Language Style Matching Predicts Relationship Initiation and Stability

Molly E. Ireland[a], Richard B. Slatcher[b], Paul W. Eastwick[c], Lauren E. Scissors[d], Eli J. Finkel[d], and James W. Pennebaker[a]

[a]The University of Texas at Austin; [b]Wayne State University; [c]Texas A&M University; [d]Northwestern University

Preparation of this manuscript was funded, in part, by the Army Research Institute (W91WAW-07-C-0029), START (Z934002), and the National Science Foundation (NSCC-0904822).

Address correspondence to James W. Pennebaker (Pennebaker@mail.utexas.edu), Department of Psychology, 1 University Station A8000, University of Texas at Austin, Austin, TX 78712.

Abstract

Previous relationship research has largely ignored the importance of similarity in how people talk with one another. Using natural language samples, we investigated whether similarity in dyads' use of function words, called language style matching (LSM), predicts romantic relationship outcomes. In Study 1, LSM in transcripts of 40 speed-dates predicted increased likelihood of mutual romantic interest (Odds ratio = 3.05). Overall, 33.3 percent of pairs with LSM above the median mutually desired future contact, compared with 9.1 percent of pairs with LSM at or below the median. In Study 2, LSM in 86 couples' Instant Messages positively predicted relationship stability at a three-month follow-up (Odds ratio = 1.95). Specifically, 76.7 percent of couples with LSM greater than the median were still dating at the follow-up, compared with 53.5 percent of couples with LSM at or below the median. LSM appears to reflect implicit interpersonal processes central to romantic relationships.

Keywords: romantic relationships, relationship stability, couples, language, LIWC

Language Style Matching Predicts Relationship Initiation and Stability

Interpersonal similarity plays an important role in the development of romantic relationships. Similarity in terms of values, interests, and personality traits are known to predict mate selection and, to a lesser degree, the long-term success of romantic relationships (e.g., McCrae et al., 2008; Watson et al., 2004). Other work suggests that people who exhibit similar nonverbal cues when talking with each other are more likely to be attracted to each other (Karremans & Verwijmeren, 2008). More broadly, when two people meet and automatically coordinate hand gestures, eye gaze, and posture, they are more likely to like and understand each other (Chartrand & van Baaren, 2009; Shockley, Richardson, & Dale, 2009).

Often overlooked in the behavioral and social sciences are the facts that couples actually talk with one another and their conversations often serve as the basis of their attraction. Remarkably little work has been done on synchrony in natural language use between two people who may become or are currently romantically involved. One recently developed tool that stands to shed new light on synchrony in real-life relationships is an unobtrusive measure of nonconscious verbal coordination called language style matching, or LSM (Gonzales, Hancock, & Pennebaker, 2010). LSM is a dyad-level measure of the degree to which two people in a conversation subtly match each other's speaking or writing style. Although it naturally occurs in most everyday conversations, LSM is undetectable by both speakers and trained observers (Ireland & Pennebaker, in press; Niederhoffer & Pennebaker, 2002). Furthermore, like eye gaze coordination, LSM is thought to map directly onto the interpersonal coordination of psychological states (Ireland & Pennebaker, in press; Richardson, Dale, & Kirkham, 2007). The purpose of this paper is to investigate whether naturally occurring LSM between potential and current romantic partners predicts initial romantic interest and long-term relationship stability.

The focus of LSM is a person's speaking or writing style, which is defined by his or her use of function words. Function words, such as pronouns and articles, are generally short, frequently used, and have little meaning outside the context of a sentence (Chung & Pennebaker, 2007). As a result of these features, function words are processed rapidly and largely nonconsciously when people produce or comprehend language (Segalowitz & Lane, 2004; Van Petten & Kutas, 1991) and require shared social knowledge, or common ground, to use effectively (Meyer & Bock, 1999). For example, the function words (underlined) in the sentence *He placed it on the table* make little sense without prior knowledge of the man, the object, and the table in question. Perhaps because of their key role in social cognition, function words are robust markers of a variety of individual differences, ranging from leadership style to honesty (Hancock, Curry, Goorha, & Woodworth, 2008; Slatcher, Chung, Pennebaker, & Stone, 2007; Tausczik & Pennebaker, 2010). As such, LSM theoretically reflects interpersonal alignment across the array of psychological states that function words represent.

By focusing on function words rather than content words, such as nouns and verbs, LSM allows researchers to assess psychological matching irrespective of context. Whereas function words are independent of conversational topics, content words are often constrained by them. For example, while two friends who work in an office building and a rock quarry, respectively, would likely use very different content words during a conversation about their days at work, research suggests their function words would be similar to the extent that the friends like and understand each other (Gonzales et al., 2010; Pickering & Garrod, 2004).

Among function words, personal pronouns appear to be particularly relevant to relationships. Married couples who use *we* more often and *you* less often have lower divorce rates and report greater marital satisfaction (Seider, Hirschberger, Nelson, & Levenson, 2009;

Simmons, Gordon, & Chambless, 2005). In dating couples, on the other hand, women's use of first-person singular pronouns (e.g, *I*, *my*) during Instant Message (IM) conversations positively predicts relationship stability (Slatcher, Vazire, & Pennebaker, 2008). However, in these previous studies, each individual's language use was the focus of analysis. In contrast, naturally occurring verbal matching requires some degree of complicity from both sides of a conversation, much like eye gaze and postural sway coordination (Shockley et al., 2009). By analyzing function word matching at the dyad-level, LSM hypothetically reflects not only each partner's attempts to engage the other but also the degree to which these attempts are reciprocated. Thus, LSM may uniquely predict relationship outcomes that entail reciprocity, such as going on a date or staying in a relationship, independently of measures that focus on individuals in isolation. Indeed, in previous studies, LSM has positively predicted such necessarily mutual outcomes as group cohesiveness and peaceful resolution of hostage negotiations (Gonzales et al., 2010; Taylor & Thomas, 2008).

In two studies, we investigated whether nonconscious verbal coordination during naturally occurring conversations, as measured by LSM, is linked to romantic relationship outcomes. Specifically, we tested the predictions that LSM is positively associated with mutual romantic interest in a speed-dating paradigm (Study 1) and relationship stability in dating couples (Study 2).

Study 1

Method

Participants. The present analyses included 40 men and 40 women (Age M = 19.6, SD = 1.2) who volunteered to take part in a speed-dating study (see Finkel, Eastwick, & Matthews, 2007).

Procedure and materials. In total, 187 heterosexual participants took part in one of eight speed-dating events on the Northwestern University campus. Participants went on 4-minute speed-dates with up to 12 opposite-sex individuals, and each date was audio- and video-recorded. Forty speed-dates were selected for transcription (see Eastwick, Saigal, & Finkel, in press) using the following criteria: the dates covered a wide range of quality, no participant appeared in more than one date, and no participants were previously acquainted with their dates. Participants also completed a 2-item measure of perceived similarity following each date. Items included "My interaction partner and I seemed to have a lot in common" and "My interaction partner and I seemed to have similar personalities" using a 1 (*Strongly Disagree*) to 9 (*Strongly Agree*) scale, $\alpha = .92$. We included perceived similarity as a covariate in our analyses to test the unique effects of LSM above and beyond the predictive power of a traditionally strong self-report predictor of romantic interest.

Within 24 hours of the speed-dating event, participants reported on a website whether they would ("yes") or would not ("no") be interested in seeing each of their speed-dates again. Participants who both replied "yes" to each other were considered a "match" and were given the ability to contact each other. Participants whose interest was unreciprocated were unable to contact their dates in the future.

Language analysis. Participants used approximately 429 words on their speed-dates (*SD* = 102, *Min* = 218, *Max* = 688). To calculate LSM for each pair, transcripts were first segmented by speaker, resulting in two aggregate text files for each date. Texts were then analyzed with a computerized text analysis program, Linguistic Inquiry and Word Count (LIWC; Pennebaker, Booth, & Francis, 2007). LIWC calculates the percentage of total words in a text that fall into

nine basic-level function word categories (Table 1). Separate LSM scores were initially calculated for each category using the following formula (prepositions are used in this example):

$$LSM_{preps} = 1 - ((\,|\, preps_1 - preps_2 \,|\,) / (preps_1 + preps_2 + .0001))$$

In the above formula, $preps_1$ equals the percentage of prepositions used by the first person and $preps_2$ 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. One LSM score was calculated for each speed-date.

Results and Discussion

Relationship initiation, operationalized as whether speed-dating partners "matched" with each other, was regressed on LSM z-scores in a logistic regression (Table 2). As hypothesized, LSM significantly predicted relationship initiation, Odds ratio = 3.05, $p = .039$. For every standard deviation increase in LSM, speed-daters' likelihood of romantically matching more than tripled. To illustrate, 33.3 percent of those speed-dating dyads that were above the median on LSM scores were mutually interested in contacting each other, compared with 9.1 percent at or below the median. In addition, when the average of the two speed-daters' perceived similarity was included in regression, LSM remained a strong predictor of relationship initiation, Odds ratio = 3.49, $p = .051$. Perceived similarity and LSM were uncorrelated, $r(38) = .06$, $p = .725$.

Theoretically, both LSM and verbosity may reflect individuals' increased interest in and desire to understand their partner. To test whether verbosity accounts for the effect of LSM, romantic matching was regressed on dyads' mean word count and LSM z-scores in a logistic regression. LSM remained a strong predictor of matching when word count was included in the model, Odds ratio = 5.70, $p < .001$.

In summary, speed-daters were more than three times as likely to match with their date for every standard deviation increase in LSM. Critically, this association remained robust when controlling for speed-daters' perceived similarity with their dates, indicating that language style similarity uniquely predicts relationship initiation beyond self-reported similarity.

Study 2

Study 1 found that LSM during first dates predicted mutual romantic interest. Study 2 investigated whether this pattern of results extends to longer-term relationships. We hypothesized that naturally occurring LSM between current relationship partners would predict relationship stability at a three-month follow-up.

Method

Participants. Eighty-six couples (Age M = 19.0, SD = 1.4) participated in a study originally designed to test the effects of expressive writing on relationship stability (Slatcher & Pennebaker, 2006). Couples were recruited on the basis that they were in a committed heterosexual romantic relationship and that they engaged in IM conversation with each other daily. On average, couples had been dating approximately 1.31 years (SD = 1.06).

Procedure. Couples provided their IM chats that took place during the 10 days of the study. Each couple member completed the Relationship Assessment Scale (RAS; Hendrick, 1988) on the first day. The RAS is a face-valid measure of relationship satisfaction consisting of seven 7-point Likert-type items, such as, "In general, how satisfied are you with your relationship?" Three months later, relationship stability was assessed by asking couples whether they were still dating.

Language analysis. The ten days of IM conversations were grouped into three periods (before, during, and after a three-day expressive writing manipulation). Conversations were then

aggregated by participant and analyzed with LIWC. On average, participants wrote approximately 1,000 words to their partners during each time segment (*SD* = 1136, *Min* = 52, *Max* = 7782). LSM for each time period was calculated as in Study 1 and then averaged, yielding one mean LSM score per couple.

Results and Discussion

All analyses controlled for the effect of experimental writing condition, although hypothesis tests yielded identical conclusions when it was excluded. Relationship stability, operationalized as whether couples were still dating at the three-month follow-up, was regressed on mean LSM z-scores (Table 2). LSM significantly predicted relationship stability, Odds ratio = 1.95, $p = .012$. For every standard deviation increase in LSM, couples were approximately twice as likely to be together three months later. To illustrate, 76.7 percent of couples with mean LSM scores above the median were dating at follow-up, compared with 53.5 percent of couples whose mean LSM scores were at or below the median. As in Study 1, LSM remained a strong predictor of relationship stability when controlling for couples' mean word count, Odds ratio = 1.98, $p = .033$. [1]

Paralleling the Study 1 covariance analysis, LSM continued to predict relationship stability when couples' mean relationship satisfaction was included in the model, Odds ratio = 1.96, $p = .021$. Relationship satisfaction was unrelated to LSM, $r(84) = .11$, $p = .323$. Results indicate that LSM uniquely predicts relationship stability beyond partners' self-reported perceptions of relationship quality.

General Discussion

In two studies, an unobtrusive measure of nonconscious verbal matching uniquely predicted mutual romantic interest and relationship stability independently of traditionally strong

self-report predictors, including perceived similarity and relationship satisfaction. Notably, relationship outcomes in both studies were consequential: Both romantic matching and relationship stability determined the existence or nonexistence of a romantic relationship.

While there is currently no consensus on the specific mechanisms underlying nonconscious behavioral coordination, it is generally accepted that coordinated eye gaze, language use, and posture function to facilitate communication and mutual understanding (Pickering & Garrod, 2004; Shockley et al., 2009). Building on this theory, we speculate that people seek to understand and thus coordinate with a conversation partner to the degree that they find their partner engaging. Further, our results suggest that engagement in a conversation, which LSM theoretically reflects, is largely independent of the degree to which individuals feel similar to or are satisfied with their conversation partner.

As with the majority of verbal coordination research, our data were correlational. While Pickering and Garrod (2004) contend that language alignment causes mutual understanding, others contend that individuals' goals to be liked and understood cause behavioral coordination (Brennan & Hanna, 2009; Lakin, Arkin, & Chartrand, 2008). It is likely that LSM and its underlying psychological processes are bidirectionally linked. Specifically, we suspect that style matching and relationship engagement each reciprocally increase the other and jointly facilitate positive relationship outcomes (Niederhoffer & Pennebaker, 2002).

LSM predicts critical real-world behaviors in contexts ranging from academics to romantic relationships (Ireland & Pennebaker, in press). Measures of nonconscious verbal matching like LSM have the potential to illuminate previously hidden processes that determine the existence or nonexistence of social relationships. Extending previous findings that nonverbal coordination facilitates smooth interpersonal interaction, our results suggest that verbal

coordination during everyday conversations is integral to the initiation and maintenance of romantic relationships.

References

Brennan, S. E. & Hanna, J. E. (2009). Partner-specific adaptation in dialogue. *Topics in Cognitive Science (Special Issue on Joint Action), 1,* 274-291.

Chartrand, T. L. & van Baaren, R. (2009). Human Mimicry. *Advances in Experimental Social Psychology, 41,* 219-274.

Chung, C. K. & Pennebaker, J. W. (2007). The psychological function of function words. In K. Fiedler (Ed.), *Social communication: Frontiers of social psychology* (pp. 343-359). New York: Psychology Press.

Eastwick, P. W., Saigal, S. D., & Finkel, E. J. (in press). Smooth Operating: A Structural Analysis of Social Behavior (SASB) perspective on initial romantic encounters. *Social Psychological and Personality Science*.

Finkel, E. J., Eastwick, P. W., & Matthews, J. (2007). Speed-dating as an invaluable tool for studying romantic attraction: A methodological primer. *Personal Relationships, 14*, 149-166.

Gonzales, A. L., Hancock, J. T., & Pennebaker, J. W. (2010). Language style matching as a predictor of social dynamics in small groups. *Communications Research*, *31*, 3-19.

Hancock, J. T., Curry, L., Goorha, S., & Woodworth, M. T. (2008). On lying and being lied to: A linguistic analysis of deception. *Discourse Processes, 45*, 1-23.

Hendrick, S. S. (1988). A generic measure of relationship satisfaction. *Journal of Marriage and the Family, 50*, 93–98.

Ireland, M. E. & Pennebaker, J. W. (in press). Language style matching in writing: Synchrony in essays, correspondence, and poetry. *Journal of Personality and Social Psychology.*

Karremans, J. C., & Verwijmeren, T. (2008). Mimicking attractive opposite-sex others: The role of romantic relationship status. *Personality and Social Psychology Bulletin*, *34*, 939-950.

Lakin, J., Chartrand, T., & Arkin, R. (2008). I am too just like you: Nonconscious mimicry as an automatic behavioral response to social exclusion. *Psychological Science*, *19*, 816-822.

McCrae, R. R., Martin, T. A., Hrebícková, M., Urbánek, T., Willemsen, G., & Costa, P. T. (2008). Personality trait similarity between spouses in four cultures. *Journal of Personality*, *76*, 1137-1163.

Meyer, A., & Bock, K. (1999). Representations and processes in the production of pronouns: Some perspectives from Dutch. *Journal of Memory and Language*, *41*, 281-301.

Niederhoffer, K. G. & Pennebaker, J. W. (2002). Linguistic style matching in social interaction. *Journal of Language and Social Psychology, 21*, 337-360.

Pennebaker, J. W., Booth, R. J., & Francis, M. E. (2007). *Linguistic inquiry and word count (LIWC2007): A computer-based text analysis program*. Austin, TX: LIWC.net.

Pickering, M. J. & Garrod, S. (2004). Toward a mechanistic psychology of dialogue. *Behavioral and Brain Sciences, 27*, 169-225.

Richardson, D. C., Dale, R., & Kirkham, N. Z. (2007). The art of conversation is coordination: Common ground and the coupling of eye movements during dialogue. *Psychological Science*, *18*, 407-413.

Seider, B. H., Hirschberger, G., Nelson, K. L., & Levenson, R. W. (2009). We can work it out: Age differences in relational pronouns, physiology, and behavior in marital conflict. *Psychology and Aging, 24,* 604-613.

Segalowitz, S. J. & Lane, K. (2004). Perceptual fluency and lexical access for lexical versus content words. *Behavioral and Brain Sciences, 27,* 307-308.

Shockley, K., Richardson, D. C., & Dale, R. (2009). Conversation and coordinative structures. *Topics in Cognitive Science*, *1*, 305-319.

Simmons, R. A., Gordon, P. C., & Chambless, D. L. (2005). Pronouns in marital interaction: What do "you" and "I" say about marital health? *Psychological Science, 16,* 932-936.

Slatcher, R. B., Chung, C. K., Pennebaker, J. W., & Stone, L. D. (2007). Winning words: Individual differences in linguistic style among U.S. presidential and vice presidential candidates. *Journal of Research in Personality, 41*, 63-75.

Slatcher, R. B. & Pennebaker, J. W. (2006). How do I love thee? Let me count the words: The social effects of expressive writing. *Psychological Science, 17,* 660-664.

Slatcher, R. B., Vazire, S., & Pennebaker, J. W. (2008). Am "I" more important than "We"? Couples' word use in Instant Messages. *Personal Relationships, 15*, 407–424.

Tausczik, Y. R., & Pennebaker, J. W. (2010). The psychological meaning of words: LIWC and computerized text analysis methods. *Journal of Language & Social Psychology*, *29*, 24-54.

Taylor, P. J., & Thomas, S. (2008). Linguistic style matching and negotiation outcome. *Negotiation and Conflict Management Research*, *1*, 263-281.

Van Petten, C., & Kutas, M. (1991). Influences of semantic and syntactic context on open- and closed-class words. *Memory and Cognition*, *19*, 95–112.

Watson, D., Klohnen, E. C., Casillas, A, Simms, E. N., Haig, J. & Berry, D. S. (2004). Match makers and deal breakers: Analyses of assortative mating in newlywed couples. *Journal of Personality, 72*, 1029-1068.

Tables

Table 1

LSM Categories and Examples

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

Note. Categories are from LIWC2007.

Table 2

Logistic Regression Models Predicting Relationship Outcomes in Studies 1 and 2

	Model	Predictor	β	*SE*	Wald	*p*	Odds ratio
Study 1	1	LSM	1.11	0.54	4.25	.039	3.05
	2	Similarity	1.64	0.63	6.83	.009	5.16
	3	LSM	1.25	0.64	3.80	.051	3.49
		Similarity	1.77	0.68	6.75	.009	5.87
Study 2	1	LSM	0.67	0.27	6.30	.012	1.95
		Condition	-0.99	0.50	3.95	.047	0.37
	2	Satisfaction	0.88	0.27	10.48	.001	2.40
		Condition	-1.04	0.51	4.11	.043	0.35
	3	LSM	0.68	0.29	5.37	.021	1.96
		Satisfaction	0.88	0.28	9.56	.002	2.40
		Condition	-0.85	0.54	2.50	.114	0.43

Note. Outcomes are matching following a speed-dating event (Study 1) and relationship stability (Study 2). Similarity is pairs' average score on a two-item measure of self-reported similarity with one's speed-dating partner (see Finkel et al., 2007). Satisfaction is couples' average scores on the Relationship Assessment Scale (RAS; Hendrick, 1988). Conditions were control or expressive writing (see Slatcher & Pennebaker, 2006).

Table 3

Examples of High and Low LSM Conversations

LSM	Excerpt	Match
.77	W: Let's get the basics over with. What are you studying? M: Uh, I'm studying econ and poli sci, how about you? W: I'm journalism and English literature M: OK, cool. W: Yeah. M: Alright, um, where are you from? W: I'm from Iowa, a town of 700. ... M: I'm from New Jersey. Uh-- W: Probably not 700. ... M: Alright, well I mean, actually believe it or not, where I'm from in New Jersey has a lot in common with like Iowa and stuff ... Uh, how are you enjoying Northwestern? W: Um, I like it a lot. Um obviously it was a big transition coming from small town Iowa but, um I love the city and have had a really good time.	Yes
.54	W: Where are you from? M: Connecticut. ... How about you? W: Um I'm from Austin, Texas. M: Texas? Nice, OK. W: When you say football, I understand football. M: Oh, OK. W: That's kind of like one of those things. M: That's-- you a UT fan or a-- W: Um fan would be the wrong word. M: An understatement? Or an o-- W: No, the wrong word. M: OK. W: I've had enough football to last me a lifetime. M: Ah, OK. ... Well um, so what are you studying here? W: Oh I-- I study opera and mechanical engineering. … M: That's interesting. Are you in the music school? W: I am.	No

Note. Excerpts are from Study 1. Pairs who "matched" mutually desired future contact. M = man; W = woman. The higher LSM pair matched each other's use of personal pronouns (10.53% vs. 12.96%), auxiliary verbs (10.53% vs. 11.11%), and negations (1.75% vs. 1.85%). The lower LSM pair differed in the same categories (15.09% vs. 10.0%, 15.09% vs. 7.50%, 1.89% vs. 0.0%, respectively).

Footnote

[1]Several logistic regressions tested whether the effects of LSM were driven primarily by matching in a subset of its categories (e.g., pronouns, negations). No one category or subset of categories reliably predicted relationship outcomes in Studies 1 and 2.