Language and hope in schizophrenia-spectrum disorders

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Highlights

- Hope is integral to recovery in schizophrenia, but its relation to speech is unknown
- Lexical analysis of transcribed life narratives were examined
- Total hope, agency hope, and pathways hope correlated with lexical variables
- Anger words most strongly predicted total and pathways hope

Abstract

Hope is integral to recovery for those with schizophrenia. Considering recent advancements in the examination of clients' lexical qualities, we were interested in how clients' words reflect hope. Using computerized lexical analysis, we examined social, emotion, and future words' relations to hope and its pathways and agency components. Forty-five clients provided detailed narratives about their life and mental illness. Transcripts were analyzed using the Linguistic Inquiry and Word Count program (LIWC), which assigns words to categories (e.g., "anxiety") based on a pre-existing dictionary. Correlations and linear multiple regression were used to examine relationships between lexical qualities and hope. Hope and its subcomponents had significant or trending bivariate correlations in expected directions with several emotion-related word categories (anger and sadness) but were not associated with expected categories such as social words, positive emotions, optimism, achievement, and future words. In linear multiple regressions, no LIWC variable significantly predicted hope agency, but anger words significantly predicted both total hope and hope pathways. Our findings indicate lexical analysis tools can be used to investigate recovery-oriented concepts such as hope, and results may inform clinical practice. Future research should aim to replicate our findings in larger samples.

Key words: *recovery, speech, goals, lexical analysis, psychosis*

1. Introduction

Hope, often defined as the belief that one's goals can be met, is thought to consist of multiple elements, including pathways and agency cognitions. Pathways cognition involves an appraisal of the possible strategies one could use to accomplish goals; agency cognition involves personal motivation to put these strategies to action (Snyder et al., 1991; Snyder et al., 1998). Hope has been identified as an integral factor in recovery for people with schizophrenia (Deegan, 1996; Noordsy et al., 2002; Resnick et al., 2005) and has been described as the most basic step to recovery, in that one must believe recovery is possible and begin to look to the future with optimism (Jacobson and Greenley, 2001). Greater hope has also been associated with reduced symptoms, improved social functioning, a greater sense of personal recovery, greater activation in psychiatric treatment, and better quality of life in people diagnosed with schizophrenia (Kukla et al., 2013a; Kukla et al., 2013b; Lysaker et al., 2004; Lysaker et al., 2008; Mashiach-Eizenberg et al., 2013; Oles et al., 2015).

Despite the integral role of hope in recovery and its importance for other outcomes, research has yet to shed light on how hope manifests for those with schizophrenia-spectrum disorders. Lexical qualities of speech offer insight into our internal states and play a key role in how others interpret our emotional condition (Wierzbicka, 2009); for example, speech characteristics such as expressivity, complexity, and self-reference have been used to identify and predict emotions and clinical severity among persons with schizophrenia (Hong et al., 2015). Thus, analysis based on lexical qualities may be one way to investigate hope in people with schizophrenia. Although word choice has been and continues to be of interest for mental health professionals in fostering a recovery-oriented, hopeful environment (e.g., see Jensen et al., 2013), we have yet to focus on clients' lexical qualities and their associations with hope. Behaviorally-based assessment tools (e.g., analysis of speech samples) provide a possible avenue through which to investigate this relationship, and may help overcome inherent

limitations in typical pencil and paper measures of hope and recovery (e.g., varied response biases, dependence on respondents' introspective abilities, etc.).

Computerized lexical analysis is a behavioral measure that matches words to predetermined categories reflecting underlying constructs (e.g., emotions) or specific functional groupings (e.g., pronouns). In recent years, computerized lexical analysis has become a popular method with which to conduct in-depth examinations of word usage. This type of analysis has been used to compare lexical qualities in people with and without schizophrenia (Junghaenel et al., 2008; Lee et al., 2007; Leichsenring and Sachsse, 2002; St. Hilaire et al., 2008) and differences are typically detected in emotional categories (though not always, see St. Hilaire et al. 2008 for an exception). More recently, lexical analysis been used to examine correlates of characteristics within schizophrenia samples, such as emotions, symptoms, and functioning. For example, Cohen et al. (2009) linked anhedonia and negative emotion words in schizophrenia, and Minor et al. (2015) linked negative emotion and social words to symptoms, metacognition, and general functioning in this population. Buck et al. (2015) furthered work with anhedonia by investigating anticipatory and consummatory pleasure and lexical qualities, with findings indicating past-words and first-person plural pronouns (e.g., we, our) are associated with both types of pleasure in this population.

Lexical analysis has not yet been used to investigate recovery-oriented concepts such as hope in people with schizophrenia. However, hope and related constructs could influence lexical qualities. In fact, in one popular lexical analysis program, Linguistic Inquiry and Word Count (LIWC; Pennebaker et al., 2007), several word categories exist that we might expect to directly reflect hope. In their original dictionary (from the 2001 program; Pennebaker et al., 2001), an "optimism" category was available, assessing words such as "hope," "accept," and "determined." The optimism category is available in subsequent versions of the program and will likely capture direct use of hope words. Although hope and optimism are distinguishable constructs, with hope reflecting more affective qualities while optimism is a general cognitive

belief in positive outcomes (Scioli et al., 1997), measurement paradigms for hope and optimism are often highly correlated (Scioli et al., 1997; Steed, 2002), supporting our expectation that self-reported hope scores will be correlated with use of optimism words. Some further categories exist that may reflect similar relationships – namely, the "achievement" and "future words" categories. The achievement category contains words like "accomplish," "confident," and "opportunity." These words may reflect goal attainment, or discussion of ways to attain goals, both of which are central to the concept of hope (Snyder et al., 1991). We would also expect hope to be associated with the "future words" category, as many conceptualizations of hope include the anticipation of something good in the future (Kylmä et al., 2006; Snyder et al., 1998), and many hope measures place great emphasis future expectations (Steed, 2002). Considering Snyder's conceptualization of hope, one's perceptions that goals are attainable represents an ability to think about the future and how one's goals may be achieved.

Another area where we may expect associations between lexical qualities and hope is with social words. For example, in schizophrenia samples, social relationships are positively related to hope (Lysaker et al., 2004), and social phobia is negatively related to hope (Lysaker and Salyers, 2007). Further, clients with schizophrenia as well as clinicians have identified supportive relationships as key to instilling hope (Kirkpatrick et al., 1995; Kirkpatrick et al., 2001). The frequency of social word usage (e.g., "everyone", "friend") as measured by lexical analysis may be an indirect measure of social connections (Pressman and Cohen, 2007). Thus, we can expect positive correlations between hope and the "famly" and "friend" word categories in the LIWC program.

In addition to social activity, individuals with greater hope tend to display high levels of positive affect and low levels of negative affect (Snyder et al., 1996). Some specific categories in the LIWC program map onto these constructs, including positive emotion words and anger, anxiety, and sadness words. Hope is considered a positive emotion by some (sometimes in response to something bad, as in hoping for improvement) or as a positive or adaptive coping

mechanism in the face of adversity (Lazarus and Lazarus, 1994; Scioli et al., 1997), suggesting a possible relationship with increased positive emotion words. There is also considerable work linking increased hope with decreased symptoms of anxiety (Carretta et al., 2014; Feldman and Snyder, 2005; Snyder et al., 1991) and depression (Mathew et al., 2014; Priester and Clum, 1993; Snyder et al., 1991) in healthy samples. Although this work is not as developed in people with schizophrenia, one study showed lower hope to be associated with symptoms of anxiety in this population (Lysaker and Salyers, 2007), and another showed lower hope to be associated with increased depression (Schrank et al., 2014). Thus, a respondent's level of hope may be manifest in speech through examination of these word categories.

One final area where we may expect to see associations with hope is pronoun use. There is a fairly robust literature showing that increased use of first-person singular pronouns (I, me, my) is associated with increased depression or suicidality (Fineberg et al., 2015; Stirman and Pennebaker, 2001; Zimmermann et al., 2016), indicating we may expect to see a negative association between hope and this type of pronoun. Conversely, there is some literature to show use of first-person plural pronouns, such as "we," could indicate a sense of social connectedness (Tausczik and Pennebaker, 2010), giving reason to expect a positive association with this type of pronoun. Research is less clear in guiding our expectations of associations with hope for second person (you, your) and third-person singular (she, he) and plural (they) pronouns, but studies have shown differences in the use of pronouns across categories in people with schizophrenia as compared to healthy controls and people with depression (Fineberg et al., 2015; Hong et al., 2015; Lee et al., 2007). Thus, while we had hypotheses for first-person singular and plural pronouns, analyses examining other types of pronouns were considered exploratory.

Considering the link between hope, recovery, and improved symptoms and functioning for individuals diagnosed with a schizophrenia-spectrum disorder, further investigation of hope and its assessment are needed. Investigation of hope using lexical analysis has potential to

demonstrate clinical utility of this measurement tool and inform clinicians of speech content that may be related to hope and could be used to inform intervention choices. Given the paucity of research examining hope and word usage, this study aimed to examine how these concepts are related in a schizophrenia-spectrum sample. We hypothesized that greater use of words categorized as optimism, achievement, future, positive emotion, or social words (family, friend) would have a positive relationship with hope and its subcomponents (pathways and agency) and that negative emotion words (anger, anxiety, and sadness) would be inversely associated with hope and its subcomponents. We further hypothesized that use of first-person singular pronouns would be negatively associated with hope, while first-person plural pronouns would be positively associated with hope. Finally, we conducted exploratory analyses to examine associations with other pronoun categories: second person, third-person singular, and third-person plural. As our goal was to provide preliminary evidence of clinical utility for the LIWC tool, or to point to clinical applications of language findings, a final goal was to examine associations with hope and its components using multiple regression analyses. Use of multiple regression enables examination of which predictor is the strongest; in busy clinical settings, simplifying language findings to indicate the lexical category with the strongest predictive capabilities is of the utmost importance. We did not have hypotheses regarding which predictor would be the strongest; thus, regression analyses were also considered exploratory.

2. Methods

2.1 Participants and procedures

Data for this investigation were obtained from 45 participants enrolled in a larger randomized controlled trial of Illness Management and Recovery (Salyers et al., 2014), a curriculum-based illness self-management program (Gingerich and Mueser, 2005). This subset of participants completed a narrative interview prior to receiving the intervention. Participants were eligible for the study if they were receiving mental health services at either a VA Medical

Center or a local community mental health center, were older than 18 years of age, had a diagnosis of schizophrenia (n = 17) or schizoaffective disorder (n = 28), and had no physical health condition that would prevent participation in an 18-month study. Potential participants were excluded if there was evidence of severe cognitive impairment impeding the ability to provide informed consent (Callahan et al., 2002). The majority of participants were male (n = 34, 76%) and Black (n = 28, 62%). Most participants had completed high school and/or gone on to further education (n = 30, 67%). The mean age of participants was 48.5 years (SD = 8.7).

Participants were interviewed by trained research assistants. Interviews were typically less than one hour (n = 38, 84%). Participants provided informed consent and were compensated $20 upon completion of the interview. All procedures were approved by the Institutional Review Boards at the VA and the university. For additional details about the interviews and procedures, see Salyers et al. (2013).

2.2 Measures

The Indiana Psychiatric Illness Interview (IPII; Lysaker et al., 2002) is a semi-structured interview that asks participants to tell the story of their lives in as much detail as possible. During the initial portion of the interview, participants are given full control over how much verbalization they produce to describe their lives, with minimal prompts from the interviewer. Following the initial question about their lives, participants are asked if they think they have a mental illness and how they understand it, how their mental illness may have impacted their life, whether and how their illness controls their life and how they control their illness, how others affect and are affected by their illness, and how they see their future. The IPII has been used previously in studies of people with severe mental illness (Lysaker et al., 2005; Lysaker et al., 2007; Lysaker et al., 2010) and in tandem with lexical analysis methods (Buck et al., 2015; Minor et al., 2015). The IPII typically lasts 30-60 minutes and produces long speech segments for lexical analysis. Responses were audio-recorded, transcribed, and de-identified.

Interviewer text was removed from all de-identified transcripts, and the narratives were then analyzed using the 2007 version of Pennebaker's LIWC program (Pennebaker et al., 2007). The LIWC program examines each word in a text file and matches words to a "dictionary" of more than 4,500 word stems, organized into 64 word categories. Analyses then yield a percentage of word matches for a given category in each imputed speech sample. Although we primarily made use of the default LIWC 2007 dictionary, we also used one word category from the LIWC 2001 dictionary (Pennebaker et al., 2001): "optimism." The LIWC software has been used previously in samples of individuals with schizophrenia-spectrum disorders (Cohen et al., 2009; Junghaenel et al., 2008; Lee et al., 2007; St. Hilaire et al., 2008) and has demonstrated validity for measuring verbal emotional expression (Kahn et al., 2007).

Hope was assessed with the State Hope Scale, a 6-item scale (Snyder et al., 1996) during a separate interview for the parent study. The parent study used a modified response scale with items rated from 1 (*definitely false*) to 4 (*definitely true*), which has been used successfully in samples of clients with severe mental illness (Bonfils et al., 2014; McGrew et al., 2004; Salyers et al., 2009; Salyers et al., 2010). An example item from the State Hope Scale is, "There are a lot of ways around any problem that I am facing now." The State Hope Scale was designed to produce a total score and two factor scores, pathways and agency. In our sample, the total score demonstrated adequate internal consistency (alpha = 0.78), as did the hope agency score (alpha = 0.82), but the hope pathways score was somewhat lower (alpha = 0.65).

2.3 Analyses

Prior to other analyses, descriptive statistics were calculated to examine means and standard deviations for overall word count, lexical categories, and hope variables. Considering the large proportion of the sample diagnosed with schizoaffective disorder (62%), we ran a series of independent *t*-tests to assess for any impact of diagnosis. Bivariate relationships between hope and lexical categories were examined using Pearson's *R*. Three linear multiple regressions were then conducted to examine how LIWC word categories combine to predict

total hope, hope pathways, and hope agency. Predictor variables for the regression were selected based on trending ($p \leq 0.10$) bivariate associations with hope. Predictor variables were entered simultaneously. Semi-partial correlations were calculated to inform the unique variance contributed by each predictor variable. Collinearity diagnostics were conducted to ascertain if large amounts of shared variance between predictors were present. Multicollinearity was considered to be an issue if tolerance was less than $1 - R^2$ for each regression model. Regression models were considered significant at $p < 0.05$. All analyses were conducted in SPSS version 23.

3. Results

Text files contained on average 5,085 words (SD = 5,555; Range 740-26,723). Two word categories varied by diagnosis – third-person plural pronouns ($t(43) = 2.02$, $p = 0.05$) and future words ($t(43) = 2.30$, $p = 0.03$). However, controlling for diagnosis by using partial correlations did not change interpretation of results, so the diagnosis variable was excluded from further analyses.

See Table 1 for bivariate relationships between the three hope scores and LIWC word categories. Those with more total hope used more first-person singular pronouns (I, me, etc.) and fewer anger words. Those with more total hope also exhibited a trend toward using more anxiety words. Greater hope pathways, i.e., the perception that there are many routes to achieving one's goals, exhibited significant associations with increased first-person singular pronouns and decreased third-person plural pronouns (they, them, etc.). Those with greater scores on the hope pathways scale also trended toward using increased anxiety words and reduced anger words. Hope agency, i.e., the perception that one is capable of achieving one's goals, did not exhibit any correlations reaching conventional levels of significance, but exhibited negative trend-level associations with anger and sadness words.

See Table 2 for detailed regression statistics. Model 1 (with first-person singular pronouns, anger, and anxiety words) significantly predicted total hope scores ($F(3, 41) = 4.43$, p

= 0.009, adjusted R^2 = 0.19). Collinearity was within acceptable limits. Increased use of anger words significantly predicted decreased total hope in this model. Semi-partial correlations reveal anger words accounted for 9.8% of the unique variance in total hope scores. Model 2 (with first-person singular pronouns, third-person plural pronouns, and anger and anxiety words) significantly predicted hope pathways (F(4, 40) = 3.85, p = 0.01, adjusted R^2 = 0.21). Collinearity was within acceptable limits. Increased use of anger words was the only significant predictor of hope pathways in the model, exhibiting a negative relationship and accounting for 8.5% of the unique variance in hope pathways scores. Model 3 (with anger and sadness words) did not significantly predict hope agency (F(2, 42) = 2.19, p = 0.124). The model also displayed problems with collinearity, with tolerance values of .86 for each predictor. This value falls below the threshold indicating problematic collinearity ($1 - R^2$, in this case 0.91). These results indicate the overlap between anger and sadness is too great to be parsed apart using multiple regression techniques; as these were the only two predictors in the model, results were not interpreted further.

4. Discussion

Our findings indicate that examination of lexical qualities can reveal important information about hope in people diagnosed with schizophrenia-spectrum disorders. Hope and its subcomponents had significant or trending bivariate correlations in expected directions with some word categories, including anger as the strongest predictor of both total hope and hope pathways. But, other word categories presented associations in the opposite direction hypothesized, including anxiety and first-person singular pronouns. Finally, several word categories we hypothesized to be related to hope and its components were completely unrelated in our sample. Although previous studies have investigated word categories in individuals with schizophrenia-spectrum disorders and some have looked specifically at emotions, symptoms, and functioning within this population (Buck et al., 2015; Cohen et al.,

2009; Minor et al., 2015), the present study is the first to link the recovery-relevant construct of hope with lexical analysis word categories.

Across hope scores, the lexical categories optimism, achievement, and future words did not exhibit significant or even trend-level associations with hope. This is surprising, as these categories contain the words most central to Snyder's hope theory (1991), such as "hope" and "goal." While these words certainly have the most face validity when trying to assess hope, it may be that in naturalistic speech they do not translate to personal perceptions of hopefulness. The LIWC program does not assess context surrounding the words – it could be that these seemingly hopeful words were expressed in a negative context, such as admissions about goals not reached or lost hopes. Alternatively, it could be that participants have goals and hope to accomplish them, but are lacking in motivation, or do not believe they have good strategies available to them. Regardless of the reason, the finding that words commonly understood to be part of the hope construct are not associated with self-reported hope has clinical implications. Staff members or clinicians working with people with schizophrenia should not take hopeful words at face value, as they may not actually inform the level of hope a particular person is experiencing. Considering the importance of hope in fostering recovery from schizophrenia (Jacobson and Greenley, 2001), building in assessments of hope to intake appointments or ongoing psychiatric visits is important. Future work should investigate if this finding holds when participants are directly asked about hope and attempt to parse apart reasons hopeful speech and hopeful attitudes might not co-occur.

Regarding emotion words, some categories were in line with expectations, while others were not. Anger words were associated in bivariate analyses with total hope, and at the trend-level with both pathways and agency hope, indicating an important role for anger speech in all hope components. Positive emotion words were not related to any hope score, even at the trend-level. Considering bivariate relationships with all three hope scores, negative emotions, particularly anger, may be more salient when investigating hope than positive emotions for

those with schizophrenia-spectrum disorders, at least as expressed verbally. Though this is against our hypotheses, it is consistent with the idea that bad thoughts, events, interactions, and outcomes tend to carry stronger psychological effects than their positive counterparts (Baumeister et al., 2001). As the lexical samples used here were based on participants' life stories, it would seem that life experiences provoking negative emotional description may impact current, state levels of hope more than positive emotional description.

A further unexpected result regarding emotion words was that greater anxiety words were associated with greater total and pathways hope (at the trend-level), a finding in the opposite direction of our hypotheses and past research in healthy samples (Carretta et al., 2014; Feldman and Snyder, 2005; Snyder et al., 1991) and in people with schizophrenia (Lysaker and Salyers, 2007) indicating that increased hope was associated with decreased anxiety. It is possible that those who reflected on past anxiety-provoking experiences in their life narratives were able to hope for better experiences in the future, which is consistent with the early steps to recovery posited by Jacobson and Greenley (2001). Although anxiety words in and of themselves do not seem likely to engender hope, it is possible that use of these words implies an emotional understanding of one's own feelings and potentially the ability to take meaning from them. In this case, it would not be the anxiety itself which brought about hope, but the understanding of what provoked the anxiety, or how things might be different in the future. A similar interpretation was offered by Buck and colleagues (2015) with regard to their finding that anticipatory and consummatory pleasure were associated with fewer positive emotion and more negative emotion words, respectively, when discussed in life narratives. Whatever drives the positive relationship between hope and anxiety, it was not a powerful predictor in this sample, and did not reach significance in regression models.

Some surprising correlations also emerged when considering pronoun use. We hypothesized that increased use of first-person singular pronouns would be associated with decreased hope, but our findings indicate the opposite relationship for both total and pathways

hope. Those who referred to themselves more throughout their life narratives also reported greater hope. It could be that greater use of first-person singular pronouns in the context of life narratives reflect a higher level of self-reflection or an increased sense of self. This would be consistent with work suggesting a relationship between self-experience and hope (Lysaker et al., 2006). Further, a body of literature suggests individuals with schizophrenia have diminished or distorted self-agency and that recovery of self-agency is associated with greater hope (Chiu et al., 2013). If this interpretation is correct, interventions to improve sense of self-agency may also foster total and pathways hope. Future work should investigate pronoun usage in more detail to parse apart these intricacies. Work examining self-experience or self-agency with lexical analytic methods may also be warranted.

In exploratory analyses examining associations between hope and second person, third-person singular, and third-person plural pronouns, most findings were null, but a significant, negative association was observed between greater use of third-person plural pronouns and reduced pathways hope. Future work is needed to assist in our understanding of why third-person plural pronouns had a negative relationship with hope. It could be that within the context of life narratives, references to other groups (i.e., "they") occur most within the context of negative life experiences. This explanation may be particularly plausible in light of stigma experienced by people with schizophrenia, which some have found is encountered on a daily basis for people with mental illness (Mak et al., 2007). Experiences of stigma could serve to reduce one's perception of available life paths and strategies to achieve goals.

In addition to bivariate relationships, regression analyses revealed that some lexical categories may be more important in assessment of hope than others. Anger words in particular seem to be important for total hope – this was the only significant predictor in the model, accounting for 9.8% of the unique variance in total hope scores. The model for pathways hope told a similar story. In this model, anger words were again the only significant predictor, suggesting they may be most helpful in prediction of pathways hope as well as total hope.

Taken together, results indicate people who express more anger through speech may be less hopeful overall, and less likely to positively appraise their available strategies to reach goals. But, it is possible the relationship goes the other way - people who feel frustrated in trying to reach their goals may show this through anger-related speech. Regardless of the possible direction, this finding has implications for treatment. Considering the important role of hope in recovery and its association with other treatment outcomes, clinicians should be attentive to expressions of anger when looking for those in additional need of help in goal-setting and attainment. Further, anger words were found to be an important predictor of increased symptoms and reduced functioning in this population, increasing the importance of attention to these types of words (Minor et al., 2015). However, considering the language pathology seen in schizophrenia paired with difficulty expressing emotions experienced by some with the disorder (Lincoln et al., 2014), the LIWC program and screening of language in general has limitations, and should be just one step in a more holistic assessment of hope.

Regarding hope agency, no lexical category reached the level of conventional significance in correlation analyses. Two lexical categories were found to be trending with hope agency in bivariate analyses – anger and sadness words – both in the hypothesized direction, such that increased hope agency was associated with decreased use of words expressing anger or sadness. However, multicollinearity in the regression model prevented interpretation of results.

Of note, lexical analysis was successful with the use of long narratives in our sample and was able to detect associations between lexical qualities and hope. This measurement tool is still early in its development but shows promise in examining hope and other constructs related to recovery. However, this study had several exploratory elements and there are limitations. For example, the lack of an association with future-oriented words may be because of an imprecise fit between the construct of hope and the LIWC dictionary - the future words category includes the words "could've," "must've," and "oughta," which on the surface appear to

express regret, obligation, or guilt. These words are not consistent with the future orientation

often seen in hopeful attitudes and may have obfuscated findings. Our results are also limited

by our small sample in one service setting. The demographic composition of our sample was

representative of the service setting where recruitment took place, but future studies are needed

to parse apart differences in language based on demographic variables such as gender, race, or

age. In a related vein, although we only excluded more extreme forms of cognitive impairment,

our results may not generalize to people with schizophrenia who are experiencing more severe

symptoms or cognitive impairment, especially if symptoms contributing to odd or disorganized

speech are more prevalent than in our sample. Finally, word counting has some inherent

limitations that should be considered in interpretation of our results, including the underlying

assumptions of such analyses. Two of the most important of these assumptions are that the

frequency of a word or word category portrays valuable information about a person, and that

these words have meaning in isolation, without context (Franklin, 2015). Future work should

certainly examine these assumptions in more detail in samples of people with schizophrenia,

ideally with external measures for triangulation with LIWC analyses.

Overall, results point to some clinical implications and directions for future research.

Lexical analysis tools can be used to investigate recovery-oriented concepts such as hope, and

results may inform clinical practice. Our study points to the potential of attending to anger words

as helpful in identifying those dealing with low overall or pathways hope. This may be something

that clinicians can attend to in regular contact with clients, or that should be investigated if

lexical analysis is used in other capacities (such as to screen for psychological deterioration, as

suggested by Minor and colleagues, 2015). Our findings also indicate it may be important not to

take use of hope words at face value, as they were not associated with self-reported hope in our

sample. Further, interventions targeted to increase agency and a sense of self (such as

Metacognitive Reflection and Insight Therapy; Van Donkersgoed et al., 2014) may also

positively impact hope. Future research should aim to replicate our findings in larger samples.

Acknowledgments

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Table 1. Bivariate correlations between lexical categories and hope scores.

	Mean (SD)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Total hope	17.13 (3.69)	1																
2. Hope pathways	8.76 (1.90)	0.81**	1															
3. Hope agency	8.38 (2.43)	0.89**	0.44**	1														
4. Optimism	0.36 (0.18)	-0.01	0.00	-0.01	1													
5. Achievement	1.24 (0.44)	-0.02	0.04	-0.05	0.47**	1												
6. Future words	0.74 (0.42)	-0.05	-0.08	-0.01	-0.10	-0.08	1											
7. Family words	1.04 (0.61)	0.03	0.14	-0.06	0.04	-0.22	0.01	1										
8. Friend words	0.17 (0.13)	0.06	0.06	0.04	0.19	-0.05	0.05	0.39**	1									
9. First-person singular pronouns	11.92 (1.70)	0.30*	0.32*	0.21	0.02	0.14	-0.26	-0.12	-0.18	1								
10. First-person plural pronouns	0.49 (0.32)	0.16	0.19	0.09	-0.05	-0.13	-0.02	0.37*	0.18	-0.44**	1							
11. Second-person pronouns	1.87 (1.33)	0.13	-0.02	0.21	-0.20	-0.02	0.39**	-0.35*	-0.17	-0.10	-0.20	1						
12. Third-person singular pronouns	1.63 (0.94)	0.00	-0.02	0.02	-0.28	-0.34*	0.53**	0.51**	0.13	-0.42**	0.40**	-0.04	1					
13. Third-person plural pronouns	1.22 (0.56)	-0.16	-0.32*	0.00	0.03	0.23	0.51**	-0.35*	-0.05	-0.22	-0.13	0.33*	0.08	1				
14. Positive emotions	2.37 (0.68)	0.24	0.15	0.25	0.40**	0.17	-0.21	0.05	-0.01	0.05	0.08	0.09	-0.18	0.01	1			
15. Anxiety	0.26 (0.19)	0.28t	0.25t	0.22	-0.12	-0.14	0.08	0.10	-0.27	0.14	-0.05	0.09	0.12	-0.18	0.21	1		
16. Anger	0.54 (0.31)	-0.31*	-0.29t	-0.25t	0.01	-0.03	-0.12	0.17	-0.11	-0.04	-0.22	-0.08	0.12	0.00	0.13	0.04	1	
17. Sadness	0.32 (0.18)	-0.22	-0.10	-.026t	0.03	-0.06	-0.07	0.24	0.04	0.08	-0.09	0.01	0.07	-0.11	-0.08	0.23	0.37*	1

Note. **Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). tCorrelation is significant at the 0.10 level (2-tailed).

Table 2 – Regression Results

	B	SEB	β	t	p	Semi-partial correlation	R²
Model 1 (Hope total)							0.245
I	0.55	0.30	0.25	1.85	0.071	0.063	
Anger	-3.78	1.64	-0.31	-2.31	0.026	0.098	
Anxiety	4.90	2.66	0.25	1.84	0.072	0.063	
Constant	11.33	3.70		3.07	0.004		
Model 2 (Hope pathways)							0.278
I	0.25	0.16	0.23	1.63	0.111	0.048	
They	-0.79	0.47	-0.24	-1.69	0.099	0.052	
Anger	-1.79	0.83	-0.29	-2.15	0.038	0.084	
Anxiety	1.89	1.37	0.19	1.38	0.176	0.034	
Constant	7.20	2.13		3.38	0.002		

Note. B = unstandardized regression coefficient. SEB = standard error of the unstandardized regression coefficient. β = standardized regression coefficient. t = t-statistic to determine significance of predictor. p = significance level. R^2 = the variance in the dependent variable accounted for the combined predictors in each model. This value is unadjusted (the values adjusted for sample size are reported in text). The semi-partial correlation represents the amount of unique variance in the dependent variable accounted for by each predictor.