LANGUAGE STYLE MATCHING AS A PREDICTOR OF SUCCESSFUL COPING IN BREAST CANCER PATIENTS AND THEIR PARTNERS

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Running Head: LSM AS PREDICTOR OF COPING AND DEPRESSION

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Abstract:

Past research has shown that the use of function words-- such as pronouns-- in Language Style Matching accurately predicts relationship satisfaction and success. The current study on breast cancer patients focuses on two main hypotheses. First, we predicted that LSM would correlate positively with relationship satisfaction and this correlation would be unique to the patient-partner relationship. Second, it follows that LSM would positively correlate with successful use of coping mechanisms for breast cancer patients and their partners. We operationalized coping through two questionnaires, the dyadic adjustment scale (DAS) and the center for epidemiological studies depression scale (CES-D), assessed longitudinally. The linguistic inquiry word count program (LIWC) software measured LSM by counting function words obtained by the objective sound clips recorded by an electronically activated recorder (EAR). Cancer patients and their partners exhibited high LSM and overall variance was low (.001) within couples (.002) and between friends and family (.061). Personal pronouns correlate with overall satisfaction as reported by partners. Conversely, LSM within couples did not predict depression in partners or patients. Results suggest that in the matter of cancer patients and their partners' self reported adjustment LSM does not significantly matter.

Introduction:

Not so surprisingly, humans adapt their behavior to better interact with other individuals in everyday life and activities. This adaptation is not limited to, but largely includes, language. Put more eloquently; "when two people are talking, their communicative behaviors are patterned and coordinated, like a dance" (p. 338; Niederhoffer & Pennebaker, 2002). The reasons for humans, as social animals, to match language largely converge on the desire to become comfortable with each other and within the environment. Therefore, language style matching (LSM) is similar to mimicked body language; which suggests that when someone is comfortable with another person they will mimic their body language almost undoubtedly. Once language styles are matched and the attempt to tailor the environment is successful to each individual involved in the conversation, a degree of comfort in the interaction is achieved (Niederhoffer et. al, 2002).

Much like blinking and breathing, LSM becomes second nature in conversation. We do not consciously adjust our language style to appropriately match our audience because intuition allows the subconscious mind to work more efficiently. Since humans are essentially unaware of the automatic process that is LSM, measuring it operationally proved to be difficult in early studies (Niederhoffer et. al, 2002). To solve this problem, the current study utilizes the Electronically Activated Recorder (EAR). This device is a relatively new technology for obtaining behavioral data in field research. The data captures ongoing behavior without relying strictly on self-reports. Participants wear a digital voice recorder, which periodically records brief intervals of ambient sounds. The sound clips provide researchers with unobtrusive and non–self-report information about a person's ongoing behaviors and immediate social situations over the course of the day (Mehl, Pennebaker, Crow, Dabbs, & Price, 2001). This apparatus

essentially allows researchers to acquire raw naturalistic data without obtrusively invading the personal space of the participant. Oftentimes people are untruthful when filling out questionnaires because they want to be consistent with a specific stereotype that is favorable for them but not always honest. With the EAR, researchers are able to study language unimpeded by self-report measures and biases such as those explained above.

Through observing the way individuals use semantics and syntax when speaking, psychologists are able to analyze linguistics in a way that allows for interpretation of meaning within the context of speech. To study this, Chung and Pennebaker (2007) recommended word counting. A primary language counting system is called LIWC (Pennebaker, Booth & Francis, 2007), an acronym for Linguistic Inquiry and Word Count. The database that LIWC operates through parses words into classifications such as: negative emotion, positive emotion, pronouns, and other categories specific to certain temperaments. The LIWC software searches for content and style words through text files that are subsequently counted and coded (Chung et. al, 2007). This was the first step in operationally defining LSM. By objectively counting words and separating them into collectively agreed-upon categories, researchers are able to measure the degree of LSM. Some subcategories that the LIWC uses are personal pronouns (e.g., I, his/her, their), quantifiers (e.g., much, few, lots), and negations (e.g., no, not, never).

Function words --of which pronouns are a sub-category-- specifically pertain to this research. The motivation for researchers to study pronouns is because they "are words that demand a shared understanding of their referent between the speaker and listener" (p. 349; Chung et. al, 2007). In other words, similar pronoun usage between conversational interactants indicates concurrence between individuals. The mechanism by which the use of pronouns is able to predict LSM lies in historical language usage. Primarily, personal pronouns have a tendency to

refer to oneself whereas other pronouns emphasize others. Further, research indicates that increased use of third person pronouns positively correlates with adaptive coping and therefore, health benefits (Chung et. al, 2007).

The current study, assessing LSM as a predictor of coping in breast cancer patients and their partners, is largely in response to findings out of Northwestern University. In that study, Ireland, Slatcher, Paul W. Eastwick, Scissors, Finkel, and Pennebaker (2010) successfully predicted romantic relationship outcomes using LSM as measured by LIWC. Researchers studied the correlation and predictive value of LSM in speed daters. Participants went on four minute long speed dates and took a questionnaire immediately following the date to gauge the self-reported success or letdown of the interaction. During the date, conversations were recorded, transcribed, and input into LIWC. Initiation of relationship, stability or relationship, and satisfaction were better predicted by the LSM measure than the questionnaires themselves. The authors concluded that the unobtrusive measure of LSM uniquely projected mutual romantic interest and relationship stability independently of self-report predictors including perceived similarity and relationship satisfaction (Ireland et al., 2010). This has specific implications for the ability of LIWC and LSM to actually predict certain relationship outcomes and variables pertaining to relationship satisfaction. There are two primary theories that attempt to explain the process of LSM. However, it is unclear which mechanism LSM works through. The accommodation process explains that conversational partners become linguistically closer to one another. Alternatively, the assortative mating theory implies that partners are linguistically similar before the initiation of a romantic relationship.

An accommodation process refers to the ability for one partner in a relationship to recognize the potential negative tendencies in the other towards coping and coping processes.

This is especially relevant when studying disease and life changing events. Finkel and Campbell (2001) discuss the possible mechanisms whereby one partner may be more stable and inclined to execute the accommodation process than the other. In the current study it is relevant to view the accommodation process as one that may also work in the face of normalcy. Since past literature has shown that LSM is implemented in a variety of situations and among countless individuals, accommodation theory may apply as well. For the theory to apply, the individuals in the relationship must be engaged and motivated

> Thus, to understand how partners maintain long-term, well adjusted relationships, we must first explain how and why individuals become willing and able to engage in accommodative behavior that is (a) antithetical to direct self-interest yet (b) beneficial to the relationship (p. 264, Finkel et. al, 2002).

The second theoretical explanation that may explain LSM is the assortative mating process. This theory suggests that it is more common for individuals who are already similar to each other to initiate a relationship than for those who start off dissimilarly. Luo and Klohnen (2005) argue that assortative mating does not only predict whether individuals will be more inclined to engage in a romantic relationship, but also that an increase in similarity may also lead to a higher quality of relationship satisfaction over time. In their study Luo et. al came to an important conclusion that people may be initially charmed by individuals who are comparable to themselves however, this similarity is perhaps not as important in maintaining a successful relationship as personality may be.

A study by Gonzales, Hancock, and Pennebaker (2010) used transcripts of the authentic language generated by small groups comprised of 4-6 same sex individuals to accurately analyze the effect of verbal mimicry on group cohesiveness. Groups networked either face to face or via

computer-mediated interaction to engage in an information search task requiring cooperation between the groups' members. The task involved searching for answers to questions in an almanac. Through efficient collaboration the authors showed that LSM successfully predicted group cohesiveness and therefore, success in the task. The authors concluded results were consistent with mimicry hypotheses that state that the degree of mimicry of function words may predict cohesion and performance in group-centered interactions.

The literature describing LSM largely converges on the ability for successful matching to predict a variety of human emotions. Inherent in this notion is the ability to better understand human dynamics and specifically, dynamics of couples or groups in a variety of situations. The studies presented show a variety of situations that present positive correlations between LSM and relationship outcomes.

The current study aims to test two hypotheses: First, language style matching will correlate positively with relationship satisfaction and this correlation will be unique to the patient-partner relationship. Current research has not yet sorted out whether the relationship between LSM and satisfaction is due to an accommodation process (i.e. interaction partners linguistically "getting closer to each other") or an assortative mating process which is the interaction partners being similar in personality and therefore, language style. Accommodation theory predicts that it is mimicry or accommodation processes that promote LSM. If that is suggested then the effect of LSM should be unique to interactions among the couple. By this standard, LSM computed from patients talking to their social networks and partners (independently) talking to their social networks would be an indicator of similar language styles due to personality. Therefore, these interactions may not predict positive outcomes. The second hypothesis is that LSM will negatively correlate with depression in breast cancer patients and

their partners. Due to the observation that under extenuating circumstances people may decrease communication thereby severing many social bonds that may have otherwise alleviated stress, it is possible that the lack of socialization is related with depression.

Methods:

Participants

Data was collected from 52 couples, or 104 individual participants. The patient was female in every case and has been diagnosed with breast cancer. Subjects were recruited from the Arizona Cancer Center and were actively undergoing treatment. Patients were in the beginning stages of cancer in every case (Stage I, 30.2% Stage II, 20.8% Stage III). Demographically patients were relatively homogenous (81.1% white, 11.3% Hispanic; *M* Age=56, *SD*=14). Partners were typically white males with little variability (84.6% white, 15.4% Hispanic; *M* Age=59, *SD*=15). The participants were classified as either the patient or the partner based on the individual suffering with breast cancer. All couples were married or cohabiting partners in long-term relationships.

Procedure

After giving informed consent, patients and partners were visited by a researcher and filled out a set of questionnaires to assess coping, depression, relationship satisfaction, and a variety of other measures in order to set baseline values. The subjects were then given the EAR to wear over one weekend while patients were on adjuvant treatment, which was chemotherapy or radiation. The EAR recorded sounds for fifty seconds every nine minutes. A researcher who collected the EARs and had participants complete a second questionnaire packet that included personality and demographic information visited couples again. Finally, there was a two-month

follow-up in which the patient and the partner filled out the DAS and CES-D again to determine the amount of change or stability over time. Transcriptions were then run through the LIWC program to assess LSM. After all the data were collected, correlation and regression were used to describe the relationships between LSM as measured by the EAR and coping and depression based on questionnaires.

Measures

The independent variable in this study is LSM, which is measured by transcribing verbalizations recorded by the EAR over the course of a weekend. The next step was to analyze data through the Linguistic Inquiry Word Count (LIWC) software that parses words into categories such as personal pronouns, impersonal pronouns, articles, conjunctions, prepositions, auxiliary verbs, high frequency adverbs, negations, and quantifiers. The dependent variables are the score on self reported questionnaires: Dyadic Adjustment Scale (DAS; Spanier, 1976) as a relationship satisfaction measure. Outcome measures for the DAS include dyadic consensus, affectional expression, dyadic satisfaction, and dyadic cohesion. The other tool used in this study was the Center for Epidemiological Studies Depression questionnaire (CES-D; Radloff, 1977). The CES-D surveys twenty different symptoms, which may be characteristic of depression. Subscales of the CES-D include somatic/depressed affect positive affect, and interpersonal/depressed affect.

The instruments used to study these participants objectively were the EAR and the LIWC software that was used as a measure of LSM. Ireland et al. (2010) utilized the typical way to compute the LSM index, which is illustrated here

LIWC calculates the percentage of total words in a text that fall into nine basic-level function word categories. Separate LSM scores were initially calculated for each category using the following formula (prepositions are used in this example):

$$LSMpreps = 1 - ((\,|\,preps1 - preps2\,|\,) / (preps1 + preps2 + .0001))$$

In the above formula, preps1 equals the percentage of prepositions used by the first person and preps2 is the percentage used by the second. In the denominator, .0001 is added to prevent empty sets. The nine category-level LSM scores are averaged to yield a composite LSM score bounded by 0 and 1, where higher numbers represent greater stylistic similarity between two speakers (Ireland et al., 2010). Transcriptions and coding are also helpful to analyze how LSM relates to adjustment when couples speak to one another. There is a comparison integrated in this study that allows for measurement of LSM between the patient and others and between the partner and others. This will help examine whether the subjects are simply better at adapting to others' language in a general sense, which would mean that it isn't a reliable indicator of partner-relationship success per se.

Results:

Cancer patients and their partners matched highly in language style (See Table 2). Correlations between the participant and their conversational partner via LSM were between .77 and .96 when patients and partners were in the presence of anyone. Between partners only in the presence of one another, the correlation varied from .71 to .96. Conversational matching between the patient and partner among friends and family was between .55 and 1.00. Overall variance for LSM was extremely low. For a participant speaking in the presence of everyone, LSM variance

was .001, LSM variance within the couple only was .002 and for LSM around friends and family the variance was .061.

After analyzing LSM via LIWC LSM does not seem to be significantly correlated with the combination of all DAS outcome measures for patients (r=. 04, p=. 77) or partners (r=. 18, p= .20). Though, personal pronouns seemed to relate with overall satisfaction reported by partners (r=. 37, p=. 01). However, this correlation was not found for patients whose satisfaction and LSM were reported in the same way (r=. 16, p=. 25; See Figure 1). Further, LSM within couples did not predict depression in partners (r=-.22, p=. 12) or patients (r=-.16,p=. 25). Also related to the cohesion outcome measure of the DAS was article usage of the partner measured by the LIWC (r=. 33, p=. 02). Quantifiers (r=. 32, p=. 02), negations (r=-.28, p=. 04), and impersonal pronouns (r=. 30, p=. 03) were correlated with the total change as measured by the DAS from time one to time two.

In contrast with the DAS, correlations between LSM and the CES-D were found in transcriptions where the actor was speaking to the partner around friends and family. Use of articles (r= -.32, p= .02) and conjunctions (r= -.29, p= .04) were negatively correlated with the sum of outcome measures for the CES-D as reported by the patient.

Discussion:

Results suggest that in the matter of cancer patients and their partners' self reported adjustment general language style does not matter much. However, specific components of language composition can predict adjustment. This is logical because, as shown in table 1, there are different categories of function words which implement differing lexicon in order to link thoughts to one another. For example, impersonal pronouns are used to speak of inanimate

objects while personal pronouns are used to talk about people, pets, and other living things. Since personal pronouns are exactly that, personal, it should follow that they predict less depressive behaviors and better coping. Pronoun usage excluding first person pronouns indicates attention to others (Chung et Al., 2007). Alternatively, personal pronoun usage could predict maladaptive social behaviors in the way of malicious behavior and gossiping. However, our analyses seem to show that personal pronouns relate with overall satisfaction reported by partners suggesting positive outcomes of pronoun use. Further analyses that demonstrate that LSM is correlated with satisfaction for the partner within the couple and independent of other conversation helps to reiterate this result.

However, it is not obvious whether LSM mediates psychological adjustment or whether couples that match more on style are also better equipped to cope with the diagnosis of terminal illness. With any correlation it is impossible to say whether the measures are directionally predictive or just coincidentally related. Although this is indeterminable, it is helpful to have data that describe a relationship in which one variable predicts another. Since our data do indicate that there is a positive relationship between personal pronouns and reported satisfaction it may help researchers and practitioners to apply more effective therapies.

In past studies, LSM has been shown to be predictive of relationship length when measured from the start to the end of relationships. In the current study LSM does not seem as though it is as predictive. It may be the case that since the variance is so low, LSM becomes less of a predictor variable and more of a measure of relationship solidity. This is because the initial attraction one feels when beginning a romantic relationship and the degree of the cohesiveness of interaction is extremely indicative of further pursuit. Thus, it is likely that once two individuals

have been in a long term and intimate relationship they begin to interact as a unit instead of two separate entities.

On the other end of spectrum, none of the function word categories were predictive of depression in the patient or the partner. There are several valid explanations for this. First, depression is commonly characterized by things it is not. It is not happy, not feeling like yourself, not wanting to socialize, etc. Because of the commonness of depression and the internal nature of the disorder it may be that the EAR cannot pick up on the symptoms and common manifestations of depression. Instead of coding for function words, in future studies I would suggest to measure the proportion of time spent talking and time spent in silence to determine whether talking and depression are correlational. It would be intuitive to hypothesize that a lack of communication may be correlated with reported depression. Another explanation for the lack of significance in the findings between LSM and depression would be the possibility that they simply are not related to any extent.

Even though the results obtained from this study were mixed it is still important to test these hypotheses for both scientific and applied reasons. Primarily, because if we had found results consistent with our second hypothesis then possible strategies for therapy may have been implemented in breast cancer and other cancer patients in relationships. To spell out the details of some of the implications of this I will give several examples of implementation. Research could consist of possible clinical therapies to elicit better mechanisms for social interaction and interaction within a romantic relationship, and further evidence to support the notion that LSM is a predictor of relationship in success. For example, if we did find that measures from the LIWC positively correlated with satisfaction, language style matching (LSM) could be incorporated into couples and coping therapy. Since the ability to match ones' partner in language, specifically

personal pronoun usage, seems to be an indicator of the ability to better deal with the detriments of cancer, then one strategy would be to focus on language style in everyday life. This could be done using mindfulness of language practice or other approaches to tailor ones' vocabulary. Further, experimental studies may be done to determine whether the application of increased personal pronoun usage has any correlation with happiness or causes any change in mood from the beginning to the end of the experiment.

The scientific implications are twofold. First, experiments should be done to effectively determine the causal relationship between LSM with coping and depression. For example, a baseline measure of LSM could be taken using LIWC prior to cancer onset perhaps in a population that is at risk for cancer. Then the change in LSM could be measured over time to see if in fact there is an order to the correlation and which direction it was in. Then, therapies may be suggested to implement more effective and empathetic communication, which could be administered to half of participants while the other half (control) would not receive such a measure. After the therapy was fully administered, LSM could be measured again using the LIWC software to ensure that couples that endured the therapy actually received adequate benefits.

Other research should examine whether other methods of natural observation will lead to different results. Video recording or watching the interaction of a couple may provide further insight into the verbal and physical associations to relationship satisfaction and depression. For example, it may be the case that not just verbalizations matter in LSM, it could be that the physical hand gestures and movements associated with conversation are also clues into more subconscious manners.

Conclusion:

Although many of the results did not completely align with our hypotheses, they are still important in contributing to the literature. It is beneficial to be aware of the fact that once individuals are in relationships for an extended amount of time, some aspects of their relationship become too alike to find variation. This was a limitation of this population and the particular study. Possible implications for practical use if future results are found to be consistent with hypotheses are clinical therapies which may be implemented to elicit better mechanisms for social interaction and interaction within the romantic relationship. Further evidence need be shown to support the notion that LSM is a definite predictor of relationship success. Additional experiments should be done to effectively determine the causal relationship between LSM and coping.

Table 1: ***LSM Categories and Examples (Ireland et al., 2010)***

Category	LIWC Label	Example
Personal pronouns	Ppron	I, his, their
Impersonal pronouns	Ipron	it, that, there
Articles	Article	a, an, the
Conjunctions	Conj	and, but, because
Prepositions	Preps	in, under, about
Auxiliary verbs	Auxverb	shall, be, was
High frequency adverbs	Adverb	quite, highly, very
Negations	Negate	no, not, never
Quantifiers	Quant	much, few, lots

Table 2: ***Mean (SD) Language Style Matching***

	LSM with partners, friends, and family	**LSM with romantic partner only**	**LSM with friends and family only**
Mean Correlation **(SD)**	***.91*** **(.03)**	***.90*** **(.05)**	***.76*** **(.25)**

Figure 1: Satisfaction reported on DAS by Patient and Partner

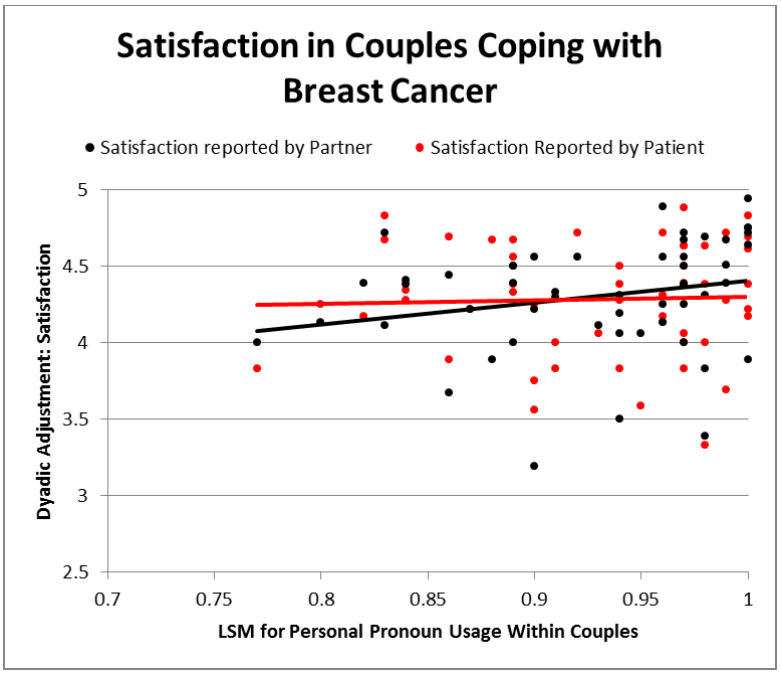
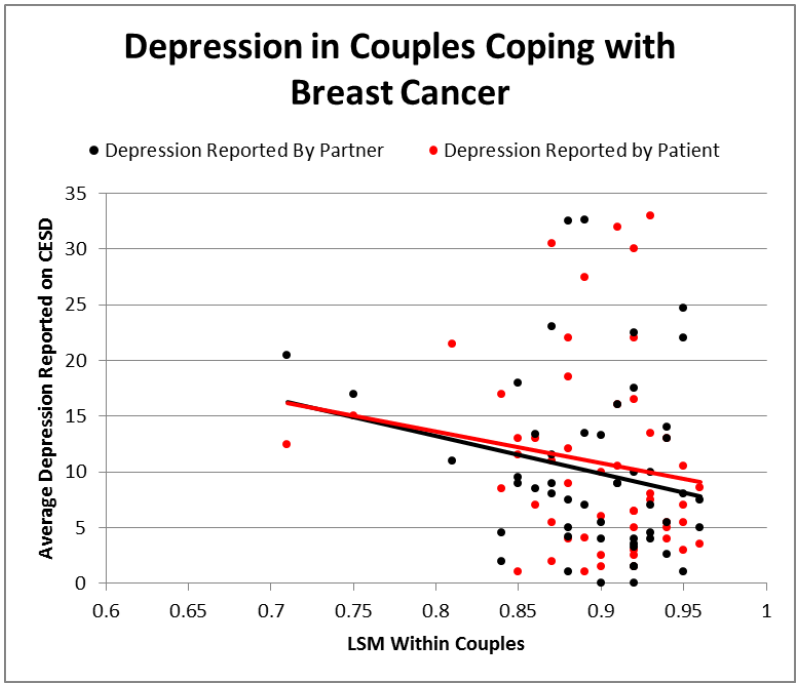


Figure 2: Depression reported on CES-D by Patient and Partner



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