A Corpus Linguistic Analysis of Pro-Anorexia Public Tumblr Posts Written in Spanish (Un Estudio de Lingüística de Corpus de Publicaciones Públicas de Tumblr a las Pró-Anorexia en Español)

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Abstract

Eating disorders have the highest mortality rate of any mental illness, affecting all races and ethnicities, and with symptoms typically beginning in adolescence and early adulthood. Still, little is known about the language markers of mental health for materials written in Spanish. This study collected pro-anorexia (pro-ana) public Tumblr blog posts written in Spanish and analyzed their content using Linguistic Inquiry and Word Count software. Pro-ana-specific words, pronoun use, and psychological linguistic properties were analyzed, and results indicated that *reasons for anorexia* was the most frequently occurring category within pro-ana posts. Words in this category were associated with intense and negative emotions commonly found in trauma narratives in the dominant language (Spanish). Users' pronoun use suggested an increased focus on people and objects, which has been linked to decreased likelihood of recovery. The psychological properties of the posts had a negative emotional tone and were marked by significant use of ingestion and health words, signaling the symptoms of anorexia. This research points to benefits in assessing bilingual clients for anorexia behaviors, symptoms, and online-posting behaviors, while also revealing the need for improved evidence-based treatment for trauma in bilingual individuals, as well as the need for Spanish and code-switching blog norms to inform and advance future research. *Keywords:* pro-ana, LIWC, corpus linguistics, Tumblr; *Palabras Claves:* pró-anorexia, LIWC, lingüística de corpus, Tumblr

Introduction

User engagement with social media has grown considerably and is expected to keep growing in the coming years. Nearly four billion people worldwide have Internet access, and the vast majority maintain some form of social media involvement, with the median user engaging on three different platforms (Pew Research Center, 2018). Social media platforms can provide a space for free and honest communication and connection with others without stigma or consequences.

Mental health-related conversations occur frequently within this space (Gaur et al., 2018). Online communities use distinctive language to define themselves and to distinguish insiders from outsiders, but pro-anorexia (pro-ana) groups, in particular, can find their efforts discouraged by policies of social media platforms that block or ban certain words or hashtags central to a

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community's sense of identity. When certain options are blocked or banned, users make their language choices more complex and vary their spellings or renderings to conceal their activities and maintain solidarity within the group. Because of such obfuscation, pro-ana group members can evade scrutiny, becoming more difficult to reach for parents, teachers, and clinicians and thereby finding themselves limited in terms of access to care.

From a review of the literature on pro-ana communities' public posts on social media, five themes stand out. These include the significant rates of anorexia in American society, the prevalence of anorexia in Hispanic communities, the frequency of social media use, the presence of pro-ana communities on social media, and the lack of education, awareness, or training for parents, teachers, and clinicians with respect to pro-ana terms written in Spanish. Following an explication of these themes, the research questions driving the present study will be presented.

Eating disorders are complex biopsychosocial illnesses; they can lead to serious health consequences, and they register the highest mortality rate of any psychiatric disorder (Arseniev-Koehler, Lee, McCormick, & Moreno, 2016). In the United States, 2.7% of those 13 to 18 years old experience eating disorders, and an additional 3.3% struggle with subthreshold eating disorder symptoms or behaviors (Merikangas et al., 2010; Swanson, Crow, Legrange, Swendsen, & Merikangas, 2011). Those experiencing anorexia often attempt to conceal this disorder and the behaviors associated with it, making this population difficult to reach; given the anonymity of social media, however, those with anorexia have an outlet for social support and resources.

While studies have addressed eating disorders as experienced by Caucasians, the Hispanic community has often been underrepresented in research on anorexia, perpetuating the misconception that the illness is one experienced mostly by Caucasian women, especially those living in the Western world. Prevalence rates are consistent across Latin American countries; however, Hispanics in North America, and especially second-generation Hispanics, experience rates on par with their Caucasian counterparts (Kolar, Mejia-Rodriguez, Chams, & Hoek, 2016).

Immigration status and level of acculturation are unique factors affecting many Hispanics in the United States (PEW Hispanic Center, 2018). Eating disorders arise from the adoption of American beauty standards and the balancing of multiple cultures (Perez, Ohrt, & Hoek, 2016). Food, culture, and identity are intertwined within the Hispanic community; meals are social affairs, food is a way to express love, and women are taught to cook as a way of contributing to the family and household. Moreover, while stigma attaches to mental illness throughout the United States, the phenomenon is heightened in the Hispanic community, making members less likely to seek services (Kolar et al., 2016). With the growing Hispanic population in the United States, and considering the risk factors facing future generations, research into pro-ana social media communication by Spanish speakers is crucial to counselors' efforts to engage and treat members of this community.

Adolescents are regular social media users who are known to be difficult to reach in regard to health issues. Adolescents are also relatively less likely to take advantage of health care services, often preferring to gather information and seek support via the Internet (Wong, Merchant, & Moreno, 2014). Finding a group of similarly situated individuals online can provide young people with a sense of relief and encouragement; but, unfortunately, some pro-ana groups promote self-harm and the continuation of dangerous symptoms of anorexia as a lifestyle choice, encouraging their members to continue behaviors associated with anorexia and leading to devastating effects on health and relationships (Chancellor, Kalantidis, Pater, De Choudhury, & Shamma, 2017). Those suffering from anorexia can be identified online by their use of certain key words characterizing and promote their condition (Arseniev-Koehler et al., 2016; Want, Brede, Ianni, & Mentzakis, 2017). Language plays an important role in signaling a shared identity, and the words that groups use are constantly evolving and being developed by members.

While anorexia is not a new phenomenon, pro-ana online communities did not become popular until the early 2000s. With their increasing memberships and reach, pro-ana communities have exacerbated problems associated with poor body image, have encouraged unhealthy methods of weight loss, and have established or reinforced conceptions of identity around anorexia (Chancellor et al., 2016). Social media outlets have influenced the behavior and choices of adolescents and young adults who could have ongoing mental health issues, including anorexia. Pro-ana behavior on social media is of particular interest given the combination of peer influence, social learning, and media that coexist in these communities (Moreno, Ton, Selkie, & Evans, 2016), and the negative potential of social media is amplified by the fact that teens and young adults are those most likely to go online, spending up to nine hours per day with digital technology, an amount of time that could exceed the number of hours they sleep on a nightly basis (Wallace, 2015).

Tumblr is a preferred social media platform for teens and young adults (Pew Research Center, 2015). Even more, for the purposes of this study, Hispanics are among the most prevalent users of the platform, interacting with Tumblr more than they do with any other social media outlet (Hull, Kim, & Stillwell, 2018). Tumblr has been criticized for the continued presence of pro-ana communities—communities that continue to thrive despite the site’s efforts to break up selected groups, show warnings about content, and block certain hashtags and words (Mastakis, 2018). An imposition on an online community could be dangerous to members, as users could rely on such groups for support, especially considering the isolating nature of anorexia, a disease where individuals often suffer in secrecy or hide their activities. An understanding community and online place of belonging could, therefore, have a healing effect (Joiner, Van Orden, Witte, & Rudd, 2009); that said, pro-anorexia communities can also trigger anorexia urges, can normalize anorexia-related activities, and can reinforce negative behaviors to the point where the harm far outweighs any perceived benefits for pro-ana members (Brown et al, 2018).

One of the central problems with pro-ana communities on social media platforms is that they promote behaviors associated with anorexia and depict anorexia as a lifestyle choice rather than an illness (Chancellor et al., 2016). This misrepresentation of the disorder is facilitated by the visual nature of Tumblr, whereby pro-ana communities can disseminate images ostensibly representing “ideal” body shapes while promoting a warped notion of “health” that the groups refer to as *thinspo* or *thinspiration*. Thinspo or thinspiration refer to images, slogans, videos, and other materials that inspire the pursuit of extreme thinness—thinness that, within this community, exemplifies hard work, willpower, control, dedication, and perfection. The large majority of thinspo images include white women, thus racializing the issue, layering on assumptions of status and privilege to the notion of “thinness,” and creating a false dichotomy where being thin means being in control and being a curvaceous “other” is construed as giving in to bodily desires. Racial hierarchies are associated with beauty, and thinness works as a means of improving social status and enabling the navigation of elite spaces for Hispanic and African American communities (Schott, 2017).

There is a gap in the literature around linguistic and psychological properties of language used in the pro-ana community online, specifically regarding materials written in Spanish. Linguistic Inquiry and Word Count (LIWC—pronounced “Luke”) software can be used to evaluate many kinds of written text, and here it was used to analyze the language specific to the pro-ana community (Pennebaker, Booth, Boyd, & Francis, 2015). Tumblr was chosen as the social media platform for the present study because of its popularity among teens and young adults, groups whose approximate age (13–24) coincides with the typical age of onset for anorexia. With the continuing growth of the Hispanic population in the United States, understanding the characteristics of language deployed in public Spanish-speaking pro-ana online posts will encourage greater social justice and will aid in the addressing of mental health issues facing this population (Gulbas, Hausmann-Stabile, De Luca, Tyler, & Zayas, 2015).

With aforementioned literature as a foundation, this study was organized around four research questions. First, in public pro-ana Tumblr posts written in Spanish, what was the use rate of pro-ana word categories? Second, in public pro-ana Tumblr posts written in English, what was the use rate of pronoun categories? Third, in public pro-ana Tumblr posts written in English, did the use rate of pronoun categories differ from norms for such posts? Fourth, in public pro-ana Tumblr posts written in Spanish, did the use rate of the psychological process categories differ from norms for such posts?

Method

Design

This study employed a synchronic corpus linguistic design (Weisser, 2017) with single words as the unit of analysis (Bjekić, Lazarević, Živanović, & Knežević, 2014). The variables for the first research question included the following word categories: methods of anorexia, anorexia-

specific terms, reasons for anorexia, and hidden-hashtag terms. The variables for the second and third research questions included the categories of first-person singular pronoun, third-person singular pronoun, first-person plural pronoun, and third-person plural pronoun. Finally, the variables for the fourth research question were psychosocial and physical categories including (a) negative emotion, (b) anxiety, (c) anger, (d) sadness, (e) cognitive process, (f) insight, (g) body, (h) health, (i) ingestion, and (j) death.

All variables were reported as a percentage of total words, and there were three sub-corpora in this study: (a) Spanish-only, (b) English-only, and (c) Mixed. In terms of the third and fourth research questions, the comparison norm for all corpora was the assemblage of Twitter blog norms in English. There are currently no Spanish or mixed-blog norms to serve as respective baselines for the Spanish-only and Mixed corpora.

The inferential analysis used in this study was a log-likelihood (LL) ratio test. This technique tests for goodness-of-fit to a hypothesized distribution. A priori power analysis for a χ^2 test was employed using G*Power 3.1, because the LL ratio can be approximated by Pearson's χ^2 (Faul, Erdfelder, Buchner, & Lang, 2009). Cohen's w is the proper effect size (Rosnow & Rosenthal, 2003). Given the planned number of comparisons, the α level was set at .0033, and the input parameters were: (a) test family = χ^2 tests, (b) statistical test = goodness-of-fit tests: contingency tables, (c) type of analysis = a priori: Compute required sample size given α , power, and effect size, (d), $w = 0.52$, (e) power ($1-\beta$ error probability) = 0.9, (f) $\alpha = .0033$, and (g) degrees of freedom = 1. The G*Power 3.1 output included a sample size of 78 and an actual power of 0.90.

Corpus

Register and scope. The register was computer-mediated communication and the sub-register was microblogging about anorexia with Spanish hashtags and captions. The researcher used Tumblr's Application Programming Interface (API) to collect public posts between October 23, 2017 and October 23, 2018. The API was instructed to scrape posts meeting three conditions: (a) the caption and/or hashtag included Spanish language, (b) the post used hashtags identifying the content as pro-ana (e.g., #hastaloshuesos signified *to the bone*), and (c) the post emanated from a North, Central, or South American country. While collecting text, the API was instructed to eliminate user names, URLs, location, names, photographs, comments left by other users, and direct quotes. During the range of time noted above 1,165 posts and associated hashtags were collected (<https://www.tumblr.com/docs/en/api/v2>).

Construction. The scraped posts were compiled into an Excel document to be cleaned. Posts (caption and hashtags) using any language other than English or Spanish were excluded, as were those composed entirely in English. The corpus, which contained posts in Spanish, posts where whole sections were in English or Spanish, and posts with mixed-language code-switching

(switching between English and Spanish in the same section), were then separated into three sub-corpora for analysis at the section level. These sub-corpora were English-only, which included sections of the post (either caption or hashtag) that were written entirely in English, while the rest of the post contained Spanish language; Spanish-only, which included sections of the post where either the caption or hashtags were written entirely in Spanish; and Mixed, which included sections of the post where code-switching occurred in the caption or hashtag.

Preprocessing. Posts were cleaned using the procedures outlined in the LIWC operator’s manual and supplement (Department of Psychological Services, 2015; Pennebaker, Booth et al., 2015), meaning all abbreviations were spelled out (e.g., “max” became *maximum*), “anorexia slang” (words used to hide anorexia-related Tumblr posts) was not normalized (Moreno et al., 2016), and “textese” was translated into standard spelling. The word count was sufficient for both power and reliability requirements (Faul et al., 2009; Wardecker, Edelstein, Quas, Cordon, & Goodman, 2017). Once the cleaning procedures were concluded, the file was processed by LIWC software.

Size. The size of the Spanish-only sub-corpus was 3,234 tokens, the size of the English-only sub-corpus was 46,921 tokens, and the Mixed sub-corpus amounted to 531 tokens.

Measures

The measures used were selected scales from the LIWC scales and the Elrod Pro-Ana Linguistic Scales (EPALS), the first author’s Spanish adaptation of the Greaves NSSI Linguistic Scales (Greaves & Dykeman, 2019). Scores for all variables represented a percentage of all words used. The EPALS scales were developed for this study; the LIWC scales were pre-set scales contained in the LIWC software. Pennebaker, Boyd, Jordan, and Blackburn (2015) reported adequate reliability and validity for these LIWC scales. The reference norms used for comparison to the present results were the Twitter norms contained in the LIWC psychometric manual (Pennebaker, Boyd et al., 2015). Internal reliability and external validity of LIWC were well-documented (Pennebaker, Boyd et al., 2015), and four anorexia specific measures were employed.

EPALS-Methods of Anorexia. Methods of anorexia are ways people engage in behaviors associated with anorexia. This is a broad category encompassing many types of anorexia-related behaviors, such as calorie restrictions, over-exercise, measuring oneself, and weighing oneself (with Spanish terms including *nocomer*, *vomitar*, and *ejercicio*).

EPALS-Anorexia Specific Terms. Anorexia is a specific diagnosis under the category of eating disorders, and examples within this grouping included *thighgap*, *thinspo*, *skinny* (with Spanish terms such as *flaco*, *delgado*, and *huesos*).

EPALS-Reasons for Anorexia behaviors. There are many reasons why people choose to engage in anorexic behaviors, such as shame, anger, anxiety, attention, control, and guilt (in Spanish as *triste*, *ansiedad*, or *enojo*).

EPALS-Hidden Hashtag Terms. To evade new social media restrictions, those who engage in anorexic behaviors, and who desire to post about it on social media, have had to become creative in the hashtags they use to communicate with other pro-ana individuals and groups. Some of these users’ “hidden hashtags” include #princesasanaymia and #putavidaa.

Pronouns

LIWC was employed to assess the frequency of the following four pronoun types: first-person singular, third-person singular, first-person plural, and third-person plural.

Psychological Processes

LIWC was also used to assess 10 psychological processes. These processes, with representative words included in parentheses, included negative emotion (hurt), anxiety (fearful), anger (kill), sadness (grief), cognitive processes (cause), insight (think), body (spit), health (clinic), ingestion (eat), and death (bury).

Comparison Norms

The baseline norm for the three sample corpora was the set of English Twitter norms contained in the LIWC psychometric manual (Pennebaker, Boyd et al., 2015). There are currently no Spanish or Mixed blog norms available for comparison. English and Spanish are syntactically dissimilar languages, but it is reasonable to assume a 1:1 correspondence between English nouns and Spanish nouns in terms of word count (Bailey, McIntyre, Arreola, & Venta, 2019); thus, the second sub-corpus, Spanish-only, was compared to English Twitter norms for psychological process categories.

The entire corpus for this study was analyzed with LIWC software (Pennebaker, Booth, et al., 2015). LIWC analysis returns results for 90 output variables (i.e., LIWC categories), and LIWC category scores represent the percentage of total words used for the sample. Words could be part of more than one category. The English LIWC2015 dictionary was used for the English sub-corpus; the Spanish LIWC2007 dictionary was used for the Spanish sub-corpus; and, both the English LIWC2015 and Spanish LIWC2007 dictionaries were employed for the Mixed sub-corpus, pursuant to Pennebaker’s recommendation (personal communication, October 30, 2018). New dictionaries were available in LIWC2015, with more cognitive-process and social words included (Pennebaker, Booth, et al., 2015).

Data Analysis

For the first and second research questions, and for each variable, raw count and percentage of total words used have been reported below. For the third and fourth research questions, the sub-corpora were compared to norms by way of the LL test (Rayson & Garside, 2000). The Bayesian Information Criterion (BIC) was the effect-size measure reported (Brezina, 2018), and analyses were completed using *R*. Given the large number of hypothesis tests conducted, a Bonferroni correction was used to reduce the chance of a Type I error.

Results

The first research question focused on identifying word-use rates, specifically pro-ana word categories, in three groups of sub-corpora. Across all sub-corpora, the most frequently used pro-ana-specific category was *reasons for anorexia*. Complete results can be found in Table 1. With respect to the second and third research questions, the linguistic process category that differed most from English Twitter blog norms was *third-person singular* ($LL = 49.13$). The effect size for this category was $BIC = 38.31$, where anything greater than 10 was considered large.

The linguistic process category of *first-person plural* also differed from English Twitter blog norms ($LL = 46.27$), registering an effect size of $BIC = 35.45$. Likewise, the linguistic process category of *third person plural* differed from the English Twitter blog norms ($LL = 11.42$), showing an effect size of $BIC = .6$. The results for these research questions can be found in Tables 2 and 3. Finally, regarding the fourth research question, in both the English sub-corpus and the Spanish sub-corpus, the psychological process category that differed most from English Twitter blog norms was *ingestion* ($LL = 485.14$, $BIC = 474.32$, for the English sub-corpus; $LL = 135.71$, $BIC = 126.94$ for the Spanish sub-corpus). In the Mixed sub-corpus, by contrast, the psychological process category that differed most from English Twitter blog norms was *health* ($LL = 316.68$, $BIC = 308.46$), followed by *ingestion* ($LL = 302.09$, $BIC = 293.87$). The complete results for this research question can be found in Tables 4, 5, and 6.

Discussion

This study examined language used in public pro-ana Tumblr blog posts written in Spanish, relying on four research questions to discern and analyze differences in the use of language in Spanish pro-ana blogs compared to blogs overall. The results from the first research question revealed that the highest use rate across sub-corpora was *reasons for anorexia*. There are two potential explanations for this result. The first is that words included in the *reasons for anorexia* category (e.g., hate, control, depression) are associated with negative emotions, a sentiment that is likely to be more prominent in the dominant language (Spanish) while individuals are in the midst of retrieving traumatic memories and in the course of offering explanations or justifications for their behavior. Specifically, anorexia behaviors are a way for

individuals to manage their distress and to avoid other social forms of expressed anger (Espeset, Gulliksen, Nordbo, Skarderud, & Holte, 2012). Alternatively, it could be that users were undergoing a change and indicating openness to recovery, given that engagement with emotional expression is linked to signs of recovery. Between these two explanations, the former is most compelling, because research has demonstrated a link between traumatic experiences, such as childhood sexual abuse, and eating disorder behaviors.

The results from the second and third research questions revealed the pronoun use rate differed from English Twitter norms most frequently and significantly in the category of *third-person singular*, followed by *first-person plural* and then *third-person plural*. There are two potential explanations for the obtained results. Consistent with results from other studies, those who exhibit less attention on themselves (for example, using the word *we* more than the word *I*) are more popular in a social community (Wang, Brede, Ianni, & Mentzakis, 2018). Gaining “likes” and followers could be a contributing factor in posting behavior of members within this community, especially given that acceptance and encouragement are part of the allure of membership in the group. An alternative explanation is that, because this is a pro-ana community, it is reasonable to expect that language will reflect a greater focus on people and objects, an effect that has been linked to a decrease in likelihood of recovery. Between these explanations, the latter is most likely, because other research has shown that, over time, only half of users posting about anorexia in English on Tumblr will have a “recovery event” (Chancellor, Mitra, & De Choudhury, 2016).

For the fourth research question, where the most common and statistically significant psychological process category in both the English and Spanish sub-corpora was *ingestion* and where the most common category in the Mixed sub-corpus was *health* followed by *ingestion*, there are two probable explanations for the obtained results. The first is that the results are consistent with the focus on body, health, and ingestion revealed by prior research on English-dominant pro-ana groups online. An alternative explanation is that users’ posts were more likely to contemplate recovery. Research has shown that the increased use of words such as *health* and *ingestion* on Tumblr posts was linked to a greater likelihood of recovery, with the increased use of health-related words being the most likely predictor (Chancellor et al., 2016). Between these explanations, the former is more convincing, because pro-ana users who indicate concerns about body image and ingestion, especially when they express themselves with a more negative tone, are more likely to be signaling symptoms of anorexia (Wang et al., 2018). These results are compatible with prior research that pro-ana communities exacerbate and reinforce harmful ideals about weight and weight-loss practices.

While these findings are robust, there are three limitations to this study that warrant consideration. First, words in LIWC can exist within more than one category and can have more than one meaning. This could skew the results to some degree. Before being analyzed by LIWC software, the data were reviewed so as to clarify any confusing meanings and to control for this

concern as much as possible. Second, this study considered neither private posts nor posts originating from beyond North, Central, or South America. Because of the practice of banning hashtags and blocking content on social media sites, it is possible that users have private accounts where they screen followers to ensure their content will not be reported by other users. This sort of decision would limit the available data and could have affected the results. Third, this study began by focusing on a Spanish-language corpus. Due to the code-switching phenomenon, however, it ended up including Spanish, English, and Mixed sub-corpora. There were no Spanish-language or mixed-language blog norms to use for comparison, thus constraining the external validity of the study.

The above limitations notwithstanding, this study reveals significant implications for both practitioners and researchers. With respect to practitioners, this study suggests areas of additional inquiry when encountering a Spanish-speaking or bilingual client who is engaging in behaviors associated with anorexia. Counselors must be equipped to speak with their clients about anorexia, especially in the case of adolescents, who are less likely to raise the topic on their own. Gathering more information about online behaviors, trauma history, and engagement with emotions would reveal even more opportunities to assess the needs of these clients.

A second implication for counselors would involve the Stages of Change (or Transtheoretical) Model (Prochaska & DiClemente, 1983), specifically allowing practitioners to better incorporate information about linguistic markers in pro-ana and pro-recovery posts. Counselors are committed to facilitating health and wellness, and research continues to demonstrate linguistic markers among groups. By monitoring clients' language use to indicate stages of change, and to more accurately target interventions for progression, counselors can, therefore, provide tailored and more individualized treatment to increase recovery rates and lengths of wellness. Finally, and with regard to research implications, this study emphasized the ongoing need for a deeper understanding of the relationship between language and anorexia behaviors, particularly in Spanish-speaking and bilingual individuals. To generate more and better data in this domain, and to cultivate a more refined and inclusive research agenda, Spanish blog norms and code-switching corpora must be developed.

References

- Arseniev-Koehler, A., Lee, H., McCormick, T., & Moreno, M. A. (2016). #Proana: Pro-eating disorder socialization on Twitter. *Journal of Adolescent Health, 58*, 659–664.
<https://doi.org/10.1016/j.jadohealth.2016.02.012>
- Bjekić, J., Lazarević, L. B., Živanović, M., & Knežević, G. (2014). Psychometric evaluation of the Serbian dictionary for automatic text analysis-LIWCser. *Psihologija, 47*, 5–32.
<https://doi.org/10.2298/PSI1401005B>

- Brown, R. C., Fischer, T., Goldwich, A. D., Keller, F., Young, R., & Plener, P. L. (2018). #cutting: Non-suicidal self-injury (NSSI) on Instagram. *Psychological Medicine*, 48(2), 337–346. <https://doi.org/10.1017/S0033291717001751>
- Chancellor, S., Kalantidis, Y., Pater, J., De Choudhury, M., & Shamma, D. A. (2017). *Multimodal classification of moderated pro-eating disorder content*. Paper presented at the 2017 CHI Conference. <http://dx.doi.org/10.1145/3025453.3025985>
- Chancellor, S., Lin, Z., Goodman, E. L., Zerwas, S., & Choudhury, M. D. (2016). Quantifying and predicting mental illness severity in online pro-eating disorder communities. *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing*, 1171–1184. <https://dx.doi.org/10.1145/2818048.2819973>
- Chancellor, S., Mitra, T., & De Choudhury, M. (2016). Recovery amid pro-anorexia: Analysis of recovery in social media. *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, 2111–2123. <https://doi.org/10.1145/2858036.2858246>
- De Muth, J. E. (2014). *Basic statistics and pharmaceutical statistical applications*. Danvers, MA: Chapman and Hall/CRC.
- Department of Psychological Services. (2015). *Reformatting transcripts for LIWC 2015*. Lubbock, Texas; Author. Retrieved from: <http://www.depts.ttu.edu/psy/lusi/files/liwc2015transcriptioncleaning.pdf>
- Espeset, E. M. S., Gulliksen, K. S., Nordbo, R. H. S., Skarderud, F., & Holte, A. (2012). The link between negative emotions and eating disorder behavior in patients with anorexia nervosa. *European Eating Disorders Review*, 20(6), 451–460. <https://doi.org/10.1002/erv.2183>
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41, 1149–1160. <http://dx.doi.org/10.3758/BRM.41.4.1149>
- Gaur, M., Kursuncu, U., Alambo, A., Sheth, A., Daniulaityte, R., Thirunarayan, K., & Pathak, J. (2018). “Let me tell you about your mental health!” Contextualized classification of Reddit posts to DSM-5 for web-based intervention. *Proceedings of the 27th ACM International Conference on Information and Knowledge Management*, 753–762. <https://doi.org/10.1145/3269206.3271732>
- Greaves, M. M., & Dykeman, C. (2019, February 3). A corpus linguistic analysis of public Tumblr blog posts on non-suicidal self-injury. <https://doi.org/10.31234/osf.io/k4qt3>
- Gulbas, L. E., Hausmann-Stabile, C., De Luca, S. M., Tyler, T. R., & Zayas, L. H. (2015). An exploratory study of non-suicidal self-injury and suicidal behaviors in adolescent Latinas. *American Journal of Orthopsychiatry*, 84(4), 302–314. <http://dx.doi.org/10.1037/ort0000073>
- Hull, K., Kim, J. K., & Stillwell, M. (2018): Fotos de béisbol: An examination of the Spanish-language Instagram accounts of Major League Baseball teams. *Howard Journal of Communications*, 30, 249–264. <https://doi.org/10.1080/10646175.2018.1471756>
- Joiner, T. E., Jr., Van Orden, K. A., Witte, T. K., & Rudd, M. D. (2009). *The interpersonal theory of suicide: Guidance for working with suicidal clients*. <http://dx.doi.org/10.1037/11869-000>

- Kolar, D. R., Mejia Rodriguez, D. L., Mebarak Chams, M., & Hoek, H. W. (2016). Epidemiology of eating disorders in Latin America: A systematic review and meta-analysis. *Current Opinion in Psychiatry*, 29(6), 363–371. <http://dx.doi.org/10.1097/YCO.0000000000000279>
- Matsakis, L. (2018). How pro-eating disorder posts evade filters on social media. Retrieved from <https://www.wired.com/story/how-pro-eating-disorder-posts-evade-social-media-filters/>
- McNamara, P., McLaren, D., & Durso, K. (2007). Representation of the self in REM and NREM dreams. *Dreaming*, 17(2), 113–126. <http://dx.doi.org/10.1037/1053-0797.17.2.113>
- Merikangas, K. R., He, J., Burstein, M., Swanson, S. A., Avenevoli, S., Cui, L., . . . Swendsen, J. (2010). Lifetime prevalence of mental disorders in U.S. adolescents: Results from the National Comorbidity Study-Adolescent Supplement (NCS-A). *Journal of the American Academy of Child and Adolescent Psychiatry*, 49(10), 980–989. <http://dx.doi.org/10.1016/j.jaac.2010.05.017>
- Moreno, M. A., Ton, A., Selkie, E., & Evans, Y. (2016) Secret society 123: Understanding the language of self-harm on Instagram. *Journal of Adolescent Health*, 58(1), 78–84. <http://dx.doi.org/10.1016/j.jadohealth.2015.09.015>
- O’Dea, B., Larsen, M. E., Batterham, P. J., CEAR, A. L., & Christensen, H. (2017). A linguistic analysis of suicide-related Twitter posts. *Crisis: The Journal of Crisis Intervention and Suicide Prevention*, 38, 319–329. <https://doi.org/10.1027/0227-5910/a000443>
- Pennebaker, J. W. (2011). *The secret life of pronouns: What our words say about us*. New York, NY: Bloomsbury Press.
- Pennebaker, J. W., Booth, R. J., Boyd, R. L., & Francis, M. E. (2015). *Linguistic Inquiry and Word Count: LIWC2015* (Operator’s Manual). Austin, TX: Pennebaker Conglomerates, Inc.
- Pennebaker, J. W., Boyd, R. L., Jordan, K., & Blackburn, K. (2015). *The development and psychometric properties of LIWC2015*. Austin, TX: Pennebaker Conglomerates, Inc.
- Perez, M., Ohrt, T. K., & Hoek, H. W. (2016). Prevalence and treatment of eating disorders among Hispanics/Latino Americans in the United States. *Current Opinion in Psychiatry*, 29(6), 378–382. <https://doi.org/10.1097/YCO.0000000000000277>
- Pew Hispanic Center (2018). Hispanic trends. Retrieved from <http://www.pewhispanic.org>
- Pew Research Center (2015). Demographics of Tumblr. Retrieved from http://www.pewinternet.org/2015/08/19/mobile-messaging-and-social-media-2015/2015-08-19_social-media-update_05
- Pew Research Center (2018). Social media use in 2018. Retrieved from <http://www.pewinternet.org/2018/03/01/social-media-use-in-2018>
- Rayson, P., & Garside, R. (2000). Comparing corpora using frequency profiling. *Proceedings of the Workshop on Comparing Corpora*, 9, 1–6. <http://dx.doi.org/10.3115/1117729.1117730>
- Rosnow, R. L., & Rosenthal, R. (2003). Effect sizes for experimenting psychologists. *Canadian Journal of Experimental Psychology*, 57, 221–237. <http://dx.doi.org/10.1037/h0087427>
- Schott, N. D. (2017). Race, online space and the feminine: Unmapping “black girl thinspiration.” *Critical Sociology*, 43(7-8), 1029–1043. <http://dx.doi.org/10.1177/0896920516652456>

- Swanson, S. A., Crow, S. J., Le Grange, D., Swendsen, J. & Merikangas, K. R. (2011). Archives of General Psychiatry, 68(7), 714-23.
<http://dx.doi.org/10.1001/archgenpsychiatry.2011.22>.
- Tausczik, Y. R., & Pennebaker, J. W. (2009). The psychological meaning of words: LIWC and computerized text analysis methods. *Journal of Language and Social Psychology*, 29, 24–54. <https://dx.doi.org/10.1177/0261927x09351676>
- Wallace, K. (2015, November 3). Teens spend a ‘mind boggling’ 9 hours a day using media. Retrieved from <https://www.cnn.com/2015/11/03/health/teens-tweens-media-screen-use-report/index.html>
- Wang, S., Eccleston, C., & Keogh, E. (2015). The role of spatial frequency information in the recognition of facial expressions of pain. *Pain*, 156, 1670–1682.
<https://doi.org/10.1097/j.pain.0000000000000226>
- Wang, T., Markus, B., Ianni, A., & Mentzakis, E. (2018). Social interactions in online eating disorder communities: A network perspective. *PLoS One* 13(7), 1–17.
<http://dx.doi.org/10.5258/SOTON/D0551>
- Wardecker, B. M., Edelstein, R. S., Quas, J. A., Cordo, I. M., & Goodman, G. S. (2017). Emotion language in trauma narratives is associated with better psychological adjustment among survivors of childhood sexual abuse. *Journal of Language and Social Psychology*, 36(6), 628–653. <http://dx.doi.org/10.1177/0261927X17706940>
- Weisser, M. (2016). *Practical corpus linguistics: An introduction to corpus-based language analysis*. Hoboken, NJ: John Wiley & Sons, Inc.
- Wong, C. A., Merchant, R. M., & Moreno, M. A. (2014). Using social media to engage adolescents and young adults with their health. *Healthcare*, 2(4), 220–224.
<https://doi.org/10.1016/j.hjdsi.2014.10.005>

Table 1

Anorexia Item Word Count

	Pro-Ana English %	Pro-Ana English Count	Pro-Ana Spanish %	Pro-Ana Spanish Count	Pro-Ana Mixed %	Pro-Ana Mixed Count
Reasons for Anorexia	2.80	1314	4.02	130	20.38	108
Pro Anorexia Terms	.81	380	3.7	120	2.28	12
Methods of Anorexia	0	0	.06	2	.14	1
Hidden Hashtag Terms	.01	5	.01	0	.05	0

Table 2

English Pronoun Word Count

	Pro-Ana English %	Pro-Ana English Count	Blog Norms English %	Blog Norms English Count	Total %	Total Count
All Words	93.60%	46921	6.40%	3206	100%	50127
First- Person Singular	7.42%	3482	6.26%	201	7.35%	3682
Third- Person Singular	.41%	192	1.50%	48	.48%	240
Third- Person Plural	.29%	136	0.68%	22	.32%	158
First- Person Plural	.16%	75	0.91%	29	.21%	104

Table 3

English Pronoun Test Results

Pronoun	Pro-Ana English Observed Count	Pro-Ana English Expected Count	Blog Norms English Observed Count	Blog Norms English Expected Count	Family- Wise Error Rate	Adjusted Error Rate	<i>df</i>	<i>cv</i>	<i>LL</i>	<i>BIC</i>
Third- Person Singular	192	224.65	48	15.35	0.05	0.0033	1	8.62	49.13	38.31
First- Person Plural	75	97.35	29	6.65	0.05	0.0033	1	8.62	46.27	35.45
Third- Person Plural	136	147.89	22	10.11	0.05	0.0033	1	8.62	11.42	0.6
First- Person Singular	3482	3446.48	201	235.52	0.05	0.0033	1	8.62	7.69	-3.13

Table 4

English Psychological Process Category Test Results

Category	Pro-Ana English Observed Count	Pro-Ana English Expected Count	Blog Norms English Observed Count	Blog Norms Expected Count	Family- Wise Error Rate	Adjusted Error Rate	d f	cv	LL	BIC
Ingestion	4664	4281.58	17	299.42	0.05	0.0033	1	8.62	485.14	474.32
Health	2876	2710.75	20	185.25	0.05	0.0033	1	8.62	251.33	240.51
Body	1140	1089.54	24	74.46	0.05	0.0033	1	8.62	48.87	38.05
Sadness	713	680.5	14	46.5	0.05	0.0033	1	8.62	32.92	22.1
Neg. E.	1760	1709.2	66	116.8	0.05	0.0033	1	8.62	27.75	16.93
Insight	774	792.82	73	54.18	0.05	0.0033	1	8.62	6.34	-4.48
Anger	488	477.38	22	32.62	0.05	0.0033	1	8.62	4.15	-6.68
Death	127	122.62	5	8.38	0.05	0.0033	1	8.62	.0528	-7.07
Anxiety	211	205.93	9	14.07	0.05	0.0033	1	8.62	2.22	-8.6
Cog. Pro.	5171	5187.5	371	354.5	0.05	0.0033	1	8.62	0.81	-10.01

Table 5

Spanish Psychological Process Category Test Results

Category	Pro-Ana Spanish Observed Count	Pro-Ana Spanish Expected Count	Blog Norms English Observed Count	Blog Norms Expected Count	Family- Wise Error Rate	Adjusted Error Rate	<i>df</i>	<i>cv</i>	<i>LL</i>	<i>BIC</i>
Ingestion	163	90.38	17	89.62	0.05	0.0036	1	8.49	135.71	126.94
Cog. Pro.	672	523.73	371	519.27	0.05	0.0036	1	8.49	86.56	76.79
Body	123	73.81	24	73.19	0.05	0.0036	1	8.49	72.1	63.33
Health	62	41.18	20	40.82	0.05	0.0036	1	8.49	22.21	13.44
Neg. E.	115	90.89	66	90.11	0.05	0.0036	1	8.49	13.02	4.25
Death	23	14.06	5	13.94	0.05	0.0036	1	8.49	12.39	3.62
Insight	109	91.39	73	90.61	0.05	0.0036	1	8.49	6.86	-1.91
Anger	40	31.13	22	30.87	0.05	0.0036	1	8.49	5.15	-3.62
Sadness	28	21.09	14	20.91	0.05	0.0036	1	8.49	4.64	-4.13
Anxiety	16	12.55	9	12.45	0.05	0.0036	1	8.49	1.93	-6.84

Table 6

Mixed Psychological Process Category Test Results

Category	Pro-Ana Mixed Observed Count	Pro-Ana Mixed Expected Count	Blog Norms English Observed Count	Blog Norms Expected Count	Family- Wise Error Rate	Adjusted Error Rate	<i>df</i>	<i>cv</i>	<i>LL</i>	<i>BIC</i>
Health	108	18.19	20	109.81	0.05	0.0036	1	8.49	316.68	308.46
Ingestion	101	16.76	17	101.24	0.05	0.0036	1	8.49	302.09	293.87
Sadness	75	12.64	14	76.36	0.05	0.0036	1	8.49	219.54	211.31
Neg. E.	106	24.44	66	147.56	0.05	0.0036	1	8.49	204.87	196.64
Death	55	8.52	5	51.48	0.05	0.0036	1	8.49	181.77	173.54
Anger	37	8.38	22	50.62	0.05	0.0036	1	8.49	73.21	64.98
Body	35	8.38	24	50.62	0.05	0.0036	1	8.49	64.22	56
Cog. Pro.	27	56.55	371	341.45	0.05	0.0036	1	8.49	21.66	13.43
Anxiety	9	2.56	9	15.44	0.05	0.0036	1	8.49	12.93	4.7
Insight	5	11.08	73	66.92	0.05	0.0036	1	8.49	4.74	-3.48