

Self-Disclosure in Opioid Use Recovery Forums

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Abstract

Some individuals recovering from opioid use join online forums to seek social support (emotional and informational) and to share private information about themselves and their struggles/experiences during opioid use recovery. However, not much is known about the types of self-disclosure and of social support sought in posts published in these online forums. In this paper, we analyze posts published in two active Reddit opioid use recovery forums, */r/OpiatesRecovery* and */r/Suboxone*. We build machine learning models to measure the extent of different types of self-disclosures (positive and negative) expressed in these forums and of social supports sought (emotional and informational), and we show that positive self-disclosure in posts correlates with emotional support sought, while negative self-disclosure correlates with informational support sought.

Introduction

Opioid use disorder (OUD) is a public health concern; in the United States (US), it affects many individuals and a considerable amount of resources has been spent on its treatment (Chancellor et al. 2019). Increasingly, individuals recovering from OUD are seeking support on online forums focused on discussions around opioid use recovery (MacLean et al. 2015). Prior work determined that individuals affected by health-care related events such as cancer, tend to seek social support and share their personal experiences on online health forums (Chou et al. 2011; Wang, Kraut, and Levine 2012; Yang, Kraut, and Levine 2017). In order to elicit social support from members of online health forums, individuals often self-disclose positive or negative information in posts, regarding their experiences; where positive self-disclosure expressed in a post refers to expressing a positive attitude such as optimism or enthusiasm and negative self-disclosure expressed in a post refers to expressing pessimism or unhappiness, for example (Yang, Yao, and Kraut 2017). The following are examples of posts (rephrased) published in an opioid use recovery forum, expressing positive and negative self-disclosure:

Positive Self-Disclosure examples

- *For the first time in more than 10 years, my girlfriend and I have been clean*
- *I've been sober for over 14 years*

Negative Self-Disclosure examples

- *I relapsed after being clean for a little over a week*
- *I am considering relapse. I need help*

In online health forums, the importance of the expression of emotional and informational support has been determined (Wang, Kraut, and Levine 2012; Yang, Kraut, and Levine 2017). In this work, using posts published in two opioid use recovery forums on Reddit we aim to understand the type of social support (emotional and informational) that is sought in opioid use recovery forum posts in which the post authors self-disclose positive or negative information.

Reddit posts are made up of the *title* section - which is a brief description of the post and the *selftext* section - which describes the post in more detail. Prior work showed that user interactions - such as commenting, on Reddit posts is guided by the *title* section of the posts (post-titles) (Glenski and Weninger 2017). Also, using post-titles from posts published on substance use recovery forums on Reddit, prior work (Andy and Guntuku 2020) determined the social supports expressed in these post-titles that elicit comments from members of these forums. Therefore, for all our analysis in this work, we use post-titles. Specifically, we build machine learning models to measure the extent to which post-titles published in the following opioid use recovery forums, */r/OpiatesRecovery* and */r/Suboxone*, express positive self-disclosure and negative self-disclosure, respectively. Also, using the models from prior work (Andy and Guntuku 2020), which predict the extent of the following social supports: emotional support sought and informational support sought, expressed in substance use recovery forum post-titles, we determine the extent to which post-titles in our dataset seek emotional support and informational support, respectively. Using Pearson's correlation, we determine the correlations between features that represent the positive and negative self-disclosure, respectively expressed in each post-title with features that represent the emotional and informational support sought, respectively in each post-title.

For individuals going through substance use recovery, an important aspect of the recovery process is to have a person or group of people that can help keep them accountable for their actions as it pertains to substance use (Allen et al.

1997; Huselid, Self, and Gutierrez 1991; Tracy and Wallace 2016; Witbrodt and Kaskutas 2005). In this work, we also aim to understand how individuals going through opioid use recovery express their need to be held accountable (i.e. accountability post). Specifically, we determine how much self-disclosure (positive and negative) and social support (emotional and informational) is expressed in accountability posts in these forums.

For all our analysis in this work, we only report the positive correlations.

Related Work

A lot of work has been done to understand user communication on online forums focused on health and well-being; in this section, we discuss relevant prior work.

The information individuals choose to disclose on online forums is influenced by what they perceive as the benefits of the disclosure (Chelune and Chelune 1979; Yang et al. 2019). In online forums, individuals are cautious about disclosing personal information, partly because the information they share could potentially be accessed by other members of the forum, who may not be the intended recipients of the information shared (Qian and Scott 2007; Yang et al. 2019). In public posts on Facebook, individuals tend to be more careful of the way in which they portray themselves because they want to impress on the potential audience a specific image of themselves (Vitak and Kim 2014). On Facebook, some individuals self-disclose their experiences with pregnancy loss, publicly, partly because they want to control the narrative of their experience and have fewer engagements with other users regarding the pregnancy loss (Andalibi and Forte 2018).

On the social media platform, Reddit, users tend to seek advice soon after they've been diagnosed or while they are receiving treatment; also, cancer survivors tend to disclose more about their personal experiences (Eschler, Dehlawi, and Pratt 2015). Parents who have children with special needs tend to disclose personal information about their experiences with parenting and seek support on online support forums (Ammari, Schoenebeck, and Morris 2014).

In some online forums focused on discussions around health, users tend to use pseudonyms (hence the anonymity of these users) and so they share more private information about themselves compared to online platforms in which pseudonyms are not used or are used less (Andalibi et al. 2016; Ellison et al. 2016; Leavitt 2015; Yang et al. 2019).

In an online forum focused on discussions around cancer, it was determined that members of the forum that received more emotional support tended not to leave the forum (Wang, Kraut, and Levine 2012). Also, in an online health forum, it was determined that members of the forum tend to respond with emotional support when a user self-discloses a negative experience and provide informational support when users ask questions (Wang, Kraut, and Levine 2015). In prior work, the social supports (i.e. emotional support sought and informational support sought) expressed in two online substance use recovery forum post-titles that elicit comments was determined (Andy and Guntuku 2020).

The linguistic attributes of posts that disclose personal information on online mental health forums was studied (De Choudhury and De 2014) and the process in which individuals self-disclose information in virtual forums was studied (Barak and Gluck-Ofri 2007).

Our work is different from prior work. In this work, we analyze post-titles published in two online opioid use recovery forums with the aim to determine the type of social support (emotional or informational) sought in post-titles that self-disclose positive or negative information. We also determine the types of social support sought and self-disclosure expressed in accountability posts.

Dataset

Our dataset consists of post-titles and meta-data from two active Reddit opioid use recovery forums: */r/OpiatesRecovery* and */r/Suboxone* with 27,000 and 9,100 members, respectively as of September 2020. We chose these forums because of: (i) the number of users in these forums and (ii) the frequency of monthly published posts in these forums. */r/OpiatesRecovery* is self-described as "We are a group of people dedicated to helping each other kick the habit". *Suboxone* is self-described as "A subreddit created to provide a place for discussion on Suboxone and other forms of buprenorphine, welcome to all whether it be short-term or long-term usage for MAT, for pain management, etc. Any Suboxone discussion is welcome here as long as it remains within the rules in the sidebar!". In these forums, users respond to published posts by either writing a comment or voting the post "up" or "down". Using Google's BigQuery¹, which is a data store with publicly accessible Reddit data sets, we downloaded and processed post-titles published on */r/OpiatesRecovery* and */r/Suboxone* between December 2015 and August 2019. From each of these forums, we collected the following data: the author of each post, the post-title, and the time in which each post was published. Table 1 highlights the summary of our data sets.

Table 1: Summary of the */r/OpiatesRecovery* and */r/Suboxone* datasets showing the number of unique users and number of published posts

Attribute	<i>/r/OpiatesRecovery</i>	<i>/r/Suboxone</i>
No. of users	4,374	1,908
No. of posts	9,900	3,300

Self-disclosure expressed in post-titles

Similar to prior work (Yang, Yao, and Kraut 2017), we build two models to identify how much positive and negative self-disclosure is expressed in opioid use recovery forum post-titles. We had 2 annotators - who were health care professionals familiar with substance use recovery, to rate a sample of 1,000 post-titles from our dataset, on how much positive

¹GoogleCloud.2018.Googlebigquery.(2018).https://cloud.google.com/bigquery/

and negative self-disclosure was expressed in each post-title. The annotators rated these post-titles by using a 7-point Likert scale in which 1 meant “a type of self-disclosure (positive or negative) was not expressed” and 7 meant “a type of self-disclosure (positive or negative) was expressed a lot”. Intra-class correlation (ICC) - which is used when text is rated by different groups of annotators, was used to measure the reliability of the raters, as shown in Table 2. For each post-title, we averaged the raters responses to how much positive and negative self-disclosure, respectively was expressed in the post-title. Each post-title had two numerical scores between 1 and 7 representing how much positive and negative self-disclosure, respectively, was expressed in the post-title.

Table 2: Intra-class correlation (ICC) showing annotator agreement

	ICC
Positive Self-Disclosure	0.85
Negative Self-Disclosure	0.91

Features

Similar to prior work (Yang, Yao, and Kraut 2017), we extracted the following features to train models to predict how much positive and negative self-disclosure, respectively was expressed in post-titles in our dataset:

Using the Linguistic Inquiry and Word Count (LIWC) dictionary - which is a dictionary comprising of psycholinguistic categories (Pennebaker et al. 2015), from each post-title, we calculated the frequency of the following LIWC categories i.e. “first personal singular”, “first personal plural”, “second person”, “third person singular”, “third person plural”, and “articles” (Yang, Yao, and Kraut 2017).

In these forums, members disclose personal information about their experiences with opioid use, hence from each post-title, we compute the frequency of the following LIWC categories associated with affect: “sadness”, “anger”, “anxiety”, “positive emotion”, and “negative emotion” (Yang, Yao, and Kraut 2017).

Similar to prior work (Yang, Yao, and Kraut 2017), we extract the following features from each post-title: the number of sentences and words, the number of parts-of-speech tags, the frequency of occurrence of weak and strong subjectivity words (Wilson, Wiebe, and Hoffmann 2005), the frequency of negation words/phrases, the number of modal verbs, and the number of named entities mentioned. Also, we extracted the frequency of sentences posed as question; these sentences were identified by selecting sentences that either ended with a question mark, began with a modal verb, or began with an indirect question pattern.

We used the Latent Dirichlet Allocation (LDA) model (Blei, Ng, and Jordan 2003) from prior work (Andy and Guntuku 2020); which is a LDA model of 20 topics from 45,000 post-titles from two substance use recovery forum i.e. */r/OpiatesRecovery* and */r/Leaves* - which focuses on discussions around quitting marijuana.

Similar to (Yang, Yao, and Kraut 2017), we calculated the average of word vectors in post-titles using pre-trained

word2vec embeddings (Mikolov et al. 2013).

Predicting Self-Disclosure in Opioid use recovery forums

Given the features described in the previous section, we built two Random Forest models (we tried SVM, logistic regression, and Random Forest, however Random Forest performed better) that each output a numerical value that represents how much positive and negative self-disclosure, respectively, is expressed in a post-title. The 1,000 annotated post-titles were partitioned into training (80%), validation (10%), and testing (10%). We evaluated the performance of the models on the validation set and when the performance was good, the models were then evaluated on the testing set. Similar to prior work (Yang, Yao, and Kraut 2017), we used Pearson’s correlation; these models correlated with the average annotator ratings with Pearson correlation: $Pearsonr = 0.457$; $p\text{-value} < 0.001$ and $Pearsonr = 0.440$; $p\text{-value} < 0.001$ for positive self-disclosure and negative self-disclosure, respectively. Table 3 shows the 4 most important features, as ranked by the Random forest models.

Table 3: Self-Disclosure: Top 4 most ranked features by the Random Forest models

Positive disclosure	Negative disclosure
Word2Vec (0.25)	Word2Vec (0.26)
Word length (0.17)	Word length (0.16)
Noun (0.08)	Noun (0.09)
Strong Subjectivity (0.06)	Strong Subjectivity (0.06)

Social Support expressed in post-titles

Here, we used the models from previous work (Andy and Guntuku 2020) to measure the extent of emotional support sought and informational support sought in each post-title.

What type of social support is sought in post-titles that disclose positive or negative information

In this section, we aim to determine the type of social support i.e. emotional or informational, that is sought in post-titles that disclose positive or negative information. To do this, using our models to identify positive and negative self-disclosure in post-titles, for each post-title in our */r/OpiatesRecovery* and */r/Suboxone* datasets, we predict the extent of positive and negative self-disclosure expressed. Also, using the models from prior work (Andy and Guntuku 2020), we predict the extent of emotional and informational support sought in post-titles in our dataset.

Results

Using the Pearson’s correlation, we correlate features that represent the extent of positive and negative self-disclosure, respectively in our */r/OpiatesRecovery* and */r/Suboxone* datasets with features that represent the emotional and

informational support sought, respectively in our dataset.

Positive Self-Disclosure: Positive self-disclosure expressed in post-titles in our */r/OpiatesRecovery* dataset correlated with the emotional support sought in these post-titles with Pearson $r = 0.497$ and $p\text{-value} < 0.05$. Also, positive self-disclosure expressed in post-titles in our */r/Suboxone* dataset correlated with the emotional support sought in these post-titles with Pearson $r = 0.185$ and $p\text{-value} < 0.05$.

Negative Self-Disclosure: Negative self-disclosure expressed in post-titles in our */r/OpiatesRecovery* dataset correlated with the informational support sought in these post-titles with Pearson $r = 0.554$ and $p\text{-value} < 0.05$. Also, negative self-disclosure expressed in post-titles in our */r/Suboxone* dataset correlated with the informational support sought in these post-titles with Pearson $r = 0.307$ and $p\text{-value} < 0.05$.

Accountability

An important step during recovery from opioid use and substance use is to have an individual or a group of individuals to hold one accountable for actions pertaining to substance use. Having an accountability partner or partners has been shown to be effective in addiction treatment approaches such as 12-step programs e.g. alcohol anonymous (AA) (Allen et al. 1997; Huselid, Self, and Gutierrez 1991; Tracy and Wallace 2016; Witbrodt and Kaskutas 2005). In online substance use recovery forums, users seeking others to keep them accountable typically publish posts in which they mention how long – in days, weeks, months, or years – they’ve abstained from substance use, for example: *“I’ve been clean for a little over 2 weeks. I need some support”*.

In this section, we aim to determine the kind of social support (emotional or informational) and self-disclosure (positive or negative) that is sought in post-titles seeking accountability. From our */r/OpiatesRecovery* and */r/Suboxone* datasets, we identified 3,379 and 2,105 accountability post-titles, respectively by selecting post-titles that made reference to the number of days, weeks, months, or years the author of the post-title had abstained from using opioids. For the analysis in this section, we use point biserial correlation - which measures the association between binary variables and continuous variables.

Accountability: Self-Disclosure: Here, using point-biserial correlation, we correlate a feature that represents if a post-title is an accountability post or not with the positive and negative self-disclosure score, respectively, of post-titles in our */r/OpiatesRecovery* and */r/Suboxone* datasets. Accountability posts correlate positively with positive self-disclosure in */r/OpiatesRecovery* and */r/Suboxone* as shown in Table 4.

Accountability: Social Support: Similarly, we use point-biserial correlation to correlate a feature that represents if a post-title is an accountability post or not with the emotional and informational social support score, respectively of post-

Table 4: Results from correlating accountability with positive self-disclosure. All the p-values were less than 0.001

	Positive Self-Disclosure
<i>/r/OpiatesRecovery</i>	Pointbiserial $r = 0.57$
<i>/r/Suboxone</i>	Pointbiserial $r = 0.11$

titles in our data set. Accountability posts correlated with emotional support sought as shown in Table 5.

Table 5: Results from correlating accountability and emotional support sought. All the p-values were less than 0.001

	Emotional Support Sought
<i>/r/OpiatesRecovery</i>	Pointbiserial $r = 0.39$
<i>/r/Suboxone</i>	Pointbiserial $r = 0.15$

Discussion

In our analysis, we correlate the positive and negative self-disclosure expressed in post-titles to the emotional and informational support sought in these post-titles and show that in both */r/OpiatesRecovery* and */r/Suboxone*, positive self-disclosure correlates with emotional support sought and negative self-disclosure correlates with informational support sought. A potential explanation for the correlation between positive self-disclosure and emotional support sought is that when users disclose positive information in these forums, they may be seeking encouragement or affirmation. Also, a potential explanation for the correlation between negative self-disclosure and informational support is that when users self-disclose negative information, they may be seeking informational support on how to overcome their struggles with abstaining from opioid use. Knowing the social support (emotional or informational) mostly sought in posts that express positive self-disclosure and negative self-disclosure can help members of the forum provide the right type of support to individuals seeking these support.

We show that accountability posts express more positive self-disclosure and seek more emotional support. A potential explanation for this is that when users express the need for accountability, they express their progress regarding avoiding opioid use and seek encouragement to continue abstaining from substance use, hence the correlation.

Conclusion and Future Work

In this work, we analyze post-titles from two opioid use recovery forums and show that post-titles that self-disclose positive information seek more emotional support and post-titles that self-disclose negative information seek more informational support. We show that accountability posts express more positive self-disclosure and seek more emotional support. The findings from this work are relevant for better understanding how individuals communicate in opioid use recovery forums. In this work, we analyzed post-titles; in the future, we plan to analyze both post-titles and the *self-text* section of Reddit posts.

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