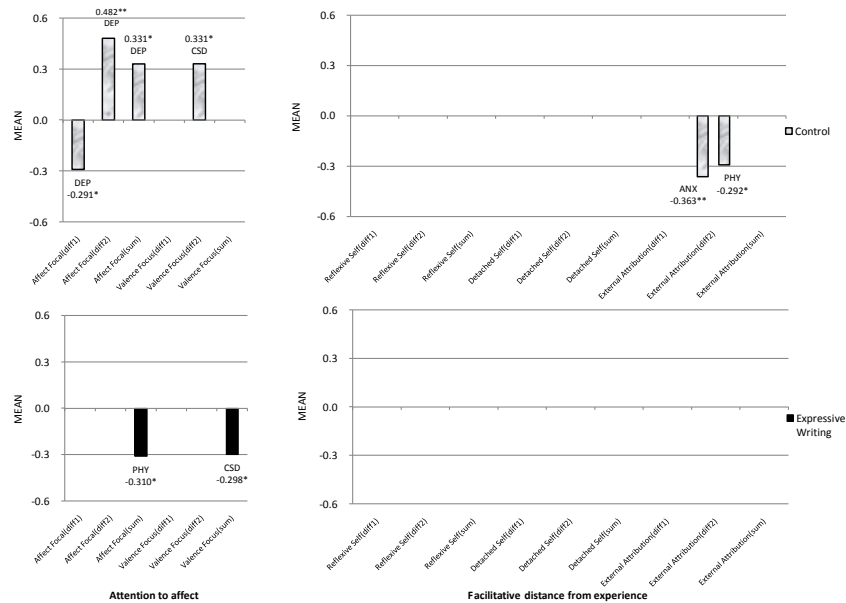
For the Control group, weighted mean of this type of language use was positively correlated ($r = .33$, $p < .05$) with depression post writing, but difference scores tell a more nuanced story. An increase in this type of expression from day 1 to day 2 was negatively correlated ($r = -.29$, $p < .05$) with depression post writing, whereas an increase of the same from day 2 to day 3 was strongly and positively correlated ($r = .48$, $p < .01$) with depression at follow up.

Valence focus (miserable/pleasant): For the Expressive Writing group, weighted mean across writing days of valence focus was negatively correlated ($r = -.30$, $p < .05$) with difficulties rated by the child post writing. For the Control group, an increase in use of this category from day 2 to day 3 was positively correlated ($r = .33$, $p < .05$) with difficulties rated by the child at follow up post writing.

Facilitative Distance from Experience

External Attribution (sexy, wonderful): For the Expressive Writing group, no significant correlation was found with outcome measures. For the Control group, an increase in

expression of emotion with external attribution from day 2 to day 3 of writing was negatively correlated, strongly with anxiety ($r=-.36$, $p<.01$) and moderately with somatic symptoms ($r=-.29$, $p<.05$), post writing.



Note. diff1=difference score between the writing days (Day2–Day1). diff2=difference score between the writing days (Day3–Day2). sum=weighted mean across the 3 writing days. ANX=outcome measure of anxiety. DEP=outcome measure of depression. PHY=outcome measure of somatisation. CSD=overall difficulties reported by the child. * $p<.05$, ** $p<.01$, *** $p<.001$.

Figure 7b. Study 2, partial correlations, between outcome measures and *Components of Optimal Emotion Representation* of SSWC (Sundararajan-Schubert Word Count), for (top) Control and (bottom) Expressive Writing groups.

Under Distance from Experience

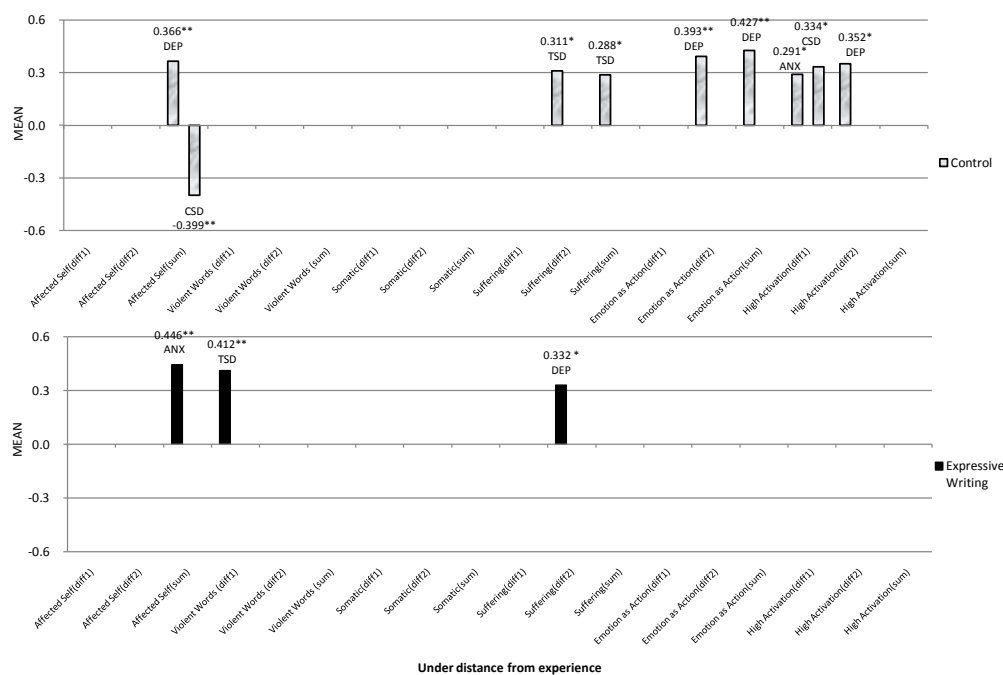
Affected Self (me, “making me . . .”): For the Expressive Writing group, weighted mean of a passive stance across three writing days was strongly and positively correlated ($r=.45$, $p<.01$) with anxiety post writing. For the control group, weighted mean of this type of language use was correlated strongly and positively ($r=.37$, $p<.01$) with depression post writing, but negatively ($r=-.40$, $p<.01$) with difficulties rated by the child.

Emotion as action (love/hate, used as verb): For the Expressive Writing group, no significant correlation was found. For the Control group, weighted mean of this type of un-reflective expression of emotion across three writing days was strongly and positively correlated ($r=.43$, $p<.01$) with depression post writing; similarly, an increase in this type of expression from day 2 to day 3 of writing was strongly and positively correlated with depression ($r=.39$, $p<.01$) at follow up.

Suffering (devastated, traumatized): For the Expressive Writing group, an increase from day 2 to day 3 of expression of trauma was positively correlated ($r=.33$, $p<.05$) with depression post writing. For the Control group, weighted mean of this type of expression

across three writing days was positively correlated ($r=.29$, $p<.05$) with the child's difficulties rated by teacher; and the same pattern of correlation ($r=.31$, $p<.05$) at follow up was found for an increase in expression of trauma from day 2 to day 3 of writing.

Violent Words (kill, rape, swear words): For the Expressive Writing group, an increase in the use of violent words from day 1 to day 2 of writing was strongly and positively correlated ($r=.41$, $p<.01$) with child's difficulties rated by teacher. No significant correlation with outcome measures was found for the Control group.



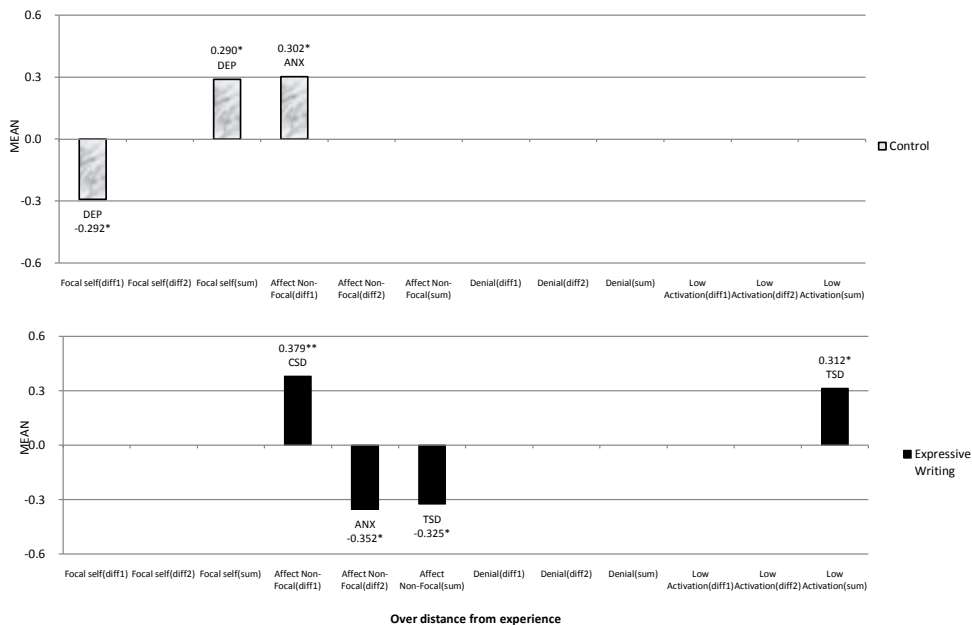
Note. diff1=difference score between the writing days (Day2–Day1). diff2=difference score between the writing days (Day3–Day2). sum=weighted mean across the 3 writing days. ANX=outcome measure of anxiety. DEP=outcome measure of depression. TSD=overall difficulties reported by the teacher. CSD=overall difficulties reported by the child. * $p<.05$, ** $p<.01$, *** $p<.001$.

Figure 7c. Study 2, partial correlations, between outcome measures and Under distance categories of SSWC (Sundararajan-Schubert Word Count), for (top) Control and (bottom) Expressive Writing groups.

High Activation (excited, nervous): For the Expressive Writing group, no significant correlation was found. For the Control group, an increase in expressions of high activation from day 1 to day 2 of writing was positively correlated with anxiety ($r=.29$, $p<.05$), and with difficulties rated by the child ($r=.33$, $p<.05$); similarly, increase in expression of high activation from day 2 to day 3 was positively correlated with depression ($r=.35$, $p<.05$) at follow up.

Over Distance from Experience

Focal Self (I, myself, my own): For the Expressive Writing group, no significant correlation with outcome measures was found. For the Control group, weighted mean of self focus across three writing days was positively correlated ($r=.29$, $p<.05$) with depression at follow up. This is consistent with findings of the connection between high self focus and depression (Watkins and Teasdale, 2004). However, difference score indicating an increase in self focus from day 1 to day 2 of writing was negatively correlated ($r=-.29$, $p<.05$), with depression at follow up.



Note. diff1=difference score between the writing days (Day2–Day1). diff2=difference score between the writing days (Day3–Day2). sum=weighted mean across the 3 writing days. ANX=outcome measure of anxiety. DEP=outcome measure of depression. TSD=overall difficulties reported by the teacher. CSD=overall difficulties reported by the child. * $p<.05$, ** $p<.01$, *** $p<.001$.

Figure 7d. Study 2, partial correlations, between outcome measures and *Over distance categories* of SSWC (Sundararajan-Schubert Word Count), for (top) Control and (bottom) Expressive Writing groups.

Affect Non-Focal (cry, understanding): For the Expressive Writing group, weighted mean of expressing emotion in cognitive and behavioral terms across three writing days was negatively correlated ($r=-.33$, $p<.05$) with child's difficulties rated by teacher. The difference score tells a more nuanced story: An increase in cognitive and behavioral expressions of emotion from day 1 to day 2 was strongly and positively correlated ($r=.38$, $p<.01$) with difficulties rated by the child, whereas an increase of the same from day 2 to day 3 was negatively correlated ($r=-.35$, $p<.05$) with anxiety at follow up. For the Control group, increase in cognitive and behavioral expressions of emotion from day 1 to day 2 was positively correlated ($r=.30$, $p<.05$) with anxiety at follow up.

Low Activation (bored, drowsy): For the Expressive Writing group, weighted mean of expressions of low activation was positively correlated ($r=.31, p<.05$) with child's difficulties rated by teacher at follow up. For the Control group, no significant correlation with outcome measures was found.

DISCUSSION

For both groups, there was a positive correlation between length of the written text and anxiety and depression at follow up. The two writing conditions also did not differ in the health consequences of less than optimal representations of self and emotions (Figures 7c and 7d)—both groups seemed to be susceptible to activation of the hot system. However, children's susceptibility was different from the adult sample (Study 1). In the adult sample, dysregulated activation was associated with over-distance type of language use (Figure 4d), while regulated activation with under-distance type of language use (Figure 4c); the reverse was the case with children—Under distance expressions were associated with extensive symptoms characteristic of dysregulated activation (Figure 7c), while the use of over-distance type of expressions was associated with a mixture of cost and benefit (Figure 7d), which to some extent approximates regulated activation, although the capacity for children to regulate the hot system was not as evident as the adult sample. This contrasting pattern may stem from the developmental needs of children, who seemed to be in particular need for mental distance such that under-distance type of language use would cause more activation of the hot system than over-distance.

Children's need for mental distance to regulate the hot system may explain why both writing conditions benefitted especially from language use that entails facilitative distance from experience (Figure 7b, right panel). This also explains why language use such as "happy" or "sad"—that has attention to affect as its primary referential focus, and that was associated with the cool system in the adult sample (Figure 4b, left panel)—activated the hot system in the child sample, as evidenced by associated symptoms at follow up (Figure 7b, left panel). That attention to affect activated the hot system for children is particularly true of the Control group, which showed a positive correlation between increase in depression at follow up and a higher percentage of expressions of self and emotions in child's writing; the same correlation holds for anxiety and core affect (see Figure 7a).

This suggests that while children were equally vulnerable as adults to the health cost of less than optimal representations, they were less able to reap the health benefit from optimal representations of self and emotions—unless they got help. Results of the Expressive Writing group showed that the instruction set could help by reinforcing and extending the cool system. Thus when children wrote with the explicit instruction to pay attention to their thoughts and feelings, their cool system prevailed where the hot system would have been dominant otherwise: With attention to affect type of language use, the Expressive Writing group showed negative correlation with symptomatology at follow up, in sharp contrast to the controls who showed positive correlation with the same (Figure 7b, left panel). Similarly, whereas children in the Control group reported depression and anxiety at follow up if they devoted a large proportion of their writing to expressions of self and emotions and core affect, the Expressive Writing group had more output of these expressions (see Figure 5) without

reaping any health consequences (see Figure 7a). It seems that with the help of the expressive writing instructions, language in emotional writing could be decoupled from the hot system, and became simply information. The cool system effect strengthened by the writing instruction of expressive writing may explain why the protocol produced by the Expressive Writing group of children was more similar to that of the adult sample in Study 1 than the control group of children.

How do the results presented here square with the findings of Fivush, et al. (2007) that the more children wrote about emotions, the more symptoms of depression and anxiety they showed at follow up? The two studies do not necessarily contradict each other, since the original study focused on the content of children's writing, whereas our re-analysis shifted from the what to the how question. Take for instance the hypothetical topic of love, which can be expressed by multiple categories of language use as indicated by italics below:

- a. "I *love* you" which would fall under the category of *Emotion as Action*;
- b. "My *love* is a red, red, rose" which belongs to the category of *Affect Focal*;
- c. "You are *beautiful*" which falls under *External Attribution*;
- d. "I am so *excited* to see you" which would fall under *High Activation*.

The results of Study 2 predicts the following protocol: If the writing came from the Expressive Writing group, use of (a), (c), and (d) would not be associated with symptomatology, whereas high frequency of (b) would be associated with a reduction in somatic complaints at follow up. By contrast, results of the Control group confirmed the finding of Fivush, et al. (2007) that the more the child wrote about emotions, the more anxiety and depression the child showed at follow up: With the exception of (c) which was associated with a reduction of anxiety and somatic complaints (Figure 7b, right panel), all the other forms of expressing emotions, (a, b, and d), were associated with an increase in symptomatology (Figure 7b, left panel; Figure 7c) at follow up.

Together, results of Study 1 and the Expressive Writing condition of Study 2 confirmed our prediction--optimal representations of emotion are under the sway of the cool system, while less than optimal representations are under varying degrees of dominance by the hot system. Although the Control group in Study 2 confirmed the contention of Fivush, et al. (2007) that some children might not have the necessary language skills to benefit from emotional writing, the results of Study 2 in general suggested a conclusion that was opposed to that of the original study, namely that explicit instructions of expressive writing may help these children. While we need to be cautious with the interpretation of certain low baseline categories, such as *Suffering*, *Denial*, and *Low Activation*, the overall picture that emerged from these results tells a nuanced story about how the connection between language use and health is robust but varies along developmental parameters.

SUMMARY AND CONCLUSION

The basic idea behind the semiotics of Charles Peirce is integration (Sundararajan, 2008), a notion that is consistent with Pennebaker's cognitive reorganization thesis (1985) as well as his inhibition theory (1993), both converging on the claim that integration of feeling and

thinking, thought and experience is essential to health. The unique contribution of Peircen semiotics lies in its capacity to model the dynamics of integration in terms of complexity. The basic insight is that it is process (known as sign action), not content, that determines the efficiency of the sign as a representation of experience. This shift of focus from *what* to *how*, from the *content* of the information per se, to the *modes* of processing and representation of emotion information is consistent with the claim of Philippot and colleagues (e.g., Neumann, and Philippot, 2007) that regulation of emotion can be achieved by a change in *processing mode* without ostensible modification of the emotional information *content*. Thus instead of the conventional content analysis that focuses on what is said in the text, it is now feasible to approach language as modes of information processing with varying degrees of complexity.

Based on the Peircean model of complexity, we proposed a taxonomy of 15 categories of language use in emotion expressions. These are further grouped into four types of language use, or processing modes, each with its unique balance between the cool and hot systems of emotion.

Based on the insight of Peirce that the mind is in signs, and not the other way around (Colapietro, 1989), our approach entails a figure and ground reversal that puts language on center stage as the main actor, and group differences as the contextual factors--along with other contextual factors such as individual differences and developmental needs--that affect the shifting balance between hot and cool systems associated with different types of language use. An analogy is gene (also a code) expression which is affected by environmental contexts.

Our theory-based predictions were implemented by a Language analysis program, SSWC (Sundararajan-Schubert Word Count), which re-analyzed texts from two studies of expressive writing, one by adults and one by children. Results of both studies showed that the categories of SSWC map out the semantic space of affect in a logically consistent and intelligible manner. The taxonomy of SSWC functions not as a dictionary so much as a prism, which renders visible the various modes of representing emotions. Its proposed classification of language use functions not as a dream book with fixed interpretations, so much as a theory-based system of coding, that tags the various modes of representation so as to see whether and how they vary systematically along various parameters such as instruction sets, individual differences, and developmental needs.

The findings presented here are tentative, but, if confirmed by future replications, may have far reaching implications for both theory and research on the language and health equation. The current research in the field tends to approach expressive writing as a unitary phenomenon, on the presence (the experimental condition) or absence (the control condition) of which hangs the balance for health outcomes. This approach renders expressive writing a black box, thereby making it difficult to investigate the qualitative differences between different types of emotion expression, and their ramifications for health. The semiotic approach to language makes it possible to shift our focus from the whether to the how question. Instead of asking whether expressive writing in general has health benefits (Frattaroli, 2006), we examined how the language and health equation may vary systematically under different contexts and conditions.

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