

# Couples Research & Therapy *NEWSLETTER*

The Newsletter of the Couples Research & Therapy ABCT–SIG, Summer 2009

## CONTENTS OF THIS ISSUE

Digital Signal Processing and Computational Linguistic Methods for Measuring Emotional Arousal and Power Processes during Interaction	1
Baucom, Atkins & Christensen	
Letter from the Co-Presidents	2
Cobb & Rogge	
Treasurer's Update	3
Clements Blackmon	
Letter from the Student Co-Presidents	14
Aldridge & Brock	
Couples Practice Research Network: An Overview and Update	15
Kistenmacher & La Taillade	
Hot off the Press	16
Kudos	17

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## Digital Signal Processing and Computational Linguistic Methods for Measuring Emotional Arousal and Power Processes during Interaction

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The observational analysis of emotion- and power-linked behaviors has a rich and storied history within the intimate relationships literature. What is currently known about emotion- and power-linked behaviors is primarily derived from studies using standard observational coding, self-report, and psychophysiological methods. However, application of techniques developed in engineering (i.e., digital signal processing) and computer science (i.e., computational linguistics) offer alternative methods for assessing emotion- and power-linked behaviors that open new avenues for exploration and solve some difficulties frequently encountered with standard observational coding, self-report, and psychophysiological methods. This article describes the basic literatures supporting the use of digital signal processing and computational linguistics for assessing emotion- and power-linked behaviors respectively, provides an overview of how to implement these methods for existing datasets and new data collection, and summarizes the results of two studies using these methods to predict treatment outcome in a randomized clinical trial of two behavioral couple therapies and to explore correlates of demand/withdraw behavior.

This research was supported by grants from the National Institute of Mental Health awarded to Andrew Christensen at UCLA (MH56223) and Neil S. Jacobson at the University of Washington (MH56165) for a two-site clinical trial of couple therapy. A methodological supplement was also awarded to Andrew Christensen and David C. Atkins. After Jacobson's death in 1999, William George served as PI at the University of Washington. The authors are grateful for the enormous contributions that Neil S. Jacobson made to this research.

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## Letter from the SIG Co-Presidents

Rebecca Cobb<sup>1</sup> & Ron Rogge<sup>2</sup>

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Hopefully we are all wrapping up productive academic years (and long winters) with several glorious summer months in front of us. We wanted to take advantage of our column in this newsletter to give you a brief update on what is going on in the SIG.

### Recap of the 2008 ABCT conference in Orlando

**SIG Officers:** At the 2008 conference we elected a new Treasurer, **Kahni Clements**. This is an incredibly important role in the SIG (we all know how hard it is to keep track of and pry money away from busy academics!); thanks Kahni for stepping in and taking up the financial reins. If you have dues to pay, please contact Kahni at [kclements@psychiatry.umsmed.edu](mailto:kclements@psychiatry.umsmed.edu). We thank Lorelei Simpson, our outgoing treasurer, for an amazing job at keeping our SIG solvent in the past two years.

**Poster Awards:** At the 2008 conference we also presented the Robert L. Weiss Graduate Student Poster Awards for excellence in relationship research. The first place winner was **Robin Barry** mentored by **Erika Lawrence** at the University of Iowa for the poster "Predicting trajectories of change in spouses' disengagement from marital problem-solving: An attachment theoretical perspective." The second prize was awarded to two individuals: **Janette Funk**, mentored by **Ron Rogge** at the University of Rochester for her poster "Home sweet home: Predicting newlywed marital satisfaction in the context of the neighborhood environment," and **Rebecca Brock**, mentored by **Erika Lawrence** at the University of Iowa for her poster "Too much of a good thing: Overprovision versus underprovision of partner support." Thanks to all the committee members for their review of the candidates and congratulations to the students for their excellent work!

**SIG Events:** There were also several excellent SIG-sponsored events at the 2008 conference. We want to thank **Kristina Coop Gordon** for the excellent preconference event "Getting Past the Affair: How to Help Couples Heal after a Major Betrayal." The topics of affairs and how to treat couples in the aftermath is one that many of us grapple with in couples therapy, and the presentation provoked a stimulating and informative discussion (not to mention cocktail hour conversation). The Couples SIG was also represented by a set of excellent posters at the SIG Exhibition and Cocktail Hour. We would like to thank all of the graduate students and faculty mentors who presented their work in this forum.

**SIG Cocktail Hour:** Our student co-presidents, **Rebecca Brock** and **Will Aldridge** organized a wonderful evening where members could catch up, and of course discuss future research plans (psychologists are definitely not the type to gossip over lemon drop martinis and hors d'oeuvres). It is a significant effort coordinating this yearly event, and we send out a heartfelt thank-you to Will and Rebecca for making the event successful.

### News and Upcoming Events

**SIG Website:** Our webmasters, **Janette Funk**, **Soonhee Lee**, and **Amy Rodriguez**, have found a new home for our webpage, and despite the occasional hiccup you can access the Couples SIG webpage at <http://www.abctcouples.net/>. Thanks to our excellent webmasters for their hard work in facilitating this move and keeping our website up to date. As always, if you have news items, job listings, recent publications, measures or other tidbits that would be of interest to our SIG members, please forward them to any of our webmasters for posting. [jfunk@psych.rochester.edu](mailto:jfunk@psych.rochester.edu), [slee64@psych.rochester.edu](mailto:slee64@psych.rochester.edu), [arodri14@psych.rochester.edu](mailto:arodri14@psych.rochester.edu).

**SIG Newsletter:** As you are no doubt discovering first hand, our newsletter editors have done a great job this year gathering interesting articles and keeping us up to date on the SIG happenings. Thanks to **Amy Meade** and **Robin Barry** for their hard work!

**2009 Pre-Conference Event:** We are looking forward to next fall's conference in New York City! Although the hot weather was great for a visit to Disneyworld, but those who were

unlucky enough to be attending or presenting at the conference when the air conditioning went on the fritz will be happy to be in a cooler clime this fall! If seeing your colleagues and learning about new research activities isn't enough of an enticement to attend ABCT, just think of all the wonderful restaurants, interesting galleries and museums, Broadway plays and musicals...

Although it might be hard to top our excellent pre-conference event from last year, we are going to do our best. Our online survey to select the topic last year was very successful and we plan to launch our survey to select this year's topic very soon. Please take a few minutes (3-4) to complete the survey when it appears in your email inbox - we will send it to everyone who is on the email list and we'd like to survey as many members as possible. The event will be held on the evening of Thursday, November 19<sup>th</sup> in the conference hotel (exact location and times TBD on the website and via email).

**2009 SIG Exhibition and Cocktail Hour:** There will be some changes in the poster exhibition format this year. Because of space limitations in NY, we will no longer have full sized posters at tables and the number of submissions will be quite limited. This does mean that the competition for these submissions will be fiercer than in previous years. We encourage you to submit, but please note that not all submissions will be accepted for presentation. Even with the smaller format 'posters,' the SIG poster exhibition is an excellent opportunity for students to present research to a wider academic audience in a slightly less formal setting. As soon as we have guidelines for the posters from ABCT (late summer) we will send out an email informing you of submission deadlines.

**2009 Robert L. Weiss Graduate Student Poster Awards:** As in previous years, we will be soliciting submissions for the annual SIG poster award shortly before the conference. Be on the lookout for an email and website call for submissions. Continuing as committee members this year are **Erika Lawrence, Ronald Rogge, Beth Allen, and Cynthia Battle** - thanks again for your hard work reviewing the submissions last year, we know it was a tough job selecting the winners from amongst the many outstanding submissions.

We look forward to seeing you in New York (makes me want to break into song)! Have a great summer!



To begin, I'd like to thank Lorelie Simpson for her two years excellent years of service as SIG Treasurer! She did a great job organizing and coordinating finances and updating SIG membership. Thank you, Lorelie!

I'd like to introduce myself as your new SIG Treasurer. Please email me if you have any questions, recommendations, or updates to your title/affiliation or contact information

It was a great conference in Orlando! Our SIG is growing stronger each year. We now have 184 members, of whom 75 are professionals and 99 are students. In the past year we gained 20 new student members and 1 new professional member. Welcome!

Last November, we voted to increase dues from \$20 to \$25 for professional members. Dues remain \$5 for students, post-docs, and retired members. If you weren't at last year's conference or haven't had the chance to pay your dues, please send a check to

Kahni Clements-Blackmon with ABCT Couples SIG in the memo line, to the address below and I'll email you a receipt.

Presently, our SIG account balance is \$820.86. Prior to the 2008 conference, it was \$1003.85. In 2008 we deposited \$1335. At the conference we paid \$587.93 for our cocktail party, \$300 for student awards, \$300 for the pre-conference speaker, and \$340.06 for the pre-conference room, leaving our balance at \$810.86. Thank you for supporting our SIG!

Don't forget, if you haven't already, please join the SIG listserv at the [www.couplessig.net](http://www.couplessig.net).

Kahni

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*Continued from page 1.**Digital signal processing of emotional arousal*

Emotion has been the focus of a tremendous amount of study within psychology as well as in numerous social, natural, engineering, and computer science studies. One aspect of emotion that has been of interest to intimate relationship researchers is emotional arousal. Emotional arousal refers to the degree of emotional activation experienced during an emotional episode and is one of the two or three dimensions<sup>1</sup> thought to underlie emotional experience and expression. Emotional arousal during interaction, typically measured using psychophysiological methods, has been linked to a wide variety of important relational phenomenon including relationship quality (see Kieckolt-Glaser & Newton, 2001 for review), likelihood of divorce (Levenson & Gottman, 1985), domestic aggression (e.g., Jacobson et al., 1994.), and the demand/withdraw interaction pattern (e.g., Kieckolt-Glaser et al., 1996). Though these findings document the value of investigating emotional arousal in intimate relationships, it is not always possible or feasible to collect physiological measures of emotional arousal such as heart rate, blood pressure, and cortisol during actual interactions. Psychophysiological measurement of emotional arousal requires a large degree of specialized training and expensive and specialized equipment. Even if training and equipment requirements are not a concern, there are some applications, such as treatment outcomes studies, where it is not practical to collect physiological measures during interaction (e.g., during therapy sessions).

An alternative method for measuring emotional arousal during interaction is to analyze nonverbal, vocal properties of speech using digital signal processing (DSP) techniques. DSP refers to extracting parameters from digital waveforms using computer algorithms, and in the case of emotional arousal, the focus is on measuring the fundamental frequency ( $f_0$ ) of spouses' speech from audio recordings. During speech production, vocal folds in the larynx produce quasi-periodic patterns of vibration that we perceive as pitch. Faster vibration, measured in cycles per second or Hertz (Hz), correspond with higher pitch.  $F_0$  refers to the lowest frequency harmonic of these patterns of vibration (Kappas, et al., 1988; Standke, Kappas, & Schrer, 1984). A robust literature links higher  $f_0$  levels to higher levels of emotional arousal (e.g., Scherer, 2003).

The use of  $f_0$  as a measure of encoded arousal grew out of the work of Klaus Scherer and colleagues. Early efforts revolved around attempts to establish

“vocal fingerprints” for different emotions. Despite some very recent findings to the contrary<sup>2</sup>, specific patterns of vocal parameters do not appear to reliably differentiate specific emotions but increased  $f_0$  has been shown to be a reliable indicator of increased arousal across a wide variety of emotions (both positive and negative) using several different methodological paradigms including recordings of naturally occurring events, portrayals of emotions, and experimental manipulation of emotions (see Russell et al., 2003 and Juslin & Scherer, 2005 for recent reviews).

Recordings made during naturally occurring events provided compelling data for early work investigating the link between  $f_0$  and emotional arousal. For example, Johannes and colleagues (Johannes, Petrovitch Salnitski, Gunga, & Kirsch, 2000) examined the  $f_0$  of Russian astronauts and Austrian soldiers during training exercises. Mean  $f_0$  was found to increase under conditions of psychological distress as well as in conditions of cognitive load and physical stress. Importantly, increases in mean  $f_0$  appear to be unrelated to other physiological indices of arousal, such as heart rate and blood pressure, in physically stressful situations, but to be related to increases in heart rate and blood pressure under conditions of psychological stress. Convergent results have been found in recordings of conversations between pilots and air traffic controllers prior to fatal crashes of the aircraft involved with mean  $f_0$  increasing over time for both pilots and aircraft controllers (Simonov & Frolov, 1973; Sulc, 1977; Williams & Stevens, 1969).

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1. The circumplex model of emotion (Watson & Tellegen, 1985) suggests that all emotions can be mapped on to a two dimension space defined by the dimensions of arousal and valence, which is the degree of positivity vs. negativity. More recent developments with emotional theory suggest that there is the need for at least one more dimension, alternatively defined as approach/avoidance or dominance/submission, for differentiation of emotions that are often of particular interest to intimate relationship researchers, such as anger and fear. If only valence and arousal are used to map emotions, both anger and fear occur at similar levels of high negativity and high arousal. However, when the dimension of approach/avoidance is added to the model, anger and fear become appropriately distinct with anger mapping onto high approach and fear mapping onto high avoidance.
  2. Grimm, Kroschel, Mower and Narayanan (2007) were able to successfully identify unique vocal patterns associated with specific emotions using fuzzy sets. The use of fuzzy sets to map vocal parameters onto specific emotions assumes that the boundaries between specific emotions are overlapping and less crisp than has traditionally been assumed by emotion theorists. Fuzzy sets appear to be a promising statistical technique for identifying specific emotions from continuous measures of emotional dimensions but are just beginning to be explored within the realm of emotion and are in need of further study and development.

Researchers have also long been interested in studying patterns of  $f_0$  that are related to psychological disorders (e.g., Eldred & Price, 1958; Zuberbier, 1957; Zwirner, 1930). Tolkmitt, Helfrich, Standke, and Scherer (1982) measured mean  $f_0$  during interviews conducted with psychiatric in-patients who were diagnosed with either depression or schizophrenia. Mean  $f_0$  from interviews conducted shortly before discharge was significantly lower than mean  $f_0$  from interviews conducted shortly after admission. Tolkmitt and colleagues (Tolkmitt et al., 1982) interpreted these findings as indicating decreased levels of distress due to successful therapy.

Studies of emotional portrayals similarly link higher levels of  $f_0$  to higher levels of emotional arousal. For example, Leionen, Hiltunen, Linnankoski, and Laakso (1997) asked male and female participants to portray 10 different emotions (frightened, angry, astonished, sad, neutral, commanding, content, pleading, admiring, and scornful) while saying the word "saara". Portrayals of astonished, frightened and angry were found to have significantly higher mean  $f_0$  than neutral portrayals. However, no other significant differences were found between the various portrayals. Convergent results were found by Banse and Scherer (1996), Wallbott and Scherer (1986) and Fairbanks and Provonost (1938), all of whom used slightly different methodologies that asked participants to either read an emotionally neutral paragraph or to speak a nonsense words, and found mean  $f_0$  to increase with arousal level.

Though the results of portrayal studies were consistent with the findings from earlier studies of naturally occurring stressors, some researchers were skeptical that actors could produce accurate and natural portrayals of emotions. This skepticism was based in part on findings that showed that the naturalness of portrayed emotion is partially dependent on individual actors' abilities (Cosmides, 1983; Wallbott & Scherer, 1986). Researchers turned to a third methodology, inducing emotions, to address the skepticism about portrayal studies.

Induction studies of vocal parameters have used three general strategies for arousing emotions and stress in participants. The most frequently used strategy has been to have participants complete some sort of stressful task in a laboratory setting. Bachorowski and Owren (1995) presented a series of two words for very short time periods to participants and asked them to judge whether the words were real or nonsense. Participants received feedback about the accuracy of their answer after each trial. Positive emotions were induced by congruency between correct responses and positive feedback while negative

emotions were induced by incongruence between response and feedback. Mean  $f_0$  was significantly elevated for both men and women during the stressful task relative to their baseline values when both positive and negative emotions were induced.

Another paradigm used by researchers to induce emotional arousal is to have subjects participate in non-evaluative activities that naturally evoke emotions. Utsuki and Exline (1991) videotaped participants who took part in mock presidential debates. Mean  $f_0$  was found to be significantly higher immediately preceding the start of the debate relative to baseline measures; the magnitude (~ 4Hz) of the increase was found to be approximately equal for both men and women. Similar results were found when participants' arousal was manipulated by reading affectively laden stories (Sobin & Alpert, 1999).

A final paradigm that has been used to induce emotions is the administration of psychotropic medications. Helfrich, Standke, and Scherer (1984) gave non-clinically diagnosed participants varying levels of anti-depressants, anxiolytics, and placebos using a double blind methodology. Consistent with expectations that more depressed individuals would exhibit lower mean  $f_0$  than less depressed individuals, significantly higher levels of mean  $f_0$  were found in an anti-depressant condition relative to a within-subject placebo condition. No significant differences were found between the anxiolytic and placebo conditions.

In summary, studies that have measured  $f_0$  during naturally occurring stressors, portrayals of numerous emotions, and artificially induced emotions have consistently found that higher levels of mean  $f_0$  are related to higher levels of arousal. These findings have been obtained in a wide variety of naturally occurring stressors, including aircraft pilots and controllers, astronauts, soldiers, therapy clients, and students, as well as in a wide variety of studies that have employed numerous methodologies for portraying emotions and inducing arousal. Importantly, mean  $f_0$  appears to more closely tied to psychological arousal than to physical arousal, and the relation between higher mean  $f_0$  and higher levels of arousal does not appear to be affected by the valence of the arousal that is being experienced.

Several different indices of  $f_0$ , including mean, maximum, floor, range and variability, have been empirically linked to arousal level. The largest body of work has used mean  $f_0$  as the primary vocal index of emotional arousal. Juslin and Scherer (2005) have recently recommended the use of  $f_0$  range in place of mean  $f_0$ . Future research would likely benefit from using both mean  $f_0$  and  $f_0$  range to allow comparison of findings with existing studies that used mean  $f_0$  and to allow transition to a "cleaner" index of  $f_0$ .

### *Generating $f_0$ in new and existing datasets*

The process of generating  $f_0$  values from digital recordings is similar regardless of whether it is being done with new or existing datasets. In both cases there are two requirements: 1) separate audio recordings of each spouse speaking and, 2) Praat (Boersma & Weenink, 2005), a free, Windows based program available at <http://www.fon.hum.uva.nl/praat/>.

Separate audio recordings of each spouse speaking are relatively straightforward to create if you are recording new interactions. The easiest way to accomplish this is to use a separate unidirectional microphone for each spouse, a multichannel audio card, and audio recording software that supports multichannel recording (e.g., Sony's Sound Forge 9.0). Each spouse's speech can then be recorded on a separate audio channel and output as a separate audio file.

Separate audio recordings of each spouse speaking are more complicated to generate for existing datasets. Any existing recordings of interactions will have recorded both of the spouses speaking in the same file so you need to know when each spouse is speaking in order to correctly calculate his or her  $f_0$  value. There are two main options for accomplishing this task. The most efficient option is to use an automatic speaker recognition algorithm to analyze the combined audio file. Mel-frequency cepstral coefficients (MFCCs; Mermelstein, 1976), which summarize the power spectrum of a sound, are a well-trying metric for determining who is speaking at any given time. The power spectrum of each person's speech is unique and can be used to differentiate his or her speech from anyone else's. Though the use of MFCCs for automatic speaker recognition is a proven technology, carrying out this process requires the use of additional software that is not commonly used in psychology. In my experience, advanced graduate students in electrical engineering and computer science have made excellent collaborators for choosing this method of analyzing archival datasets. The other method, splitting the combined file by hand, is much more simple and reliable but also much slower. To accomplish this method, the only thing that is required is a nonlinear digital editing program, such as Adobe Premiere or Adobe Audition. This type of program allows you to divide a single audio track into multiple audio tracks and thereby create separate audio files for just the wife's speech and just the husband's speech.

Regardless of which method is used to identify which spouse is speaking at each point in time, the

second and final step is to analyze the audio file with Praat. Praat is used to read in the audio file (waveform audio format (.wav) files work well) and then to produce either summary statistics for the whole recording or a time series of values with summary statistics for each .25 second of the interaction<sup>3</sup>. The end result of this process is a value of mean  $f_0$  as well as minimum and maximum  $f_0$  that are needed to calculate range of  $f_0$ , which is maximum – minimum  $f_0$ . A sample audio file is on the SIG website if you'd like to analyze a short audio file with Praat. A screenshot from Praat along with summary and time-series results of analyzing this file are included in Figures 1 - 3.

### *Probable future DSP developments for measuring dimensions of emotion*

Using DSP to measure emotional arousal by calculating  $f_0$  values for speech samples uses well developed and easily accessed programs. There are a number of additional efforts currently underway to apply DSP to video recordings to generate other measures of emotion-linked behaviors. Teams from Carnegie Mellon University ([http://www.ri.cmu.edu/research\\_project\\_detail.html?project\\_id=10&menu\\_id=261](http://www.ri.cmu.edu/research_project_detail.html?project_id=10&menu_id=261)) and the University of California, San Diego ([http://mplab.ucsd.edu/?page\\_id=2](http://mplab.ucsd.edu/?page_id=2)) have successfully developed DSP technologies for analyzing facial expressions in video recordings based on the Facial Action Coding System (FACS; Ekman & Friesen, 1976). FACS provides a framework for identifying specific emotions from the activation of facial musculature. FACS coding is a very time intensive system and these successful implementations of DSP techniques may make FACS coding of spousal interactions more feasible and realistic. Teams at the University of Southern California are also working on implementing DSP methods for analyzing facial expressions but are basing their efforts on the Facial Expression Coding System (FACES; Kring & Sloan, 2007) to generate a continuous measure of valence.

### *Assessing power processes with computational linguistics*

Power has often been conceptually placed at the core of romantic relationships and family systems (e.g., Huston, 1983; Minuchin, 1974). Power is typically thought of as consisting of three separate but overlapping domains, potential power, the use of power, and outcome power (Cromwell & Olson,

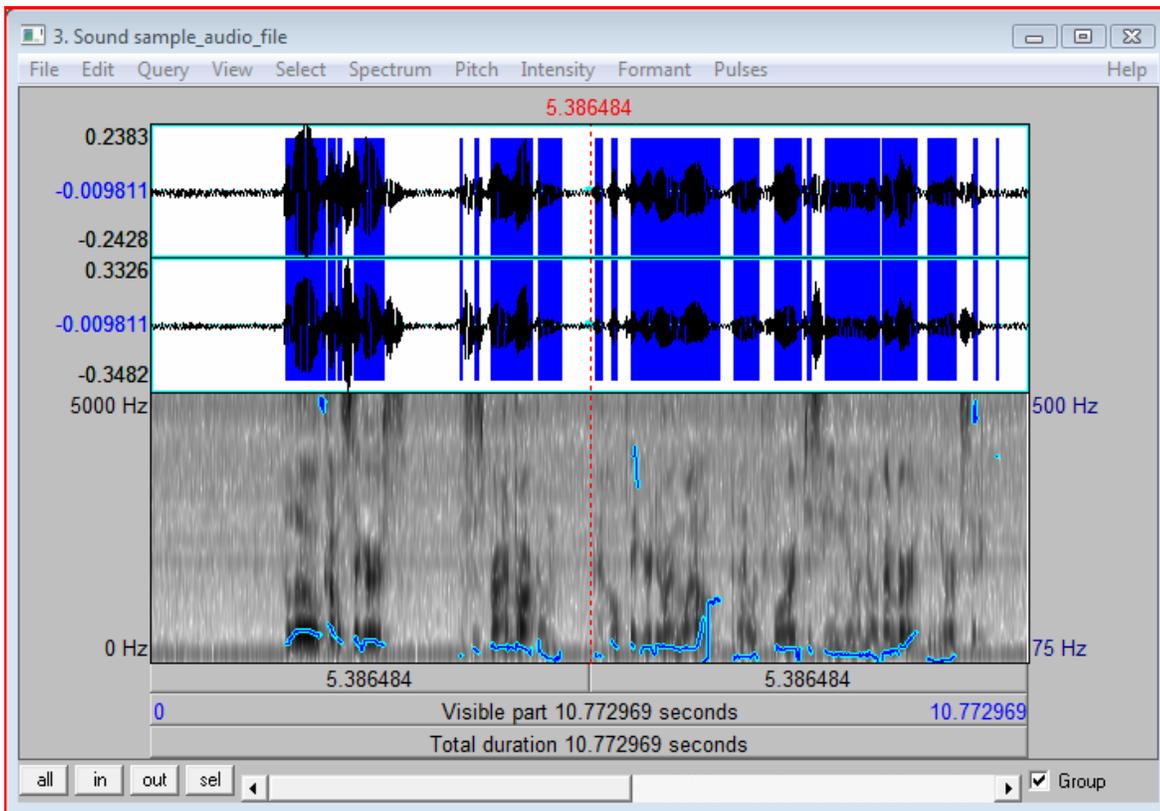


Figure 1. Sample screenshot from Praat.

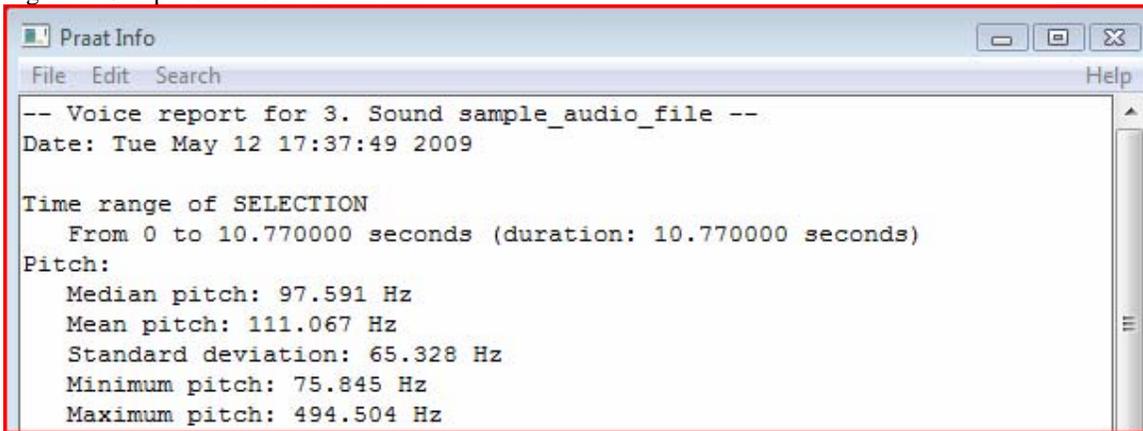


Figure 2. Sample summary output from Praat.

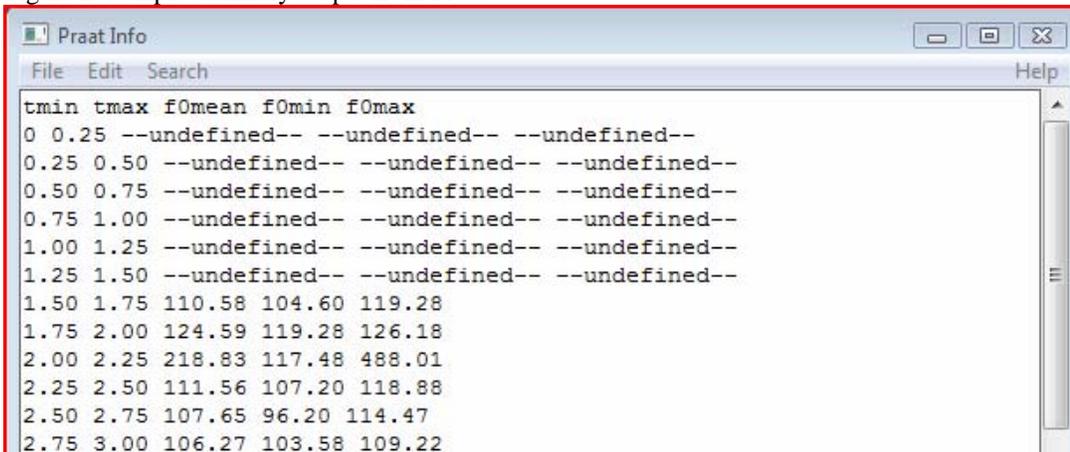


Figure 3. Sample time-series output from Praat

1975). Potential power refers to economic and individual difference based sources of influence, such as monetary earnings, commitment, or desire for intimacy, that a spouse contributes to the relationship; power processes refer to the interaction techniques that are used by spouses in attempts to gain control over assets of the relationship; outcome power refers to who has the final say in a problem-solving or a decision-making process. Power processes have been found to have particularly important consequences for relationship quality. Power processes are the means by which spouses attempt to restructure their marriages to be a better fit for their needs and to resolve conflict when it arises within their marriage. Much of the work on power processes within the intimate relationships area has utilized observational coding and self-report methods. Recent advances in the field of computational linguistics provide alternative methods for studying power processes that create new possibilities for exploration and overcome some of the limitations of standard assessment tools.

As is the case with emotion, power has also been the subject of study in a wide variety of social sciences and humanities. Communication studies and discourse analysis scholars have long advocated the analysis of language as a means of studying power (e.g., Lakoff, 1977; Sacks, Schegloff and Jefferson, 1974). Within these traditions, both microanalytic and macroanalytic perspectives have emerged. Microanalytic perspectives focus on specific words or linguistic behaviors while macroanalytic perspectives emphasize broad classes of behaviors. Recent application of computational linguistics to the study of romantic relationships driven by the work of Atkins and colleagues (e.g., Atkins, 2006) permits these methods to be used to analyze words spoken during interaction between spouses in a highly efficient and reliable fashion.

#### *Microanalytic models of power*

One microanalytic approach for examining linguistic power processes is to use a semantic perspective in investigating patterns of word usage. Hedges are words, such as might, could, and a little bit that reduce or weaken the certainty of a statement; greater usage of hedges is generally associated with lower power potential and outcome power. With regard to potential power, O'Barr and Atkins (1982) compared the courtroom testimony of high and low status men and women and found that hedges were more prevalent in the testimonies of low status than in high status individuals regardless of their sex. Similar results were found in a study of undergraduates whose power was experimentally manipulated in a series of

role plays (Morand, 1996). With regard to outcome power less frequent hedge use has consistently been found to be related to greater power. For example, Holtgraves and Lasky (1999) had undergraduates listen to different versions of a speech advocating for the introduction of comprehensive exams at a university. The only difference between the speeches was the presence of frequent hedges in the low power version of the speech. Participants rated the high power version of the speech as significantly more persuasive than the low power version of the speech. Less frequent hedging has been judged as more persuasive in a number of different types of language samples, including using written as well as spoken messages advertising new products (Areni & Sparks, 2005; Lituchy & Wiswall, 1991), transcripts of court proceedings (Bradac, Hemphill & Tardy, 1981), and tape recordings of crisis intervention phone calls (Bradac & Mulac, 1984).

#### *Macroanalytic approach to power*

One particularly promising macroanalytic model of power focuses on the amount of freedom that the target of an influence attempt has to respond to the influence attempt. Originally proposed by Kipnis and colleagues (Fung, Kipnis, & Rosnow, 1987; Kipnis & Schmidt, 1985; Kipnis, Schmidt, & Wilkinson, 1980), the two poles of this dimension are referred to as hard and soft influence tactics. Hard influence tactics are controlling, coercive, and give the target of influence very little choice in deciding how to respond to influence attempts while soft influence tactics are collaborative and give the target of influence some freedom in responding to influence attempts (Bruins, 1999; Kipnis, 1984; van Knippenberg, van Eijbergen, & Wilke, 1999). Numerous studies employing this taxonomy have linked the use of hard and soft influence tactics to both potential and outcome power.

More frequent use of hard influence tactics and less frequent use of soft influence tactics have been linked to both higher potential power and higher outcome power. When potential power is defined in terms of absolute authority using hierarchical position within a company, more powerful individuals, whether male or female, tend to use hard tactics more frequently when interacting with less powerful coworkers than they do when interacting with similarly powerful or more powerful coworkers (Fung et al., 1987; Kipnis, Schmidt, Swaffin-Smith, & Wilkinson, 1984; Kipnis, Schmidt, & Wilkinson, 1980; Kolberg, 1990; van Knippenberg et al., 1999; Yukl & Falbe, 1990; Yukl & Tracy, 1992). Likewise, Fung et al. (1987) found that soft influence tactics are

used more often than hard influence tactics when the influence target holds a higher position in a company.

It is important to note that in addition to investigating the links between potential power, outcome power and linguistic behaviors, there has also been a large amount of effort devoted to the study of sex differences in these linguistic behaviors. Though some significant sex differences have been found in these linguistic behaviors, the majority of studies have failed to uncover sex differences and recent reviews have concluded that these linguistic behaviors are better understood as indices of power rather than as being representative of sex-based differences in communication styles (Anderson & Campbell, 1998; Carli, 1990; Falbo & Peplau, 1980).

#### *Computational linguistic approaches applied to power processes*

Computational linguistics programs provide an efficient and reliable way to measure the use of hedges and hard/soft influence tactics. Computational linguistics programs analyze the transcript of an interaction and provide summary statistics of the words that spouses used during the interaction. Given that existing research has generated large lists of specific hedges, word counting programs, such as Linguistic Inquiry and Word Count (LIWC; Pennebaker, Francis, & Booth, 2001), are a good option for generating this index of power processes. LIWC counts the relative frequencies of a pre-defined category of words, or a dictionary, within a sample of text and the summary score it generates represents the percentage of the total words that the parameter of interest accounts for in the sample of analyzed text. For example, a hedge score of .5 would mean that every other word was a hedge.

It is important to note that LIWC is subject to several limitations related to the quality of the pre-defined category of words. All possible permutations of a phrase must be included in the dictionary in order to be included. For example, suppose you wanted to count the number of times that a participant said, "I think". If a participant said, "I really think", or, "I thought", those phrases would not get counted unless each was specifically included in the dictionary. Additionally, misspellings in either the dictionary or the text can have a large impact of the quality of the results derived from LIWC.

The complexity of the phrases and statements used to create influence makes them difficult to assess using word counting programs. Latent Semantic Analysis (LSA; Landauer, Foltz, & Laham, 1998), another computational linguistic program, determines the contextual meaning of words and phrases and is a

more realistic option for use in measuring influence tactics.

In LSA, two samples of text are compared in terms of the similarity of their semantic meaning<sup>4</sup>. To use LSA to analyze the transcript of an interaction, it is first necessary to generate a sample of text that contains words whose semantic meaning is consistent with the phenomenon of interest. For example, we could use the words "insist, criticize, ridicule, superiority, dominance" to be examples of hard influence tactics and the words "compromise, negotiate, clarify, explain, accord, reason" to be example of soft influence tactics. Then a semantic space must be selected in order for LSA to derive the semantic meaning of both the comparison text and the transcript of the interaction. Importantly, the meanings of words are derived by analyzing both the contexts that words appear in as well as the contexts that the words are absent from in a semantic space. This aspect of LSA allows it to consider words that do not appear in the comparison text yet are similar in meaning to words that are in the comparison text. For example, LSA would score the word "care" as having similarity to the word "love" even if "care" was not in the comparison text and "love" was. The result of the LSA analysis is a single score representing the similarity of the comparison text to the transcript in overall semantic meaning. The higher the value, the greater the similarity between two samples of text. Additional details about using LSA for these purposes are available in Baucom (in press).

To conduct either of the two types of analyses described here, it is necessary to have a transcription of the interaction as well as the required computer program. LIWC is available for purchase from <http://www.liwc.net/index.php>, and a free, web-based version of LSA is available at <http://lsa.colorado.edu/>. Interested researchers may find it helpful to consult Mergenthaler, and Stinson (1992) for recommendations for generating transcriptions for psychological research.

#### *Example studies using these techniques*

##### *Emotional arousal, power processes and the demand/withdraw interaction pattern.*

Baucom (2008) used DSP, computational linguistics, and observation coding methods to investigate links between the demand/withdraw interaction pattern, power processes, and emotional

4. LSA is a very general method for extracting underlying linguistic dimensions in a corpus of text. These underlying dimensions can be used to make similarity comparisons of words and/or passages, though this does not capture the extent of LSA's uses. See Landauer, McNamara, Dennis, & Kintsch, 2007 for a full description of LSA and extensions to LSA.

arousal in treatment-seeking and community couples. The demand/withdraw interaction pattern occurs when one partner, the demander, nags, criticizes or complains to the other in attempt to create change within the relationship whereas the other partner, the withdrawer, avoids, withdraws from or terminates the interaction in response (Christensen, 1988). Frequent and intense occurrence of the demand/withdraw interaction pattern has been shown to be characteristic of distressed relationships. Power and emotional arousal have been hypothesized to be important components of the occurrence of demand/withdraw behavior as well as of the tendency for partners to assume behavioral roles, i.e. the likelihood of being a demander vs. a withdrawer (see Eldridge & Christensen, 2002 for a review). The treatment-seeking couples in Baucom (2008) were severely and stably distressed married, heterosexual couples who took part in a randomized clinical trial of two couple therapies (Christensen, Atkins, Berns, Wheeler, Baucom & Simpson, 2004). The community couples were married and dating heterosexual couples, lesbian couples and gay male couples who ranged from moderately satisfied to moderately dissatisfied. Demand/withdraw behavior was observationally coded in two identically structured conflict interactions using similar coding systems and power processes and emotional arousal were assessed in the same manner in both samples of couples. Microanalytic power processes were assessed using observationally coded interruptions and hedges (measured using LIWC); macroanalytic power processes were assessed using hard and soft influence tactics (measured using LSA); emotional arousal was assessed using mean  $f_0$  (measured with Praat).

Both the total amount of demand/withdraw behavior and the relative distributions of demanding and withdrawing behaviors between partners were significantly associated with power processes and encoded arousal. Specifically, greater frequency of hedge use, higher levels of soft influence tactic use, and lower levels of mean  $f_0$  were associated with lower levels of total demand/withdraw behavior in both samples<sup>5</sup>. Additionally, demanders were found to use significantly more hard influence tactics than withdrawers in both samples, and demanders were found to have significantly higher  $f_0$  than withdrawers in the treatment-seeking sample<sup>6</sup>. There was a non-significant trend of similar magnitude in the same direction in the community sample between mean  $f_0$  and relative demanding and withdrawing behaviors. There were no significant differences in the associations between total or relative

demand/withdraw behavior and power processes or emotional arousal across couple composition (i.e., same-sex couples relative to cross-sex couples) in the community sample.

This collection of results is consistent with the idea that emotional arousal and power are important intra- and interpersonal correlates of demand/withdraw behavior. Consistent with previous conceptual models of the involvement of power in demand/withdraw behavior, shared power, operationalized as more frequent use of hedges and greater use of soft influence tactics, was associated with lower levels of demand/withdraw behavior while asserted asymmetrical power, defined as more frequent use of interruptions and greater use of hard influence, was associated with higher levels of demand/withdraw behavior. Power processes were also associated with the behavioral roles that partners assume when engaging in demand/withdraw behavior. Demanders used more hard influence tactic language than withdrawers. This finding suggests that when demanders ask for a change from their partners, they do so by frequently using strong emotional terms and by leaving very little room for negotiation in their request (Baucom, in press).

Results linking higher levels of mean  $f_0$  to higher levels of overall demand/withdraw behavior are consistent with a large body of empirical evidence that has linked conflict to arousal (see Kieckolff-Glaser & Newton, 2001 for a review) and with the hypothesis that demand/withdraw behavior is associated with arousal level. However, the finding that higher levels of  $f_0$  are associated with an increased tendency to assume a demanding role is opposite of what would be predicted for the escape conditioning model (ECM; Gottman & Levenson, 1988). The ECM suggests that partners may withdraw from conflict when their level of emotional arousal is unbearably high in an attempt to distance themselves from the arousing conflict, and that partners who are particularly sensitive to conflict are likely to assume a withdrawing role within their relationship. It is possible that demand/withdraw behavior is associated with emotional arousal in a more complicated manner than is hypothesized by the ECM. The ECM considers emotional arousal independent of the emotion linked with it; it is possible that emotional arousal is associated with different

5. More frequent interrupting behavior and higher levels of hard influence tactic use were significantly associated with higher levels of demand/withdraw in the treatment-seeking sample, but these results did not replicate in the community sample.
6. Demanders were also significantly more likely to use hedges and soft influence tactics than withdrawers but only in the community sample.

emotions for demanders and withdrawers. Exploratory post-hoc analyses suggest that demanders experienced significantly more anger than withdrawers and that withdrawers experienced significantly more anxiety than demanders. These results linking relative demand/withdraw behaviors to different emotions should be considered as tentative as they require replication in a study specifically intended to test these associations (Baucom, in press).

*Emotional arousal, power processes and response to couple therapy*

Emotional arousal and power processes assessed with DSP and computational linguistics have also been linked to response to two couple therapies two years after treatment termination. Results of a randomized clinical trial of two behaviorally based couple therapies, Integrative Behavioral Couple Therapy (IBCT; Christensen & Jacobson, 2000) and Traditional Behavioral Couple Therapy (TBCT; Jacobson & Margolin, 1979), have shown that both therapies create improvement in relationship functioning that is maintained over a period of two years after treatment termination, with a statistically significant but not dramatic advantage for IBCT (Christensen, Atkins, Yi, Baucom, & George, 2006). Atkins and colleagues (2005) examined pre-treatment demographic, intrapersonal and interpersonal variables as predictors of treatment response at termination. Treatment condition, gender, years married, distress level and a sexual satisfaction by treatment condition interaction emerged as significant predictors of the rate of improvement in relationship satisfaction (Atkins et al., 2005).

Recent work by Baucom and colleagues (Baucom, Atkins, Simpson, & Christensen, 2009) examined prediction of treatment response two years after termination in the same randomized clinical trial of IBCT and TBCT using the same set of pre-treatment variables as Atkins et al. (2005) with the addition of  $f_0$  range, hard and soft influence tactics and several other empirically based predictors from the same pre-treatment assessment. Study findings showed strong associations between 2-year outcome, wife's pre-treatment  $f_0$  and the couple's use of hard influence tactics for moderately distressed couples in both therapies. Additionally, the couple's use of soft influence tactics was associated with 2-year outcome for couples receiving IBCT. Higher levels of arousal, higher levels of hard influence tactic use, and lower levels of soft influence tactic use during pre-treatment conflict interactions were all associated with less positive response to therapy.

The association between higher levels of pre-treatment arousal and less positive long-term response to couple therapy is consistent with studies that have documented long-term associations between higher levels of conflict related arousal and an increased likelihood of divorce (e.g., Levenson & Gottman, 1985). Though the mechanisms linking arousal to treatment outcome are not yet known, it may be that spouses are unable to effectively join emotionally with their partners or to problem-solve during therapy sessions when they are highly aroused by their own sources of distress. The emotional and cognitive demands of therapy may be too great when spouses are already using all of their available cognitive resources and coping abilities to handle being in a highly aroused emotional state (Baucom, in press).

The results linking power processes to outcome are consistent with previous randomized treatment outcome studies of behavioral couple therapies and with the theoretical underpinnings of the interventions used in IBCT. Hard influence tactics are characterized by high levels of emotional manipulation and pressure and decreased room for spouses to discuss requests for change. This finding is in line with Jacobson and Christensen's (1998) suggestion that a collaborative set, which is a shared sense of investment in working on the relationship and a willingness to compromise in order to strengthen the relationship, is a crucial ingredient for successful couple therapy. One of the primary interventions in IBCT is empathic joining, a technique that aims to get spouses to share vulnerable emotions related to on-going distress (Jacobson & Christensen, 1998). Using higher levels of soft influence tactics, which are characterized by collaboration, connection and shared power, likely makes it easier for couples to engage in empathic joining and thus to be more responsive to IBCT (Baucom, in press).

*Summary and future directions*

The use of DSP and computational linguistics open new possibilities for efficient and reliable exploration of emotional arousal and power processes during interaction. No additional equipment is required (though some additional equipment would be helpful) to use either technique beyond what is typically used to record interactions. Some additional software is necessary but much of this software is freely available on the internet. Collaborating with researchers outside of psychology would likely increase the efficiency of conducting either form of analysis but straightforward methods of data preparation allow for both types of analyses to be done without the involvement of engineers and/or computer scientists if that is not

desirable or possible. Finally, future developments in DSP technology will likely make it possible to analyze valence and specific emotions from digital video recordings.

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# Letter from the Student Co-Presidents

William Aldridge II<sup>1</sup> & Rebecca Brock<sup>2</sup>

<sup>1</sup>University of North Carolina, Chapel Hill, <sup>2</sup>University of Iowa

Attending SIG member presentations each year at the ABCT convention is so enjoyable, and last year was no different. From a broad perspective, one can truly witness the movement of the couple research and therapy field. At a more specific level, these presentations provide us the opportunity to engage with each other professionally and intellectually, and to sharpen our own research and practice.

Of course, another important part of each convention is the opportunity to socialize with each other and have a real fun time. Our SIG has always done an incredible job of balancing work and play and this is one of the main reasons our group remains much like a family despite how big it grows. In fact, I've heard many describe the convention experience as, in part, an "annual family reunion for the SIG."

Together, Becca and I continue to make the social aspects of the Couples SIG one of the foci of our student co-presidency. Last fall, in addition to our annual Couples SIG Cocktail Party, we had the Couples SIG After-Dinner Student Cocktail Event (yes, we're still working on the name...). We hope some form of this student social event will continue to re-connect Couples SIG students for fun and catching-up each year.

The Big Apple brings exciting opportunities for play, and Becca and I will soon be planning both the 2009 Couples SIG Cocktail Party and the 2009 Couples SIG student social event. Of course, planning social events for large professional groups brings certain challenges.

In 2004, our general SIG social gathering transitioned from a dinner format to a cocktail format due to the growing size of the SIG. This has helped keep the event practical while continuing to provide an opportunity for catching up and unwinding together. Still, we look for ways to integrate the old charm of our SIG dinners into the new cocktail format. In 2005, this was re-captured in the retirement tribute that was given to Gary Birchler during the SIG cocktail party. In 2007, then-Student-Co-Presidents Brian Baucom and Eric Gadol brought back a little of that old charm by holding the SIG cocktail party at a local brew pub in Philly and providing an informal dinner opportunity following cocktails.

In 2009, we want to consider ways to recapture some of the old charm in our SIG cocktail party. As we begin the planning process, we'd really like to hear your thoughts and opinions about how we might be able to do this, whether in the location of the cocktail party or in specific cocktail party activities. In addition, for the 2009 Couples SIG student social event, we not only want to hear some re-naming suggestions, but also ways to heighten both the anticipation for and experience of the event. So whether in the timing of the event (e.g., happy-hour vs. after-dinner vs. late-night) or the location of the event (i.e. the hotel bar or one of the Big Apple's famous night-lights), students, let us know what you think.

We end with a usual reminder to student Couples SIG members: make sure that you have subscribed to the **Couple SIG student listserv**! However, we also want to add a new reminder for this newsletter edition: if you are on Facebook, make sure to join the new **ABCT Couples SIG Student Facebook Group**. Together, the student listserv and Facebook group serve as the main channels for Couples SIG student news and event updates. If you have not subscribed to the student listserv and would like to join, just send an email to Becca at [rebecca-brock@uiowa.edu](mailto:rebecca-brock@uiowa.edu) or Will at [will\\_aldrige@unc.edu](mailto:will_aldrige@unc.edu).

Happy spring to everyone and best wishes for a relaxing yet productive summer!

# Couples Practice Research Network: An Overview and Update

Barbara Kistenmacher<sup>1</sup> and Jaslean La Taillade<sup>2</sup>  
<sup>1</sup>*Bronx-Lebanon Hospital* & <sup>2</sup>*University of Maryland*

The Couples Research and Therapy SIG Practice Research Network (PRN) was initially established in order to: 1) learn more about the outcome of couple therapy across diverse clinical settings and populations; 2) establish a database which SIG members could access for research purposes; 3) formalize practitioner-to-scientist communication about what is happening in the treatment of couples in “real world” settings; and 4) improve the quality of interventions being provided to couples.

Based on several meetings since the establishment of the PRN committee, we agreed on the following **strategic plan**:

1. Build knowledge and consensus for the PRN, beginning with Dr. Tom Borkovec’s presentation on establishing and maintaining PRN’s at the 2005 ABCT pre-conference workshop
2. Obtain additional information regarding existing PRN’s and their operation
3. Conduct a web survey of the SIG to determine how many SIG members would be interested in participating in the network, and to obtain information about their clinical practices (e.g., number of couples seen per year, demographic characteristics of clients and treatment providers, etc.)
4. Outline the procedures necessary for the establishment and maintenance of the database (e.g., ethical and funding issues, accessibility, confidentiality, etc.)
5. Develop a core battery of best practice assessment measures that can be easily administered by therapists at the end of sessions to reliably assess pertinent target behaviors (e.g., relationship satisfaction, communication behaviors, etc.) relevant to progress in treatment

We established several subcommittees within the PRN who would be responsible for accomplishing each of the strategic plan items. These committees include: Membership Committee, for recruiting persons interested in the PRN; Measures Committee, for reviewing and selecting measures to survey couples; Ethics/IRB Committee, for addressing human subjects and IRB issues pertinent to the establishment and maintenance of the network; Database Committee, for establishing, maintaining, and disseminating data collected from couples; and the Research/Practice Link Committee, for establishing and maintaining collaborative relationships between practitioners, scientists, and scientist/practitioners within the PRN.

We agreed that the Membership Committee, led by Jaslean and Barb, would create a survey that would be reviewed by the larger PRN committee and then sent to all Clinic Directors of couples programs within the SIG.

To date, we have accomplished #1 and #2 of the strategic plan and are very close to completing step #3. We also recently invited a new faculty member, Dr. Susan Perkins, to join our committee. Susan has been helping Barb develop a comprehensive list of e-mails of Clinical Directors. The survey should be sent very soon, so please look out for it!

During the SIG meeting at the 2009 ABCT Convention, we plan on updating members of the SIG on the results of the survey. In addition, we plan to discuss the steps involved in establishing and maintaining the database. Those persons who are, and wish to be, involved with the Ethics/IRB Committee, as well as with the PRN, please contact Jaslean La Taillade ([jaslean@umd.edu](mailto:jaslean@umd.edu)) or Barb Kistenmacher ([bkistenm@bronxleb.org](mailto:bkistenm@bronxleb.org)). We look forward to working with all of you in the future and seeing you at ABCT in NYC!

# HOT OFF THE PRESS

## In Press and Recently Published Literature

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SEE YOU IN NYC!

## ***KUDOS!!!***

**Deborah Welsh** and **Shmuel Shulman** were the guest editors for an entire special issue of *The Journal of Adolescence* on observational studies of adolescent romantic relationships in December 2008.

**Brian Buzzella**, was recently awarded the Roy Scrivner Memorial Research Grant from the American Psychological Foundation to support the evaluation of a relationship education program for same-sex couples marrying in Massachusetts.

**Penny Leisring** was married to **Mark Mooney** on January 3, 2009 in Orleans, Massachusetts.

**Brian Baucom** and **Katie Williams** were married on March 20th. Andy Christensen (their advisor) performed the ceremony.

**Michael Maltese** and **Tara M. Neavins** were married on October 18, 2008, in Waterbury, Connecticut.

**Rebecca Brock** received the Ruth L. Kirschstein National Research Service Award (NRSA) from the National Institute of Mental Health (NIMH)

**Robin Barry** received the Spence Award from the University of Iowa, Department of Psychology for excellence in research, teaching and service. She also received the Randy Gerson Memorial Grant from the American Psychological Foundation and an American Psychological Association dissertation grant.