Men's mental health-related usage of social media platforms that are non-intended for psychological support

What have men been disclosing and asking about with regard to their anxiety and depression on r\AskMen since the start of the COVID-19 pandemic ?
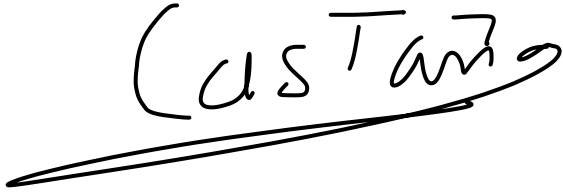
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A dissertation submitted to the University of Bristol in accordance with the requirements of the degree of Master of Science by advanced study in Computer Science in the Faculty of Engineering.

February 10, 2022

Declaration

This dissertation is submitted to the University of Bristol in accordance with the requirements of the degree of MSc in the Faculty of Engineering. It has not been submitted for any other degree or diploma of any examining body. Except where specifically acknowledged, it is all the work of the Author.

Felipe Castano, February 10, 2022

Abstract

The aim of this study was to provide a topical analysis of the Reddit submissions posted by men since the start of the COVID-19 pandemic on the subreddit r\AskMen where the author disclosed about his anxiety or depression. The goal was to fill the current existing void in the literature concerning topical analyses of male driven discussions on their anxiety and depression, within a social media platform non-intended for therapeutic use. The methods used in this study were the collection of anxiety/depression-related Reddit submissions from r\AskMen using PMAW, the filtering of non-anxiety/depression related submissions collected using a statistical approach, the extraction of topics using a Latent Dirichlet Allocation model, and the expansion upon these topics with a thematic analysis. This study brings an insight into the relationship that anxiety and depression has with men's lives, and into the type of questions asked by men on r\AskMen when disclosing about these mental health issues. The results obtained from this study could bring a more tailored and specific approach for the emergent digital therapy techniques. This study could also provide a first attempt at examining the differences between the male driven mental-health-related use of platforms intended for support and of those that are not.

Acknowledgements

COVID-19 Impact Statement

This project was not impacted by the COVID-19 pandemic in any way.

Contents

1 Background information

Since the start of the COVID-19 pandemic as declared by the World Health Organisation (WHO) on 11th March 2020, mental health has been a soaring topic. As mentioned in [57], "about 4 in 10 adults in the U.S. have reported symptoms of anxiety or depressive disorder" during the pandemic, which has been "up from 1 in 10 adults who reported these symptoms from January to June 2019".

More specifically, men have been known for being an underserved population. This comes as a contradiction to certain statistics, as according to [58], "the prevalence of mental illnesses in men is often lower than women." However, men are more likely to die by suicide than women [46], with the number of suicides being the highest amongst middle-aged men (35-64 years). This therefore puts a spotlight on the fact that men are way less likely to seek treatment for their mental health issues. Indeed, "40% of men won't talk to anyone about their mental health" [64]. This tendency of not looking for treatment comes in conjunction with the presence of a weaker initiative from the general public when it comes to providing support to men who are struggling, in contrast to women and children[31].

Both of these last ideas (men not seeking help and help being less available for them) are aggravated by the stigma that is present around the male population and its mental health, with "American men [being] subjected to a culture where the standards of masculinity are literally killing them" [49]. This culture is driven by "masculinity" norms that rely on the following behavioural factors as cited in [21]: winning, emotional control, risk-taking, violence, dominance, playboy, self-reliance, primacy of Work, power over women, disdain for homosexuals, and pursuit of status.

Thus, logically, with the rise of social media platforms since the 1980's [71], the discussion of mental health disorders from men through personal narratives and the mutual support between male users on social media platforms is a phenomenon that has taken an increasingly important place amongst the many different uses of the Internet.

This study aims to provide a topical analysis of the anxiety and depression-related submissions posted by men on the social media platform Reddit, and more specifically under the subreddit r\AskMen, since the start of the COVID-19 pandemic.

2 Related work

The past years have known an exponential growth in the number of social media users. In 2005, the engagement of users in social media was of 22 million, but by 2015, this number had already reached 204 million, and it is predicted that it will be of 220 million in 2022. Interestingly, a vast majority (80 %) of those users utilise these platforms as a place to seek health related information, and 50% of those users specifically look for medical specialists on these platforms [26]. This indicates that social media platforms are incredibly big source of health-related information, both from a patient and an expert perspective.

However, what is of great interest is that, according to [14], mental health-related topics are frequently mentioned on these platforms. There is therefore a natural tendency from the population to flip health-related discussions on their psychological side. Numerous studies have shown that interacting with other users when it comes to mental health issues yields positive effects. This is valid for anxiety ((Bartlett and Coulson, 2011; HØbye et al., 2010; Setoyama et al., 2011)), depression (Bartlett and Coulson, 2011; Griffiths, Calear, and Banfield, 2009; Setoyama, Yamazaki, and Namayama, 2011;), negative mood ((Shaw, Hawkins, and McTavish,

2006) and others [61] .

One of those social media platforms, Reddit, has become increasingly popular when it comes to considering the phenomenon of social media being used for mental health-related conversations. Reddit is a platform where users share content in form of text, posts and links and actively engage in discussions organised in "subreddits". "Subreddits" are platforms within Reddit where said users are encouraged to post and comment with a common theme or a targeted audience in mind. Reddit platform offers "free, unobtrusive, and honest sharing of mental health concerns because a patient is completely anonymous and so can open up without worrying about any social stigma" [26]. This represents an incredible opportunity for the public as mental-health sufferers often face stigma and discrimination coming from their close social circle (Barney, Griffiths, and Banfield, 2011; De Choudhury and De, 2014). As a result, the content being shared on Reddit is less biased and thus more representative of reality than the results obtained from interviews and questionnaires. Nevertheless, anonimity online is also thought to have negative effects as it causes the "dishinibition effect" [68] which drives some users to participate in activities that do not contribute to healthy social support, like trolling and flaming [35]. Additionally, it is worth mentioning that Reddit, just like any other social media platform, has rules on how to use it.

Therefore, obtaining information from these social media platforms represents an infinitely valuable opportunity to learn more about the epidemiology (distribution and causes) of mental health disorders [26], as well as the role these play in the users' lives. As a result, web-based interventions that use social media platforms as tool of action can have a greatly positive impact on a population that is not receiving enough help, and all this in a cost-effective way [23].

As of late, predictive analysis [26] on mental health-related content on social media have become increasingly important. As mentioned in [26], this implied transforming the content on the social media sphere to a "data bubble" where statistical, topical and linguistic studies could be carried out.

Numerous studies have been done on the linguistics in the submissions of patients suffering from mental health issues. [24] gathered linguistic attributes (most frequently used terms as well as most frequently used semantic catgeories) of Reddit posts in Mental Health focused subreddits (alcoholism, anxiety, bipolarreddit, depression, mentalhealth, MMFB (Make Me Feel Better), socialanxiety, SuicideWatch). [22] and [26] showed different ways of detecting indicators of psychiatric disorders on Reddit. [11] and [4] are also reflective of this effort to study the changes in people's way of expressing themselves. [67] showed that the majority of posts and comments on a pro-Eating disorder subreddit aligned with ED psychopathology. Finally, [3] quantified the evocation of suicide methods on social media platforms dedicated to people who have attempted suicide.

Furthermore, this study [42], instead of solely focusing on linguistics, presented an extensive analysis of the degrees of mental health related disclosure on Reddit (but not the actual content).

However, topical analysis was shown to be of primary importance in predictive analysis, as it enabled feature (linguistic, semantic, etc.) extraction and better classification, as shown in [36] with respect to Twitter. A topical analysis was carried out to quantify the tone used by people with self-harm and suicidal tendencies in [25]. Discussion of a particular mental health concern was shown to topically differ from other subreddits assimilated to other mental health concerns, like shown in [61], but the topical similarities were highlighted as well. [24] sought to find what users posted and commented about on disorder-specific subreddits regarding treatments and symptoms.

When it comes to mental health support, the male population is underserved due to their tendency to suffer more from this kind of issues. As highlighted in [16], "traditional masculine

role socialization produces a wide range of interpersonal patterns and behaviors that are profoundly harmful to society and to men themselves". This article stresses on the fact that these features can be a cause or a consequence of mental health issues. [9] mentions that in Canada, 80% of suicides are done by men, and that male depression has a complicated structure that is weakly recognised by the current medicine, and therefore poorly treated. This study also explains how men have specific ways of coping with their mental health, and that they underuse the services put at their disposition.

One subreddit in particular, r\AskMen, aims to be a platform for people that have a question that applies to a male experience specifically. As explained in [66], "Askmen is one of the few sites that offer an overtly demographic focus on men in the same way as sites such as iVillage target women". These questions range from "If you could tell the entire female population one thing about men what would you want us to know?" to "Where did you meet your wife? (That wasn't online dating)". However, one interesting fact is that this subreddit, which was not intentionally created to cater for mental health discussions, has known a considerable increase in such a type of submissions in the last years, with a vast number of users opting for this subreddit instead of those that were specifically set up for the discussion of a particular mental health topic, e.g r\Anxiety. This phenomenon has been so significant that the subreddit moderators themselves have had to start banning this type of submissions on 26th September 2020, arguing that "coming to reddit to ask about mental health resources and how to improve your mental state is just plain stupid. Like we get that you may think there is nowhere to turn, but there really is. Literally any place on the internet is better than Reddit." and that "from now on, Automod will automatically remove all posts about dealing with depression, suicide, and men's mental health."

Anxiety disorders are said to affect "40 million adults in the United States age 18 and older, or 18.1% of the population every year" [40], making it the most common mental illness in the U.S. The specifics of the different anxiety disorders have pushed the current study to focus on the most general form of anxiety, i.e Generalised Anxiety Disorder (GAD) [41]. On the other hand, depression represents an almost equally important mental health issue, as "In 2017, around 17.3 million adults age 18 or older in the U.S. had experienced at least one major depressive episode in the last year (6.7% of adults in the U.S.)"[39]. As for anxiety disorders, depressive disorders can be of many types, each one with its own specific characteristics. This study therefore focused on the most common and general one of them, i.e Major Depressive Disorder (MDD) [41].

3 Aims and objective

To the best of my knowledge, there has been no previous work aiming at extracting the topics from the mental health-related submissions in male-focused subreddit, non-intended for mental health-related discussion, such as r\AskMen.

Due to the importance of anxiety and depressive disorders amongst the population, as shown in 2, this study focused on the submissions where the author posted about his anxiety or depression.

Each post on Reddit is mainly composed of a title, where the user usually asks their question, and a body, where they can add context and further explanations to their question. Here below is an example:

Title: *Men of Reddit who were once shy and socially anxious in their early 20s, how did you change and become more confident?*
Body: *Happy to read your experiences, I am 20M and I am missing lots of things people my age do, due to shyness and low self-esteem.*

This implied that any thorough topical analysis of the anxiety and depression-related submissions posted on r\AskMen had to focus on two aspects: 1. the topics disclosed by the users, usually contained in the body of the posts, and 2. the questions asked, usually contained in the title of the posts.

Consequently, in order to fill the aforementioned scientific void in a suitable manner, this study aimed to answer the following research questions:

RQ1: What have men been disclosing on r\AskMen with regard to their anxiety and depression since the start of the COVID-19 pandemic ?

RQ2: What have men been specifically asking on r\AskMen when disclosing about their anxiety and depression since the start of the COVID-19 pandemic ?

4 Methods

4.1 Data collection

In order to gather the posts from r\AskMen, the data collection, analysis, and archiving platform Pushshift was used. Out of the different wrappers existing for the Pushshift API, PMAW was the one chosen as it is more adapted to gathering large datasets [63].

The outbreak of the COVID-19 virus was declared as a global pandemic by the World Health Organisation (WHO) on 11th March 2020 [60]. Only the posts created after that date were thus selected. On the other hand, only content posted on r\AskMen before 15th October 2021 was selected. Said date is in accordance to the timeline that this study followed and is therefore an arbitrary timestamp.

According to [55], people with anxious depression employ a particular vocabulary on social media platforms when disclosing about their mental health. Table 1 gathers these terms. Even though said study dealt with anxious depression and not just anxiety itself, not many other papers presenting such clear information concerning the way that anxious people communicate on social media could be found. Additionally, many cognitive models (Clancy, Noyes, Hoenk, and Slymen [19], Cloninger, Martin, Clayton, and Guze [32], Dealy, Ishiki, Avery, Wilson, and Dunner [30]) view depression as a secondary disorder to anxiety. Therefore, the terms mentioned in [55] were assumed to be reflective of social media users suffering from anxiety.

On the other hand, [27] presents the vocabulary commonly used by depression sufferers on social media. Table 1 also gathers these terms.

Lexicon	Words commonly employed in social media (or susceptible to be)
Anxiety	'anxiety', 'anxious' ,'fat','bad', 'weak','problem', 'tired', 'illusion', 'restless', 'bored', 'crap', 'shit', 'fuck', 'sad', 'escape', 'useless', 'meaningless', 'crying', 'reject', 'suffer', 'sleepless', 'never', 'bored', 'afraid', 'unhappy', 'ugly', 'upset', 'awful', 'torture', 'unsuccessful', 'helpless', 'suffer', 'fail', 'sorrow', 'nobody', 'blame', 'damaged', 'shatter', 'pathetic', 'insomnia', 'kill', 'panic', 'lonely', 'hate', 'depressed', 'frustrated', 'loser', 'suicidal', 'hurt', 'painful', 'disappoint', 'broke', 'abandon', 'worthless', 'regret', 'dissatisfied', 'lost', 'empty', 'destroy', 'ruin', 'die', 'sick'
Depression	'depression', 'depressed','alone', 'break', 'blame', 'deserve better','die','escape','distraction', 'nobody','feel alone','feel depressed', 'felt pain',' fuck dont ',' hate ','hurt','loneliness','reject love','safe','shit','sucks','no job','painful','pressure','too worried','unsuccessful','ugly','uncomfortable','winter','worry','worth','wrong life'

Table 1: List of words belonging to each lexicon.

Even though [55] does not specify that the terms 'anxiety' and 'anxious' are commonly used by anxiety sufferers on social media, these were added to the corresponding list. This was done because, as the terms in Table 1 were going to be used to select the anxiety/depression-related submissions from r\AskMen, it was assumed that there was high chance that posts concerning the disclosure of anxiety related problems on Reddit contained the terms 'anxiety' and/or 'anxious'. Similarly, even though 'depression' is not said to belong to the list of terms commonly used by depressed users on social media according to [27], this term was added for the same reason as for 'anxiety' and 'anxious'. Additionally, in [27], the phrase 'deserve unhappy' is said to be frequently used by depression sufferers on social media. However, it is grammatically incorrect, and was hence removed from the list.

The posts were obtained using the *api.search_submissions()* function from the PMAW documentation, by passing each one of the terms from Table 1 as an argument. Then, the submissions obtained were ranked by number of scraping terms that they contained. Figure 1 presents the number of posts containing different numbers of anxiety-related scraping terms. Figure 2 presents those for depression related terms. Thus, each post could be classified according to how many scraping terms it contained.

Nevertheless, not all of the posts obtained had to do with anxiety or depression, or had been even posted by a man. For example, a submission containing the term "blame" from the "Anxiety" row of Table 1 did not necessarily have to do with the author being a man disclosing about his anxiety. Using those submissions in the topical analysis would have skewed the results. Therefore, in order to find an estimate of the number of valid posts for each category of submission (e.g submissions containing 4 anxiety related terms), a statistical approach was taken.

Each category of posts represented a discrete, dichotomous population, i.e each submission could be anxiety/depression related or not, and the author could be a man or not. From now onwards, such a characteristic of a Reddit submission will be labeled (*anxiety/depression-related, posted by a man*). When selecting a submission and evaluating whether it was posted by a man and had to do with anxiety/depression self-disclosure, said submission was not put back in the pool of gathered posts, as it had already been analysed. Thus, any selection and
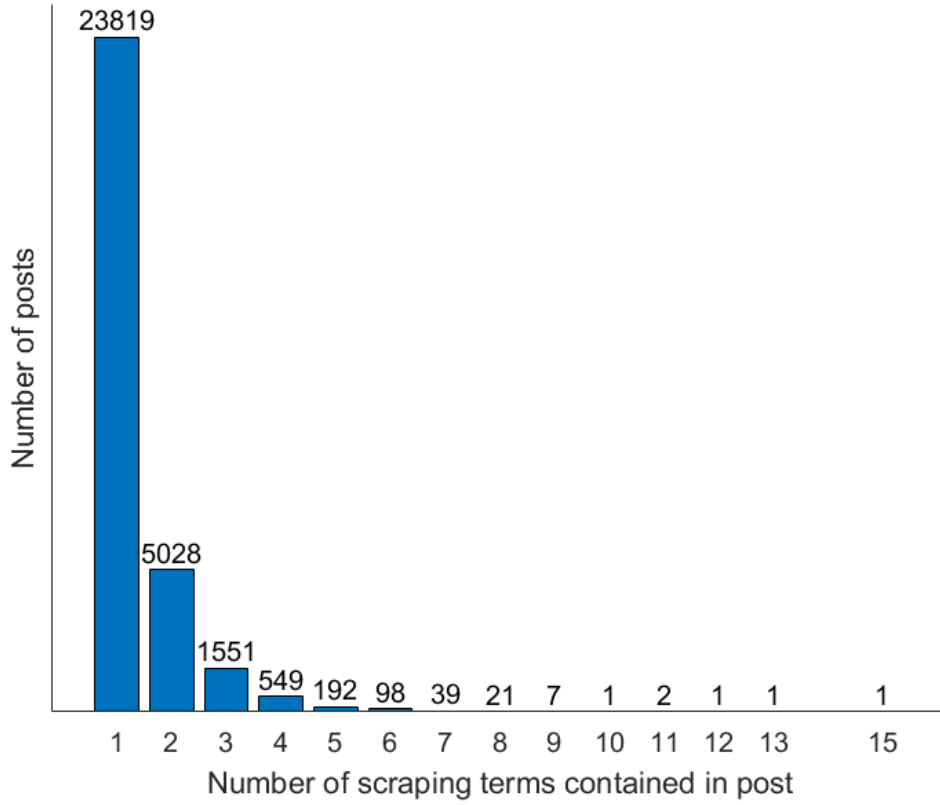
Figure 1: Number of Reddit posts on r\AskMen containing different numbers of anxiety related terms

verification of a submission was a "sampling without replacement".

Therefore, with the above-mentioned conditions satisfied, the distribution of the probability of randomly selecting a submission that was anxiety/depression-related and that had been posted by a man was hypergeometric [18]. A portion (sample) of each category of posts had to be selected, and then the submissions had to be analysed to check the validity of (*anxiety/depression-related, posted by a man*) . However, for simplicity, a hypergeometric distribution could be assumed to be binomial in the cases where the corresponding sample size n verified:

$$\frac{n}{N} \leq 0.1 \quad and \quad n > 50 \tag{1}$$

where N is the size of the corresponding population (e.g $N = 1551$ for posts containing 3 depression-related posts).

To calculate the required sample size for a binomial distribution, the normal approximation of the confidence interval for a binomial proportion was used. For this approximation to be valid, the eventual sample size n that would have been obtained from this approximation was assumed to be large enough. This sample size was required to verify that the confidence interval, for the population proportion of (*anxiety/depression-related, posted by a man*) posts for each category , was smaller or equal to the margin of error of choice, i.e
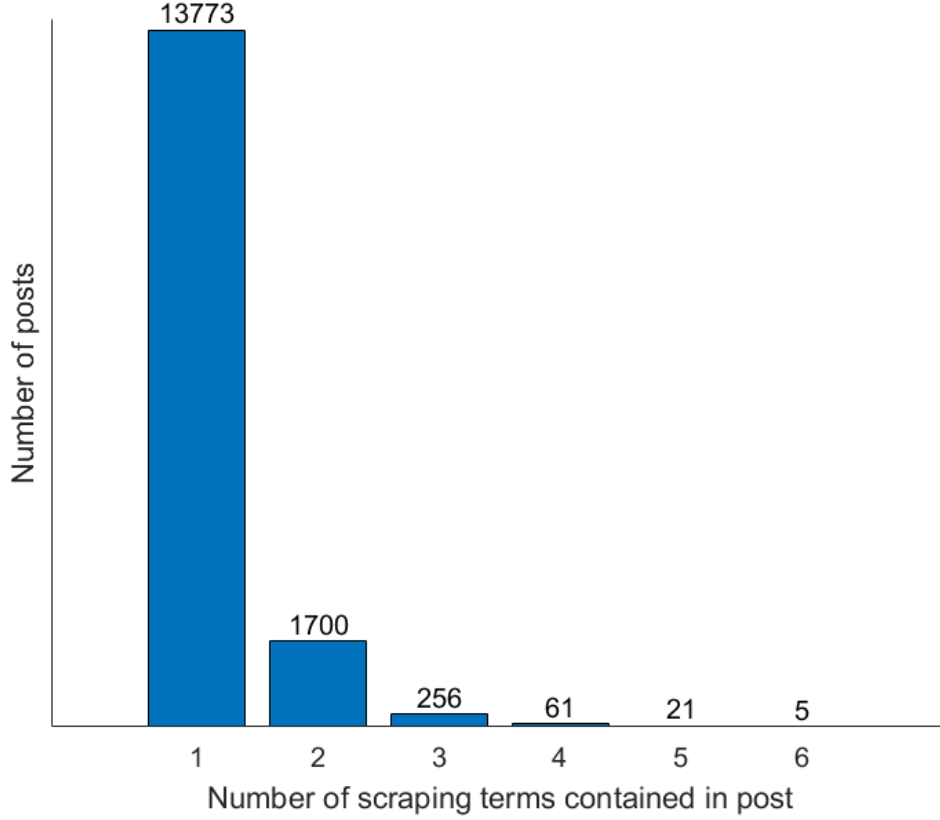
Figure 2: Number of Reddit posts on r\AskMen containing different numbers of depression related terms

$$Z \times \sqrt{\frac{p(1-p)}{n}} \leq m \qquad (2)$$

where Z is the amount of confidence required, p is the population proportion of (*anxiety/depression-related*, *posted by a man*) posts and m is the margin of error chosen. However, as p could not be determined yet, an estimate of it, labeled p^*, was to be chosen. Rearranging equation 2 to isolate n gave:

$$n \geq (\frac{Z}{m})^2 \times p^*(1-p^*) \qquad (3)$$

Guidelines for the use of statistical methods in Social Sciences, as seen in[2] (pp 125-126), specify that when determining a suitable sample size before estimating the population proportion, an educated guess of $p^* = 0.5$ can be made as a safe approach. This is because that value yields the maximum value for $p^*(1-p^*)$, that is 0.25, and thus ensures the highest minimum value for n. Thus, using a level of confidence of 95 %, and a margin of error of 8 %, as shown in the numerous examples in [2], the sample size was determined to be of 150 posts. This meant that, if a binomial approach was assumed for the distribution of (*anxiety/depression-related*, *posted by a man*) posts containing the same number of anxiety/depression related terms, and a level of confidence of 95% and a margin of error of 0.08 were required, the minimum number of submissions checked had to be of 150.

Therefore, having determined the value of the minimum sample size n assuming a binomial distribution, the conditions in Equation 1 could be evaluated. Table 2 and Table 3 gather the different decisions on whether the probability distribution could be assumed to be binomial or if it had to stay hypergeometric.

Number of scraping terms	Number of posts	Value of n/N	Distribution assumed
1	23819	0.006	Binomial
2	5028	0.03	Binomial
3	1551	0.096	Binomial
4	549	0.27	Hypergeometric
5	192	0.78	Hypergeometric
6	98	1.53	Hypergeometric
7	39	3.85	Hypergeometric
8	21	7.14	Hypergeometric
9	7	21.43	Hypergeometric
10	1	150	Hypergeometric
11	2	75	Hypergeometric
12	1	150	Hypergeometric
13	1	150	Hypergeometric
15	1	150	Hypergeometric

Table 2: Value of n/N for each category of submissions obtained with anxiety-related terms and decision made on the corresponding probability distribution

Number of scraping terms	Number of posts	Value of n/N	Distribution assumed
1	13773	0.01	Binomial
2	1700	0.09	Binomial
3	256	0.59	Hypergeometric
4	61	0.41	Hypergeometric
5	21	7.14	Hypergeometric
6	5	30	Hypergeometric

Table 3: Value of n/N for each category of submissions obtained with depression-related terms and decision made on the corresponding probability distribution

For the categories of posts where a binomial simplification of the hypergeometric distribution could not be considered, the corresponding minimum sample size was calculated using Equation 4 as described in [1].

$$n = (N - \frac{N \times m - 1}{2})(1 - (1 - Z)^{\frac{1}{N \times m}})) \tag{4}$$

As for Equation 3, here it was chosen that $Z = 95\%$ and $m = 0.08$.

Tables 4 and 5 gather the values of the minimum sample sizes for the different categories of anxiety and depression-related posts. For the populations of posts containing 7, 8, 9, 10, 11, 12, 13 and 15 anxiety-related scraping terms, and the populations of posts containing 5 and 6 depression-related scraping terms, the corresponding sample sizes were not calculated however. This is because the original population size was small enough for the analysis to be carried out over the whole population.

Number of scraping terms	Probability distribution assumed	Corresponding minimum sample size (if original population size not small enough)
1	Binomial	150
2	Binomial	150
3	Binomial	150
4	Hypergeometric	35
5	Hypergeometric	33
6	Hypergeometric	30
7	Hypergeometric	39
8	Hypergeometric	21
9	Hypergeometric	7
10	Hypergeometric	1
11	Hypergeometric	2
12	Hypergeometric	1
13	Hypergeometric	1
15	Hypergeometric	1

Table 4: Minimum sample size for each cateogry of posts obtained with anxiety-related terms.

Number of scraping terms	Probability distribution assumed	Corresponding minimum sample size (if not original population size not small enough)
1	Binomial	150
2	Binomial	150
3	Hypergeometric	34
4	Hypergeometric	27
5	Hypergeometric	21
6	Hypergeometric	5

Table 5: Minimum sample size for each category of posts obtained with depression-related terms.

By verifying how many posts were (*anxiety/depression-related, posted by a man*) for each category of anxiety-related posts and depression-related posts, a confidence interval for the population proportion could be inferred. For the categories of posts where a binomial distribution was assumed, the corresponding confidence interval was, according to [72],

$$LB = \hat{p} - 1.96 \times \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \tag{5}$$

and

$$UB = \hat{p} + 1.96 \times \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \tag{6}$$

where LB and UP are the lower and upper bounds of the confidence interval respectively and $\hat{p}$ is the proportion of (*anxiety/depression-related, posted by a man*) posts out of the corresponding sample.

For the categories of posts where a binomial distribution could not be assumed and a hypergeometric distribution had to be considered, the corresponding confidence interval was, according to [1],

$$LB = \frac{NX}{n} - t_{\alpha/2,n-1}(\frac{(N-n)NX(n-X)}{n^2(n-1)})^{1/2} \tag{7}$$

and

$$UP = \frac{NX}{n} + t_{\alpha/2,n-1}(\frac{(N-n)NX(n-X)}{n^2(n-1)})^{1/2} \tag{8}$$

where X is the number of (*anxiety/depression-related, posted by a man*) posts out of the sample size, and N is the corresponding population size.

According to the standard classification manual of mental disorders of the American Psychiatric Association [41], anxiety disorders can be of many types: generalised anxiety disorder, separation anxiety disorder, selective mutism, specific phobia, social anxiety disorder, panic disorder, agoraphobia and Substance/medication-induced anxiety disorder. However, the current study did not aim to provide an in-depth diagnostic of these, but a topical analysis. Thus, the broadest sense of this disorder was considered when deciding whether a post was anxiety-related or not. [41] specifies that Generalised Anxiety Disorder (GAD) is the most common and general anxiety disorder. It is explained in [59] that people with GAD display excessive anxiety or worry, most days for at least 6 months, about a number of things such as personal health, work, social interactions, and everyday routine life circumstances. On Reddit, the time factor of the users' anxiety experience might be omitted or downplayed. Therefore, an anxiety-related post was considered to be one where the author explained that he had been fearful of certain events, activities, experiences for at least days.

According to [41], depressive disorders can be of many types: Disruptive Mood Dysregulation Disorder, Major Depressive Disorder, Persistent Depressive Disorder (Dysthymia), Premenstrual Dysphoric Disorder and Depressive Disorder Due to Another Medical Condition. However, this manual specifies that "Major depressive disorder (MDD) represents the classic condition" out of the whole spectrum of depression disorders. It is characterised by "discrete episodes of at least 2 weeks duration (although most episodes last considerably longer) with clear-cut changes in affect, cognition, and neurovegetative functions and inter-episode remissions." As Reddit users might downplay the severity of these criteria, a broader, simpler definition of depression was used: according to [47], depression is a mood disorder that causes a persistent feeling of sadness and loss of interest.

Table 6 gathers the population proportions p or confidence intervals inferred from the different values of the sample proportion $\hat{p}$ for each category of anxiety-related posts.

As an arbitrary choice, a confidence interval with a midpoint equal or superior to 0.5 was deemed to be representative of a category of posts worth taking into account in the topical analysis. The reasoning behind this was that a population with a proportion of at least half of the posts being anxiety related would be worth taking into account when identifying the topics of the corpus. Additionally, such a population proportion would result in a maximum of half of the submissions not being anxiety-related, but being diverse enough to not yield significant implications in the results of the topical analysis.

Number of scraping terms	Value of $\frac{Verifiedposts}{Consideredposts}$	Corresponding confidence interval or value of the population proportion
1	23/150	[0.096 ; 0.211]
2	42/150	[0.208 ; 0.352]
3	53/150	[0.277 ; 0.430]
4	17/35	[0.344 ; 0.656]
5	11/33	[0.214 , 0.505]
6	21/30	[0.561 ; 0.822]
7	21/39	0.538
8	14/21	0.667
9	5/7	0.714
10	1/1	1.000
11	2/2	2.000
12	1/1	1.000
13	1/1	1.000
15	1/1	1.000

Table 6: Value of the sample proportion and corresponding population proportion or confidence interval of the population proportion for the each category of anxiety-related submission.

According to Table 6, the categories of posts where the corresponding population proportion is equal to or higher than 0.5 or where the confidence interval yields a midpoint equal to or higher than 0.5 are those with 4, 6, 7, 8, 9, 10, 11, 12, 13 and 15 scraping terms per post. These posts were thus taken into account. For the discarded categories of posts, i.e those containing 1, 2, 3 and 5 scraping terms, only the submissions containing the nominal and adjectival form of the word "anxiety", i.e "anxiety" and "anxious", were taken into account: it was assumed that submissions containing at least one of those two words automatically had to do with the user experiencing anxiety.

The final number of selected anxiety-related posts was of 2528 out of the original 31310 submissions.

On the other hand, Table 7 gathers the values of the population proportion p or the confidence intervals inferred from the value of the sample proportion $\hat{p}$ for each category of depression-related posts.

Number of scraping terms	Value of $\frac{Verifiedposts}{Consideredposts}$	Corresponding confidence interval or value of the population proportion
1	32/150	[0.148; 0.279]
2	46/150	[0.233 ; 0.380]
3	12/34	[0.230 ; 0.527]
4	15/27	[0.426 ; 0.705]
5	10/21	0.476
6	3/5	0.600

Table 7: Value of the sample proportion and corresponding population proportion or confidence interval of the population proportion for the each category of depression-related submission.

According to Table 7, the categories of posts where the corresponding population proportion is equal to or higher than 0.5 or where the confidence interval yields a midpoint equal to or higher than 0.5 are those with 4, 5 and 6 scraping terms. These posts were thus taken into

account. For the discarded categories of posts, i.e those containing 1, 2 and 3 scraping terms, only the submissions containing the nominal and adjectival form of the word "depression", i.e "depression" and "depressed", were taken into account. It was assumed that submissions containing at least one of those two words automatically had to do with the user experiencing depression.

The final number of selected depression- related posts was of 1218 out of the original 15816 submissions.

4.2   Topic detection with Latent Dirichlet Allocation

Latent Dirichlet Allocation (LDA) is a "generative probabilistic model of a corpus" [45]: the corpus is assumed to present numerous distinctive topics, and that these topics are distributed over certain specific corpus words. Each document (independent divisions of the corpus) is considered as a "bag of words", which means that the order of the words does not matter [45]. In this current study, the whole set of selected submissions related to one mental health issue (i.e anxiety or depression) represented the corpus, made of N words in total. Each submission represented a document.

This method for topic extraction has been widely used in mental health related conversation on Reddit, [26], [35], [70], [61].

The anxiety and depression-related posts obtained from the selection process described in 4.1 were pre-processed (removal of stopwords, tokenisation, etc.) and fed to the LDA program implemented in Python.

As the number of topics k required from the program could be changed, the coherence score was calculated for each number of topics outputted by the LDA model. The coherence score is a value which reflects the "human interpretability" of the topics outputted by the model. Higher scores "better approximate human ratings and suggest that the topics are more distinguishable (i.e. highly interpretable) from one another than topic models with lower coherence scores" [34].

For anyone value of the required number of topics k to be outputted by the LDA model, the result looks like this:

- *Topic 1: word 1, word 2, word 3, word 4, ...*

- *Topic 2: word 1, word 2, word 3, word 4, ...*

- *Topic 3: word 1, word 2, word 3, word 4, ...*

- *...*

- *Topic k: word 1, word 2, word 3, word 4, ...*

where each word of each topic is ranked by their frequency within the topic. However, this implied that some of the words ranked high within one topic might not be representative of that very topic but rather of the whole corpus due to its high global frequency. To make up for this eventual decrease in interpretability, the words within each topic were also ranked by relevancy. Introduced in this study [8], the relevancy r of any term w to the topic k is defined as:

$$r(w, k|\lambda) = \lambda log(\phi_{kw}) + (1 - \lambda)log(\frac{\phi_{kw}}{p_{kw}}) \tag{9}$$

where ϕ_{kw} is the probability of the term w in the topic k, p_{kw} is the term's marginal probability across the corpus and λ (a value between 0 and 1) is a factor that reflects how much importance is given to the first ($log(\phi_{kw})$) or second term ($\frac{\phi_{kw}}{p_{kw}}$) of the equation. The second term, $\frac{\phi_{kw}}{p_{kw}}$, helps discards globally frequent terms, and thus a a lower value of λ results in the terms within a topic to be more reflective of how exclusive they are to that topic. However, a trade-off between a high value of lambda and a lower one was desirable as a value too small would have resulted in some terms globally frequent across the corpus to not be shown, which would have thus omitted crucially important terms for the whole document and therefore for each topic.

Due to a time constraints, λ was set to 0.5, although it would have been desirable to run the LDA model with many different values of λ between 0 and 1.

4.3 Thematic analysis

In order to make sense of the topics outputted by the LDA model, a thematic analysis was carried out by selecting the posts representative of each topic. This way of expanding upon the results of the LDA model is preceded by other studies analysing social media data [20].

In order to do this, the topic score of each submission was calculated for each one of the topics outputted by the LDA model, both for the anxiety and the depression corpus. For each Reddit submission, the topic score was determined by calculating the Jaccard similarity between the terms representing the topic and the processed (tokenised, stopwords removed, etc.) terms of the post considered. The usage of the Jaccard Similarity for the calculation of the topic score of Reddit submissions is preceded by prior research attempting to verify the LDA-outputted topics by verifying the Reddit posts with the highest topic scores [70].

Then, for both the anxiety and depression corpus, the posts were ranked by Jaccard similarity value from highest to lowest, for each one of the topics outputted by the LDA model. The first 20% posts from both the anxiety and depression corpus were planned to be thematically analysed. This proportion would have been consistent with prior research using thematic analysis on textual data from social media ([20], [17], [7]). 20 % of the 2528 chosen anxiety-related posts amounted to 505 submissions. 20 % of the 1218 chosen depression-related posts amounted to 243 submissions.

However, time constraints only allowed for 10% of the anxiety and depression corpora to be thematically analysed, i.e 252 anxiety-related submissions and 120 depression-related submissions.

The thematic analysis was carried out according to the guidelines provided in [37].

5 Description and analysis of results

5.1 Topic extraction with LDA model

5.1.1 Anxiety corpus

Figure 3 shows the discrete evolution of the coherence score for increasing values of k topics outputted by the LDA program, when fed all the selected anxiety-related submissions.
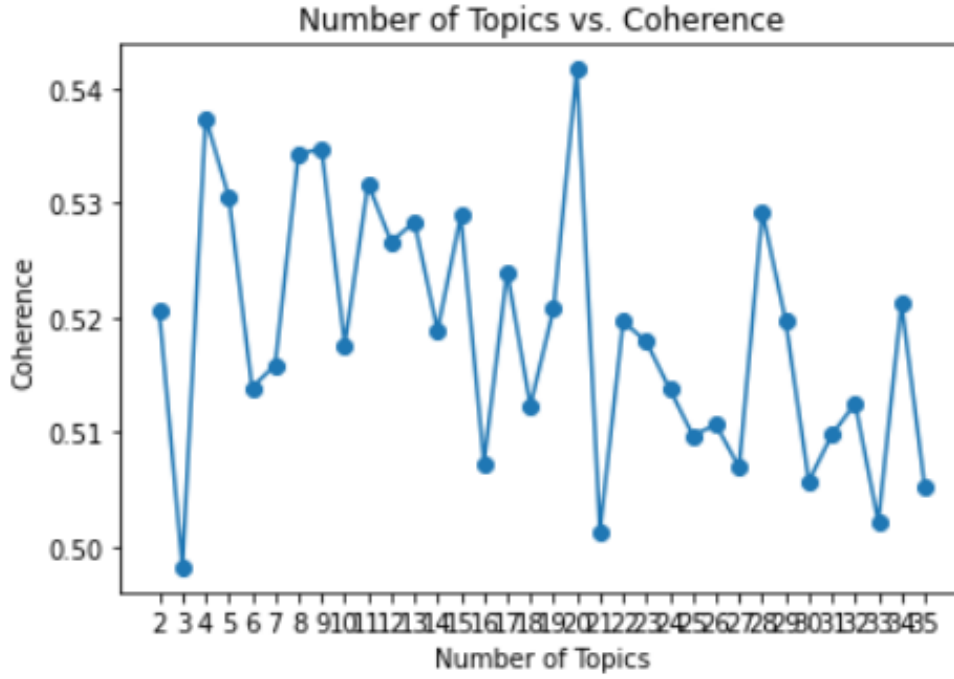
Figure 3: Evolution of the coherence score for k ranging from 1 to 35, for the anxiety corpus

It can be seen that the value of k yielding the highest coherence score is $k = 20$. The corresponding topics outputted by the model were as shown below:

- *Topic 1: sex someone feel day life problem time work guy relationship*

- *Topic 2: feel time way kind man day work talk life stuff*

- *Topic 3: life brother relationship avoidance kind reddit time need house anxiety*

- *Topic 4: relationship man way feel time girl guy insertion didnt fact*

- *Topic 5: life anxiety relationship bun time day help job didnt watch_porn*

- *Topic 6: relationship feel text coz female_coworker someone coworker semester fact person*

- *Topic 7: group job rp work life help end plug chappell everyone*

- *Topic 8: life file success matrace cant whole_life wife point month load*

- *Topic 9: family groom injury guy tik stripper bachelor year night next_year*

- *Topic 10: time life jack feel pill part danger appearance anyone dosent*

- *Topic 11: lose_interest mutual _friends illness goofy class body time way reason person*

- *Topic 12: group time zone cartoon didnt sex cable turkey coward press*

- *Topic 13: partner person someone paul john cause army magic billie sufferto*

- *Topic 14: social_media stop_feeling relationship casual _sex girl gift match straight_man healthier brother*

- *Topic 15: acid breath work fantasize dad grandfather balance spending _time adult pardon*

- *Topic 16: paul rc thisit til time fuel pedo best_friend way ima*

- *Topic 17: partner party person demon ronnie respond vow jeopardize amaze picturesvideos*

- *Topic 18: blah testicle psyche negativity stupidest talent minimum time stack bat*

- *Topic 19: jessica past_months bfs oblige ahoy skyn volleyball thingymegigy n_c residence*

- *Topic 20: reasurance criticism school numb echolocation brotheri overreact wich supermarket settle*

The terms *life*, *time* and *relationship* were globally present terms (present in 7, 6 and 7 topics respectively), which caused many of the topics to have overlap with each other.

Additionally, the topics that did not contain overly specific terms were described by terms that were too varied and vague. This applied to topics 1, 2, 3, 4 and 5. For example, some of the terms with the highest relevancy describing topic 5 were "life", "anxiety", "relationship", "time", "day", "job" and "help". Some of these terms belong to the semantic field of dating ("anxiety", "relationship") whereas others to that of work ("job", "time", "day"). Then others can be seen as completely abstract, like "time" and "life", if not accompanied by more explanatory terms. This made topics 1 to 5 not interpretable and distinctive enough.

Finally, the remaining topics were represented by overly specific terms. This applied to topics 6 to 20. For example, some of the terms with the highest relevancy describing topic 17 were "partner","party", "person", "demon", "ronnie" and "respond". This made topics 6 to 20 not interpretable enough.

Therefore, the next best coherence score was selected, i.e that for $k = 4$ topics, which had for results the following topics:

- *Topic 1: anxiety life relationship time feel girl someone day way work*

- *Topic 2: life feel time work relationship sex day didnt way home*

- *Topic 3: time someone didnt partner person relationship talk man sex year*

- *Topic 4: brother way time life mom night family nothing dad didnt*

These results were clearer, as it could be seen that the terms representing the topics could be organised in 4 semantic fields: a professional career ("work", "time", "day"), a romantic life ("girl", "relationship", "partner", "man"), family life ("mom", "family", "brother", "home", "dad") and sex life ("sex", "girl", "night", "partner").

However, for topics 1 and 2, the terms describing them were a mixture of the semantic fields mentioned above, so the terms were too diverse. For example, some of the terms with the highest relevancy describing topic 2 were "life", "work", "relationship" and "sex". These terms could be each organised under one of the 4 semantic fields mentioned earlier, but they are too different from each other. This made topics 1 and 2 not interpretable enough.

Additionally, there was a considerable overlap between topics 1 and 2, with the terms "life", "relationship", "time", "feel" and "way" being present in both. This made those two topics not distinctive between each other, in addition to not interpretable.

Only topics 3 and 4 were actually interpretable: the former could be seen as representing the users talking about their dating life and the latter as representing the users talking about their family life.

The results for $k = 4$ were therefore retained for the computation of the Jaccard similarity of each post, and therefore the thematic analysis.

5.1.2 Depression corpus

Figure 4 shows the discrete evolution of the coherence score for increasing values of k topics outputted by the LDA program, when fed all the selected depression-related posts.
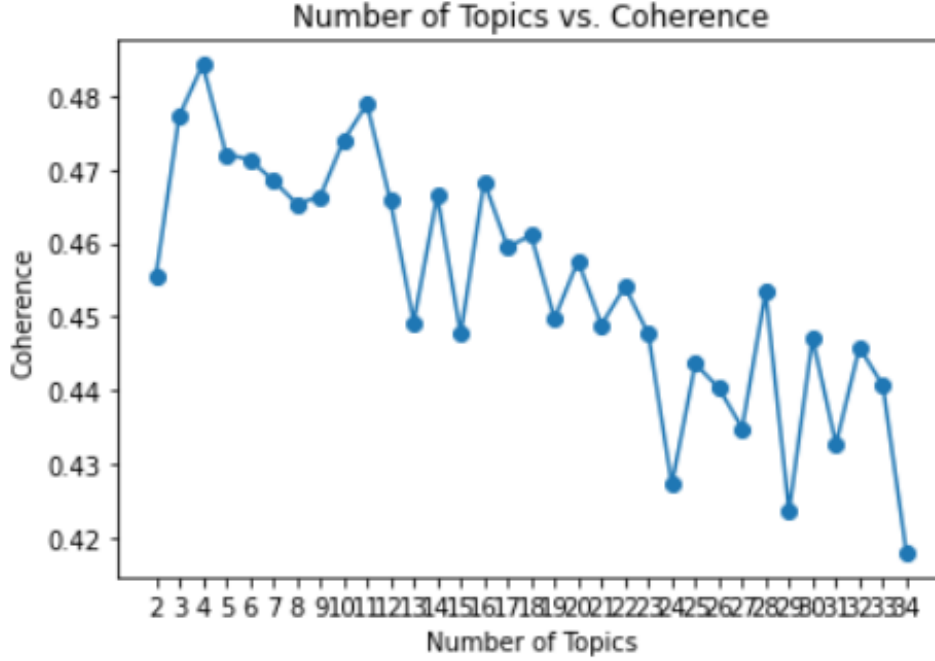

Figure 4: Evolution of the coherence score for k ranging from 1 to 34, for the depression corpus

It can be seen that the values of k yielding the highest coherence scores were $k = 4$ and $k = 11$.

For $k = 4$, the corresponding topics outputted by the model were as shown below:

- *Topic 1: life time relationship depression feel anyone partner way work advice*

- *Topic 2: depression anxiety help job feel guy time work someone life*

- *Topic 3: depression time didnt way feel nothing week day guy someone*

- *Topic 4: life support depression feel sex day family relationship talk mental_health*

The most prevalent words were those relating to a professional life ("job", "work", "time"), a dating life ("relationship", "partner"), support ("help", "support"), depression ("depression", "feel", "advice", "anxiety", "talk", "mental health") as well as those indicating time ("day", "week", "time").

However, some of these terms, if isolated, are too vague and abstract. These 5 semantic fields were spread out across all 4 topics. For example, some of the terms with the highest relevancy describing topic 3 were "depression", "time", "feel", which represent two of the semantic fields previously mentioned (depression and time) and are very abstractly linked to each other. This made all four topics hardly interpretable.

Nevertheless, it is worth mentioning the presence of the word "depression" in every single topic, thus showing its major importance across the whole corpus.

For $k = 11$, the topics outputted by the model were as shown below:

- *Topic 1: life time relationship kind year start someone way mom guy*

- *Topic 2: life feel anxiety depression advice help talk partner anyone time*

- *Topic 3: didnt anyone deal guy care time way depression feel point*

- *Topic 4: sex depression time feel help drive girlfriend man woman didnt*

- *Topic 5: wife work day time help home eat situation need friend*

- *Topic 6: depression job someone time feel hair support cry deal seniority*

- *Topic 7: depression partner relationship whenever boob suffer dad way party person*

- *Topic 8: gift respect plane husband help bill ride werent joe game*

- *Topic 9: someone cause feel person share life suicide help time talky*

- *Topic 10: college year none time experience fever day girlfriend boyfriend skate*

- *Topic 11: man nuisance war relationship work stepdad play social_life feel depression*

Here, the terms "life", "time", "relationship", "depression" and "feel" were present in 4, 8, 3, 6 and 6 topics respectively. Thus, these terms being very present across all topics, many of the topics showed lot of overlap with each other and were thus hardly distinctive.

The only topics that a broad theme could be inferred from were topic 2, reflective of the experience of opening up about one's depression, topic 4, reflective of the effects of depression on men's sex life, topic 5, reflective of living day to day with depression and topic 9, reflective of the experiences of opening up and obtaining support.

However, topics 1, 3 and 7 presented too much diversity amongst the terms representing them. For example, some of the terms with the highest relevancy for topic 3 were "anyone", "deal", "care" and "time". This made topics 1, 3 and 7 hard to interpret.

Furthermore, topics 6, 8, 10 and 11 are represented by terms that were too specific for them to be interpretable. For example, some of the terms with the highest relevancy for topic 8 were "gift", "respect", "plane" and "husband".

As the thematic analysis of the posts with the highest Jaccard similarity would bring more clarity on the meaning of each topic, the topics obtained for $k = 4$ were retained. This was decided because although $k = 11$ yielded some fairly interpretable topics, i.e topics 2, 4, 5 and 9, the other ones, faulty of being too diverse or too specific, would have made the thematic analysis harder.

4 topics obtained from the anxiety corpus and 4 topics obtained from the depression corpus were therefore selected for the computation of the Jaccard similarity. As 252 anxiety-related submissions were thematically analysed, this meant 63 posts per each anxiety LDA topic. On the other hand, as 120 depression-related submissions were analysed in total, this meant 30 posts per LDA depression topic.

5.2 RQ1: Thematic analysis of the anxiety and depression-related disclosure

5.2.1 Anxiety corpus

When analysing the posts where men disclosed about their anxiety, this mental health issue was seen to play a role in five different sectors of their lives: anxiety in the author's 1. romantic life, 2. social life, 3. academic/professional life, and finally 4. sex life.

Anxiety and the author's dating life

Within this main theme, two different sub-themes were identified: **Anxiety as a cause of problems** and **Anxiety as a result of issues**.

Anxiety as a cause of problems In many posts, the author's anxiety was depicted as being at the root of his problems when it came to his dating /romantic life. In many cases, the author identified with his anxiety and saw it as a personality trait:

I've been an awkward person. I never really knew how to or what to talk to people. Even now I'm trying to change it

Sounds weird to be worried about this since i'm only 19 years old, but i'm an introverted guy with anxiety, not that i can't talk to people, i'm just really awkward when doing so especially with strangers,

Additionally, in some posts, the author explained how we was foreseeing problems with his eventual partner due to his anxiety,

i'm just really awkward when doing so especially with strangers, and i'm worried that if i ever fall in love again i wouldn't know what to do

whereas in others the difficulties to approach a potential partner were highlighted as the result of anxiety.

The other day I (20M) was riding the train when I saw a cute girl sitting just in front of me; we were facing each other. We made eye contact a few times and I even passed a smile and I thought to myself that I should go up to her and talk and maybe ask her out but for some reason I could not muster up the strength, courage and confidence, **WHICH I THOUGHT I HAD**, to go up to her and talk.

In a few rare but still meaningful cases, the author opening up about his anxiety would be what got him in relationship problems:

A few years back I opened up to my then girlfriend about some anxiety I was having and got completely crushed.

Anxiety as a result of issues In many other cases, anxiety was seen as the result of shortcomings in the author's dating life. In many submissions, it would be previous dating experiences that would give him anxiety:

Asking this because I always ruin my relationships because the previous ones which would leave me with a certain anxiety which ends up messing the relationship I'm in at the time.

Despite this being just a first date, I still have this anxiety. This has happened before with other dates, and is possible in the future.

In other cases, his anxiety was seen as a result of worrying about hurting their partner over an eventual break up:

My gf (f18) is boring me by always agreeing with me. I'm losing attraction and interest but I don't want to hurt her. What do I do?

However, as expected, many posts were from users who had been broken up on, and that were experiencing anxiety in their lives as a result of this.

I moved on in the sense that I have dated plenty of other girls, continued on with my life in every other aspect but I still find myself constantly thinking about her. It's unhealthy in a way I find myself making small decisions based on what she would think.

Anxiety and the author's social life

Within this main theme, 2 sub-themes were identified, which were found to follow a similar logic as for *Anxiety in the author's dating life*: 1. Anxiety at the root of the author's problems and 2. Anxiety as a consequence of his social circumstances.

Anxiety at the root of the author's problems In many posts, it was explained that the author's anxiety were causing him issues with his family and friends. As for the author's dating life, in many cases he would see his anxiety as a personality trait:

I have severe social anxiety and I find it hard to work up the courage to open myself up and meet people.

How do you guys deal with social anxiety? I have dealt with this for almost my entire life and although it has seemed to get a bit better or time it still has a strong hold on my life.

In many cases, the impact of the COVID-19 pandemic would be mentioned as an aggravating factor:

[...] and I find it hard to work up the courage to open myself up and meet people. My school is currently closed because of covid and I have no idea how I am supposed to meet people my own age.

In a few amount of cases, the author overthinking his current friendships would cause him anxiety and thus suffering.

With pretty much every type of relationship I'm in- taking it's logical conclusion in romantic relationships- I'm in my head all the time worrying if the other person likes me the same way I like them, and it's exhausting. It makes me paranoid and anxious.

Anxiety as a consequence of his social circumstances Many other submissions described the author's anxiety as a result of issues in his social life. The author would have acted in an antisocial manner with his social circle,

Basically during covid I said some horrible things anonymously online to others, people think I'm a stalker and that I harass others. It's spreading throughout town all the things I've said. [...] I just want to disappear, I'm such an embarrassment and I truly hate what I've done, there's no way to fix anything, I deleted myself off of social media and now I'll have to forever be scared to be seen in public, my name is completely tarnished. What am I suppose to do,

In the majority of cases however, social circumstances attached to the author's upbringing would be at the root of his anxiety,

When I was a kid I was really unfortunate that my school was small and my year group was almost all girls. [...] I get anxious when talking to guys because I don't know how to talk to them. Its really odd, i know.

with some of these social circumstances being COVID-19 pandemic-related.

Are any of you introverted guys a little anxious about the end of quarantine?

Anxiety and the author's academic/professional life

Expectedly, anxiety was also depicted as a prime factor in the author's academic (college, university., school, etc.) and professional (career, job) life. Again, in a similar way to the previous two themes, anxiety could be seen as 1. the source of the author's problems or as 2. the result of his issues in this sector of his life.

Anxiety as the source of the author's problems In many submissions, the problems that the author was facing were pictured as stemming from his anxious behaviour. In some cases, the author would experience difficulties to carry on with education due to his anxiety,

I live with social anxiety on the daily which has turned me into a bit of a recluse over the past few years and I'm convinced I have ADD (but ironically haven't gotten around to getting a screening for it yet). [...] I have dropped out of sixth form college 4 time now and while everyone in my life thinks it's because I'm a lazy bastard it's actually due to a combination of the problems mentioned above.

whereas in many other cases, it would be his capacity to perform his job that would be affected.

Right now, my anxiety and depression have made my job not realistic right now. I hate saying that because I can and have made way more money in this role when I'm feeling good than a college degree would probably ever pay me. [...] My anxiety and depression have just made this damn near impossible for me to do.

I keep freezing/getting nervous and second guessing myself during critical moments when I'm suppose to act and it's affecting my job...

Nevertheless, a small but significant portion of the posts analysed highlighted the author's anxiety as the reason for him not getting a job altogether.

31 year old man. B.A degree in education. Unemployed for over two years due to social anxiety and depression.

Anxiety as the result of his issues As expected, the majority of the posts covering how anxiety played a role in the author's academic/professional life put it as the result of shortcomings in that sector of his life. Work would get too demanding in a great amount of cases,

How did you learn to just enjoy life?,It's all I want to do. Just enjoy my life. But my mind always gets overtaken by the stress of my work

I work in IT and am getting growingly anxious at my responsibilities and how frequently I need to be available regardless of where I am or might be doing.

but a lot of the submissions analysed described the author's anxiety as also a consequence of financial worries:

It's all I want to do. Just enjoy my life. But my mind always gets overtaken by the stress of my work [...] The worry of money in the long run etc.

e are in the process of losing our rent controlled apartment, an equivalent apartment near us would be over double the cost. So I am trying to not rent another apartment and just make the mad dash into raising funds to buy a house as the mortgage would be cheaper than the rent. I'm starting to get a bit of anxiety because of the massive workload, and I'm sure the massive amounts of caffeine are not helping.

Interestingly, in a significant portion of the posts, the author would feel anxious because of his uncertainties regarding his future career/path:

I've been thinking a lot and am anxious if there are some things I should already know or be doing at this point in my life that I have not.

Anxiety and the author's sex life

When analysing the submissions where the author disclosed about his anxiety and his sex life in conjunction, two sub-themes were identified: 1. Anxiety over sexual performance and 2. Performance anxiety causing further issues.

Anxiety over sexual performance A great portion of the submissions dealing with the author's sex life concerned his anxiety over how well he would perform with an eventual sexual partner. In a lot of cases, the author would specify his sexual inexperience

Hello Redditors , I am a 22 year old virgin.Will be having sex for the first time in about two weeks.Obviously anxious about performance.

I will be getting lucky next week, and it is my first time. What tips can you give me and how do I ""perform better/longer"". Very anxious that it might not go well.

In a small but still meaningful percentage of these posts, the author would specify that said performance anxiety came as a result of his past relationship(s).

I'm a 29 year old male and experienced my first encounter with performance anxiety last year with a new partner after going through a break up..

Performance anxiety causing further issues The author's anxiety, and not just his performance anxiety, was also seen as entailing problems in his sex life. The majority of said problems would concern erectile dysfunction.

How do you deal with sexual performance anxiety?,"I'm a 21 year old college student and I've been having some issues getting an erection during sex.

How to get out of a loop of performance anxiety?,"I'm not that sexually experienced, and am a 20 year old male. I just started talking to this girl and she wanted to have sex and I really like her. It basically resulted in me having trouble getting hard, staying hard, and penetrating her..

How to deal with anxiety with a new partner? [...] First two times when we cudve had sex i was hard during foreplay then my nerves came back and that was that.

In some cases it would also be specified that this anxiety had caused the author to have orgasm issues.

Obviously I'm down, but I haven't had sex in months.. and the reason is that I have had really bad performance anxiety (I cum in about 2 milliseconds)

I just started talking to this girl and she wanted to have sex and I really like her. It basically resulted in me having trouble getting hard, staying hard, and penetrating her. I also could not orgasm. I felt on the edge of orgasming, but it was as if my body was not allowing it, tensing up.

5.2.2 Depression corpus

After carrying out a thematic analysis of the depression-related posts, an overall structure similar to that of the anxiety-related posts was identified: the author's depression was depicted as playing a role in his 1. dating life, 2. social life, 3. academic/professional life and finally as 4. having blurred links with his life.

Depression and the author's dating life

Within this main theme, 2 sub-themes were identified, reflecting the position of the author's depression with respect to his dating life.

Depression as the cause of dating issues In many posts, the author would depict his depression as having entailed problems in his dating life. The author would sometimes seek to distance himself from his partner,

Men of Reddit, what does it feel like when you need time alone from your partner, because of depression, grief or other issues?

My ex of 7 years left me and I'm struggling with it. How do you get over heartbreak?,"Looking back I definitely had issues that were pushing her away. Over time I became less and less affectionate dealing with my own depression and issues.

or in other cases he would directly consider breaking up with his partner.

Have you ever broken up with someone due to depression?

Well and I? I felt unhappy sometimes, I lost myself in the thought of breaking up more often. So yesterday I decided I should do it. It felt right for a moment.

Depression as the result of dating issues The author's depression was pictured many times as stemming from his dating problems. Expectedly, in a lot of submissions, the author

would explain that he was depressed as a result from being broken up on or from losing a potential partner:

My ex of 7 years left me and I'm struggling with it. How do you get over heartbreak?.

this is where I think that feeling of being empty all began. 2 years ago I liked this nice, quiet girl with a great body, but I didn't really realized it until it was too late. When she was already interested in someone else, then it start to hit me. I was like "Oh, fuck. Is this heartbreak?"

Also, a considerable amount of posts were about the author experiencing depression after breaking up with his partner.

Ended the relationship with my girlfriend. Feeling really depressed / numb. What do I do and how should I handle it?

Early February: I broke up with my first girlfriend (about a year, broke up a few times beforehand, very toxic, but I did love her) [...] But every night, that's when my brain would decide to have deep thoughts about me and my ex etc (I miss the good parts, I miss the love but I don't wanna get back with her, we was toxic and she was aggressive) Even now in quarantine, 2 odd months after everything, my brain still has deep thoughts about it, especially at night. I don't know if it's love or the affection I miss. I understand it was my first love so that's always gonna hit harder. At the moment life just feels pretty empty

In some cases however, said depression would be the result of regrets:

i [19m] had a crush on this one girl from when i was 12 and never managed to ask her out now i am very sad what should do to get rid of this sadness?

Depression and the author's social life

Similarly to the previous theme, the author's depression was seen to play both a position of 1. cause and of 2. consequence of problems in his social life.

Depression as a cause of his problems In many case, the author's would experience issues as a result of his depression. He would have acted in an antisocial manner because of it,

I spent my late teens and 20s dealing with depression and severe anxiety, pushing people away and not investing in relationships.

I used to be really close with one of my friends (f) and all of a sudden, she said to me that she didn't care about me anymore or any of my problems (I have bipolar depression) and that all our friendship brought was drama and all that.

I (24M) recently uncovered that I have clinical depression and anxiety, which I have started therapy for. With these diagnoses, my life has become a bit more clear, as I understand why my life is what it is. However I can't help but reminisce about the things my illnesses kept me from. My illnesses kept me from enjoying my youth, mainly high school and college. I was so sad all the time, had such low self esteem, [...] Today it's hard for me to have a conversation with someone because I have nothing to talk about.

with some posts mentioning the stigma that men suffer regarding their depression and how it can cause them to be lonely,

Depression,I know as men we are told to "man up" and "men don't cry" but how many of y'all have internal depression that you have to battle alone due to social norms?

Depression as a consequence of his social circumstances Depression was also seen in the majority of these submissions as a consequence. In some cases, the author would mention a person in particular,

How do you get over depression of not being able to help someone financially?

How do I come to terms with the fact that I'm never going to see someone again? [...] We were never in a relationship, but being with them made me happy and when we hung out, even if it wasn't in person, I didn't feel sad or depressed for however long we were together. Long story short I messed everything up and just over 2 months after I met them, our friendship ended. There's no way I'll ever see them again, and I don't know how to come to terms with this.

but most of the submissions falling into this sub-theme pictured depression as stemming from a particular social situation.

How do you deal with your depression and/or anxiety?,"A bit more context - for you guys who have had a hard life, who had a rough childhood which has led to difficulties as an adult, who are lonely, unemployed, feeling like a disappointment to those you lose and a failure, who are hopeless, angry... how do you guys make it through the day or, better still, overcome it?

Advice regarding quarantine depression

Depression and the author's academic/professional life

When going through the submissions where the author disclosed about his depression and his education/job/career, depression was only pictured as a consequence of issues in said aspect of his life. For some users, the absence of a career would be at the root of their depressive symptoms:

I've fallen sort of deep into a depression over the last year or so because of my lack of a solid career, still living with my parents at 27 and seeing my peers succeed.

Anyone else depressed they can't even find the most basic work right now?

Expectedly, many posts had to do with the depression resulting from financial problems related to the author's job:

been suicidal lately, just so many mean people out there, mostly mean men but women too...not sure what to do. my life is at a standstill..."," I am 50,000 in student debt with an 11 an hour job working at a call center. How can i ever expect to have any quality of life, being this poor. How can I ever hope to have a family?

How did you dig your self out of the ""hole""?" [...] I have a job that I go to everyday on time and work my ass off but it doesn't pay nearly enough to support myself.

Finally, a smaller but still considerable portion of the submissions would be about the author failing at pursuing an education, causing him to experience depressive symptoms:

I used to be a good students when i was little but it gradually became worse and worse till it became bad. [...] hen i got into university, i tried to change a little and join a student association. [...] Got kicked out as i failed 3 times the same year and had to wait one more (it's normally 2 years one year is gone) and it was a depressing year for me and i often lacked motivation to do anything.

Depression and the author's sex life

In a significant portion of the posts, the author would disclose about his depression and his sex life. However, unlike many of the themes identified previously, depression was mostly viewed as occupying a position of causality with respect to his sex issues. These were almost all of the time a reduction in the author's sex drive:

Depression cause little or no sexual desires or attraction?

Does depression affect your sex drive?

How to tell if you're numb from depression, and the depression is causing zero sex drive along with no feeling/pleasure in orgasms?

As a man, how do you deal with having a much lower libido than your female partner?","I've had a low libido in general, which has dropped even more recently because of my struggles with metal health and resultant medication. My struggle with depression has also caused some erectile disfunction and an inability to cum on occasion.

Depression with blurred links to the author's life

Something that was considerably noticeable as a difference with respect to the anxiety corpus was the presence of a lot of posts where the author would not disclose the links that his depression had with his life, i.e if it was either the root of his problems or the result of his circumstances. This type of submissions would usually depict the author's depression as a all-encompassing feeling that would be part of their whole life. These posts were usually shorter than those where the author would provide context,

Have you ever been in a life situation where you feel like you should be happy but feel depressed? If so, do you have any advice for those situations?

What are some mantras y'all tell yourself when you're feeling down?,Could be something that picks you up in short-term blues or a saying that gets you through long periods of depression.

In the cases where such a depiction of depression was embedded in a longer post, the author would usually specify the ways he had been trying to alleviate his depression,

How can I get better at crying?,"Honestly, I'm super self-conscious about the fact that I struggle to cry. I used to feel like I cried way too often (8-10 years old) but now I'm 19 and I just feel like it's become a battle to cry. I know that there's sadness inside of me that wants to be released sometimes, I guess that i've just trained myself over time to not cry at all. I remember the last time I did cry though. It took like 4 years to get there, but it was when I finally opened up to my mom about how depressed I had been for the last like 5 or so years. It was full waterworks.

What strategies/tips do you have to fight depression during the quarantine?,"Hey so ive noticed with the quarantines my mental health is slipping. During normal times I really relied on the gym and just staying busy throughout the day but because of the quarantine I have too much time on my hands. I've done some at home workouts, called friends, and been watching movies/playing videogames. So I'm wondering what y'all have been doing to stay busy and positive during this time..

5.3 RQ2: Thematic analysis of the questions asked in anxiety/depression-related posts

5.3.1 Anxiety corpus

A thematic analysis of of the questions belonging to anxiety-related posts allowed to identify 4 main themes: questions regarding the author's 1. dating life, 2. sex life, 3. social life and 4. education/professional career.

Questions regarding the author's dating life

Within this theme, 4 sub-themes were identified.

Getting over the past Many of the questions posted had to do with moving on from their romantic past. The questions were mainly on how to forget about past partners in order not to let it affect their current life,

What's your personal experience regarding relationship trauma and how did you manage to get over it?

Problem is, my brain keeps telling me that I don't actually care about this girl, that I'm just using her to replace the one I lost. Like I mentioned, I do honestly like this girl! But I guess my breakup left me burnt and afraid of trying again. Any tips?

but in other instances, the author would seek for similar experiences to his.

Whats the longest it took you to get over a girl? I was broken up with by someone almost 3 years ago. [...] but I still find myself constantly thinking about her.

What action to take Many other posts revolved around a question asking for advice on what the author should do regarding his relationship. a great number of these questions were more specifically about whether the author should communicate something to his partner to improve the relationship,

My gf (f18) is boring me by always agreeing with me. I'm losing attraction and interest but I don't want to hurt her. What do I do? [...] What do you guys think- am i just in a low in the relationship that I will get out of eventually or should I address it?

or whether he should just break up with them.

I just got proposed to by a girl I once considered the love of my life, the problem is, I'm in a relationship right now, what the fuck do I do? [...] I'm currently in a six month relationship and while I love my current girlfriend I can't help but feel like me and this other girl would be so much better, pls advice

Fellas, I need some input, my gf (17 F) and I (18 M) have been dating for over two years. [...] However, I'm not confident in the future due to a few things. [...] With all of this, I've been thinking about it more recently and I honestly don't know what to do. I don't know how it's going to workout for us because I drive us everywhere and I pay for everything and have been for the whole relationship. I don't know what to do or think fellas

Getting a partner A considerable portion of submissions revolved around the author asking about how to get a serious romantic partner.

I'm 24 and have aspergers - how do I pursue a relationship?

How do I properly make up for all the lost years of never having been in a relationship due to a lack of action?

Approaching/getting intimate Many other questions were about how to approach someone when out in public,

How to approach a group of girls?," I 22M have little trouble when it comes to approaching one girl alone, but I have bad anxiety when it comes to approaching a group of 2 or more girls.

or how to get more intimate with someone on a romantic level. This difficulty to get intimate with someone was seen to stem from both the author and the person they wanted to get closer to.

Men with anxiety, how did you find love (again)?. Recently got out of a 3 year relationship and it fuckin hurts lol [...] and i'm worried that if i ever fall in love again i wouldn't know what to do.

How do I get close to an emotionally unavailable person?,"So I had the talk with my friend last night. three months ago I told her I was into her and she said she wasn't ready.

Questions regarding the author's social life

An other considerable proportion of the submissions collected revolved around the author asking for advice on different aspects of his social life. The questions gathered were organised in 3 different types and hence 3 different sub-themes.

Fixing his social life For many users where anxiety played an important role in their social life, their primary doubt was on how to repair or improve their connections with people.

Advice on how to improve my (24M) relationship with others. [...] I feel like that my problem is with how I talk with people, because I remember many acquaintances purposefully avoiding me. Those include people from college, work and even people in my home town. Surprisingly I have really close friends too! I tried to be nice to everyone but it seems like I've made many hate me unknowingly.

How do I reclaim my social life? [...] Over the last year or so I have become increasingly anxious while inebriated. However, it has gotten to the point now that every time I indulge I become almost a mute, so anxious and self conscious I can't muster up the confidence to hold a conversation with anyone! [...] Unfortunately because of my seemingly odd behaviour people are becoming less inclined to be around me.

Some questions would not specifically mention the relationships to be fixed but would instead concern the action to be taken with regard to the author's social life.

My life is ruined, what do I do",",Basically during covid I said some horrible things anonymously online to others, people think I'm a stalker and that I harass others. [...] I just want to disappear, I'm such an embarrassment and I truly hate what I've done, there's no way to fix anything, I deleted myself off of social media and now I'll have to forever be scared to be seen in public, my name is completely tarnished.

Making friends A similar sub-theme to the previous one, but different in the sense that it focused on nonexistent friendships rather than flawed social connections, was identified. Many authors sought advice on how to build non-romantic connections,

Hello Reddit. How do men socialise. [...] I have only had female friends and have no idea how to make friends with other men as a man

How do you make friends in uni?,",So, basically I've mostly been an antisocial caterpillar my whole life because of my social anxiety that I can't seem to fix.

Stopping the anxiety An interesting category of questions that was identified was those where the author wanted to manage his own social anxiety and was asking for advice on how to do it.

How do you stop worrying if the people you know like you?

How to deal with Social Anxiety,How do you guys deal with social anxiety?

Questions related to sex

Withing this theme, two sub-themes were identified: questions related to 1. stopping performance anxiety and to 2. avoiding erectile dysfunction.

Stopping performance anxiety Many users asked for advice on how to handle their anxiety of not performing well when having sexual intercourse.

How to deal with Social Anxiety,How do you guys deal with social anxiety? [...] It happened last weekend with my new girlfriend and I played it off cool so it wasn't an issue that particular time but I'm afraid it's going to happen again and again.

How to deal with anxiety with a new partner?,",Got out of a long term relationship in december and havent had sex since. Found a new girl i really like and she really likes me and things are moving fast, maybe too fast? First two times when we cudve had sex i was hard during foreplay then my nerves came back and that was that.

However, another interesting subset of the questions regarding how to get over performance anxiety were those where the initiation of the sexual intercourse was specified as the moment of peak performance anxiety.

As a man, how do you deal with anxiety related to initiating sex with a new partner?","I feel silly for asking, but this honestly felt like the best sub for the question...hoping to get some knowledge from you dudes. I'm 27 now and in the past several years I've had three relationships where I have been sexually active, but my specific issue is that I always get this major anxiety with initiating sex with a person for the first time. [...] After that first time in each relationship it's been smooth sailing without the fear of making myself sound like an idiot proposing the person stay in my bed with me for fun time haha.

Avoiding erectile dysfunction Around half of the questions falling into this theme were on how to avoid having erectile problems,

How do you deal with ED after 9 years without sex ?,"Hey, so I'm 25 and started dating again after 9 years.

Can't stay hard inside vagina. What do?,"Title says it all. I'm 24, work out most days, etc. Twice now I've had this frustrating problem of going soft not long after I go inside her, but I've always had a sort of similar problem.

with some men specifying both erectile dysfunction and its cause, performance anxiety,

Young men who had erectile dysfunction or preformance anxiety, how did you overcame it and what are the things that got it going for you?

Questions relating to the author's education/academic career

When analysing the posts where the author asked for advice concerning his education or professional career, the overwhelming majority of the questions had to do with how to manage the anxiety from school/work. Many of the submissions revolved around the author seeking advice on how to make the anxiety caused by school or work more bearable,

How can I not crumble under the constant stress I feel from working?,"I work in IT and am getting growingly anxious at my responsibilities and how frequently I need to be available regardless of where I am or might be doing. That being said, I also am eager to grow and make the most of my time, i.e. I want the ability to not suffer from the anxiety this day to day has been bringing me while still ensuring I'm doing my absolute best, even when it feels I have no control over my own time. How are you able to find ways to cope and not let the work stress bleed over into the rest of life?

while others just wanted to get rid of said anxiety altogether.

How did you learn to just enjoy life?,It's all I want to do. Just enjoy my life. But my mind always gets overtaken by the stress of my work - the anxiety and depression of thinking about not being where I want to be in life. The worry of money in the long run etc. All these things add up to me never really enjoying the day. I'm not asking how to get rich or how to get women or how to climb the ladder in my industry. I just want to know how you guys enjoy each day and just be happy being alive.

Additionally, other questions were about how to counteract this anxiety, i.e how to relax and unwind,

Men who suffer from anxiety, what do you do to unwind?","I find myself taking on all the weight at work which causes anxiety. And over analyzing my relationship and emotions can lead to heart palpitations. How do you guys relax?

Finding the right direction in life

Many of the questions posted on r\AskMen had to do with how to find the right direction in life. The questions falling into this category were not put under any of the previous themes mentioned because when this type of questions were asked, the author would convey a general feeling of being lost in every areas of his life. Indeed, it is worth mentioning that for this type of submissions, the author would usually mention all the sectors of his life where he was experiencing issues.

How did you realize an activity or thought is good for you?","TL;DR - Young guy is confused with the direction of life and seeks advice. [...] I (23/m) recently ended a year-long relationship. Before that, I was with someone for almost four years. [...] My decision for leaving my last relationship was really tough. I hadn't healed from the triggers/heartbreak of my past and did not really know how to truly be alone. Learning to be alone, figuring out my life, understanding what truly made me happy. That kind of stuff. Hence, I have decided to devote my life to my career and hobby for the time being; not another person. I follow my passions - I have a job in something I like to do. But there's much more - I want to study further, learn new things.

Men of Reddit , what honest advice do you have for someone entering their 20's","I as of tomorrow turn 20, and I feel kind of anxious. I still feel like I am 12 years old and I don't know what I'm gonna do with my future sometimes. Other than school I've never been challenged, and that was mainly due to academic pressure from parents. I feel anxious that time is ticking so quickly ever since I turned 19 and that I won't fall in love because I haven't met anyone amazing since my ex gf. I am in uni and I hope to get a job after I graduate but after that it seems bleak: working, paying bills, mortgage. I still miss the carefree fun and banter I had in my final year of high school, and all of a sudden everything seems so serious and quick paced.

5.3.2 Depression related posts

The questions from the depression related submissions could be gathered in 4 different main themes: questions about 1. the experience of being depressed, 2. the experience of opening up about one's depression, 3. managing/overcoming depression and finally questions about 4. living with/post depression.

The experience of being depressed

A considerable portion of the posts had to do with the experience of suffering from depressive feelings. Some of the authors would seek diagnosis from their peers.

Depression or just feeling down?

How do I know if I'm in a stage of depression?

but the majority of the questions within this theme would be the author asking for other's people's experience of feeling depressed in order to bring some perspective into his situation.

What does depression feel like to you? How do you cope with your bad feelings?

For depressed men, what is it that makes you feel so depressed (and potentially suicidal?)",”Male suicide is heartbreakingly high. As a male with depression and constant suicidal thoughts I honestly can't put my finger on why I feel this way but I feel like allot is to do with society and the way people treat men.

Men of Reddit, what does it feel like when you need time alone from your partner, because of depression, grief or other issues?

The experience of opening up about one's depression

Other posts revolved around the user asking about the experience of opening up about his depression. This specific question would either be about how to explain his depression to his closed social circle,

How do you explain your depression to s/o?,”General answers appreciated. More specifically in today's context, though, I'm having a hard time illustrating how my depression makes it hard to compartmentalize stresses and how things that seem unrelated to a ""normal"" brain don't feel unrelated to me.

or the author would ask for similar experiences to his peers concerning his difficulties in opening up.

Do you not feel comfortable letting loved ones know about your depression?

Does anyone feel embarrassed for expressing their feeling or talking to someone when you're depressed because of the social stigma??

Managing/overcoming depression

Expectedly, a great amount of the questions asked on r\AskMen had to do with making depression more bearable:

What are some coping mechanisms you can recommend, for someone who is dealing with depression, but cannot be active?

What are some worthwhile hobbies/skills that you think are healthy for someone with depression?

Additionally, a meaningful portion of this type of questions had to do with the usage of antidepressants.

Men of Reddit who have taken Antidepressants for Depression/Anxiety, what have you taken and how have they affected you?

Men who have depression - do you take antidepressants? Why / why not?

However, a smaller but still significant amount of the questions submitted had to do with how to get rid of depression altogether.

How to get rid of mild depression?,"I think I might have mild depression and in the result I am addicted to internet and surf net for 12 hours a day, I have good sleep schedule and good diet and I go to gym, how to fix myself?

Living with or post-depression

The final type of questions that was identified were those about dealing with certain aspects of the author's life while living with depression or after overcoming depression. Some of the questions would specify that the author was suffering from depression, and that he needed advice in some areas of his life,

What should a guy do that has clinical depression and anxiety but wants to start dating again?

How do I become more disciplined, especially if I'm depressed?

while other users would still seek advice after specifying that their depression was an issue of the past.

What muscle-building sport, aside from weightlifting, would you recommend to someone who just came out of depression?

Just got over depression and need advice about pretty much everything concerning being an adult. What should I do to point my life in the correct direction?

6   Critical evaluation of the work

6.1   Discussion of the results

Figure 5 shows the intertopic distance map for the 4 topics produced out of the anxiety corpus by the LDA model. Each circle represents each topic, and the distance between each reflects how related they are to each other.
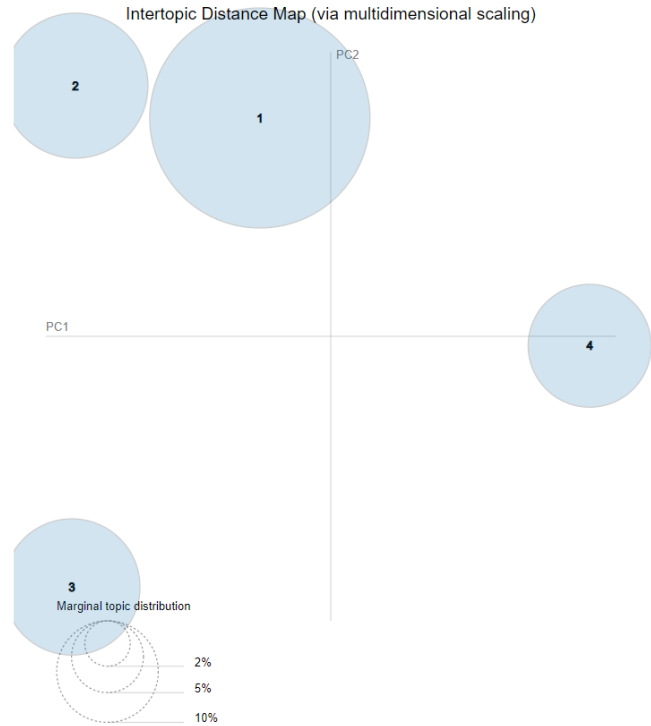
Figure 5: Intertopic map of the $k = 4$ topics outputted by the LDA model when fed the anxiety corpus

As discussed in 5.1.1, topics 3 and 4 showed to be distinct to the other ones, as well as between each other.

Topic 3 could be seen as reflective of the author's dating life. Unsurprisingly, when carrying out a thematic analysis of the highest scoring posts obtained by computing the Jaccard similarity with topic 3's terms, a considerable proportion of posts belonged to the sub-theme *Anxiety and the author's dating life*. However, a great fraction of those posts were also categorised under the theme *Anxiety and the author's sex life*. This reflects the naturally strong overlap existing between men's dating and sex life.

As mentioned in 5.1.1, Topic 4 could be interpreted as representing the author's family life. However, the thematic analysis of the highest scoring posts obtained from topic 4's terms showed the sub-themes *Anxiety and the author's dating life*, *Anxiety and the author's social life* and *Anxiety and the author's academic/professional life* were the ones to appear the most, and all this under the theme *Anxiety as a consequence*. This indicates the incredibly strong position of causation that men's families have in their current issues.

Figure 5 also shows that topics 1 and 2 shared considerable similarity between each other. However, as shown in 5.1.1, they were not interpretable enough, which unsurprisingly came reflected in the thematic analysis of the corresponding submissions as the sub-themes *Anxiety and the author's dating life*, *Anxiety and the author's social life*, *Anxiety and the author's academic/professional life* and *Anxiety and the author's sex life* were approximately evenly spread across the posts selected.

Figure 6 shows the intertopic distance map for the 4 topics produced out of the depression corpus by the LDA model.

Figure 6: Intertopic map of the $k = 4$ topics outputted by the LDA model when fed the depression corpus

It can be seen that there exists a lot of topical overlap between topics 1 and 2.

When carrying out the thematic analysis of the posts obtained with the Jaccard similarity of the terms describing topic 1, the main themes that were overall present were *Depression and the author's dating life* and *Depression with blurred links to the author's life*. On the other hand, the main topics identified from the thematic analysis of topic 2's posts were *Depression and the author's dating life*, *Depression and the author's academic/professional life* and *Depression with blurred links to the author's life*.

On the other hand, as shown on Figure 6, topics 3 and 4 were the most distinctive ones. However, the thematic analysis of the corresponding posts showed that the themes *Depression and the author's dating life*, *Depression and the author's social life* and *Depression with blurred links to the author's life* were the most prevalent ones for topic 3, and the themes *Depression and the author's dating life*, *Depression and the author's social life* and *Depression with blurred links to the author's life* were the most prevalent ones for topic 4.

Topic 3 and 4's posts presenting mainly the same themes from the thematic analysis poses a contradiction to the intertopic map in Figure 6 which displays those two topics as the most distant between each other and to the other ones. Thus, it seems that the themes identified in the depression corpus from the thematic analysis are not reflective of the intertopic distance outputted by the LDA model, and therefore that the LDA model identified topics in the corpus that are different in nature from those of the thematic analysis. This conclusion therefore also rules out the argument that topic 1 and 2 are shown as overlapping considerably in Figure 6 due to their sharing of the theme *Depression and the author's dating life*.

It is also worth mentioning that the theme *Depression with blurred links to the author's life* was identified to be important for the posts scoring high for all 4 topics. This emphasises the importance of this theme in the corpus, and thus stresses on the unclear nature of depression in men's life.

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Furthermore, Figure 7 summarises the themes and sub-themes found in the anxiety corpus when identifying the position that this mental health issue holds in men's lives, while Figure 8 does that but for the depression corpus.
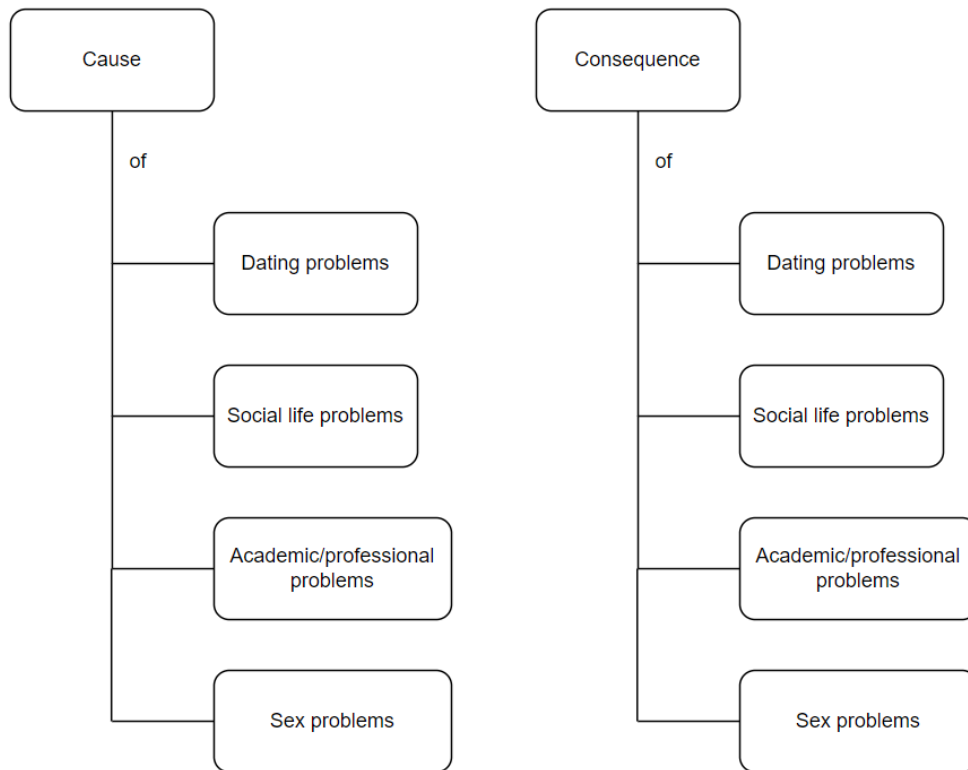

Figure 7: Summary of the themes and sub-themes identified in the anxiety-related disclosure part of the anxiety corpus.

Figure 8 displays in red the changes from the themes and sub-themes shown in Figure 7, where the dashed lines indicate that theme or sub-theme is not present in the thematic analysis of the depression corpus, and where the solid lines represents the additional theme that the thematic analysis of the depression corpus presents in comparison to that of the anxiety corpus.

It can be seen that in the depression corpus, depression does not seem to be portrayed as the issue entailing problems in men's academic/professional lives, but rather only as a result of this kind of issues. An explanation to this could be that, when a user would experience problems with his education/job, he would also picture his depression as having worsened due to his education/job. This would thus make said disorder appear as a consequence only.

Additionally, the fact that depression is not usually depicted as the result of issues in men's sex life while it is when it comes to men's dating, social and academic/professional life reinforces the idea suggested by Costello [48], Lloyd [56], Paykel et al. [13], which view depression as mainly arising from situations of loss. Indeed, it is hard to imagine loss in men's sex life, but it is easy to do so with regard to their dating (e.g a break up), social (e.g fallout with a close friend) and academic/professional life (e.g fired from a job).

Furthermore, the presence of the theme *General issue with blurred links with the author's life* reflects this idea that depression is an issue where its causes and effects in men's life are not easily distinguished, whereas anxiety's position and role in their lives appear to be well delimited. This primary distinction between anxiety and depression in the lives of men is
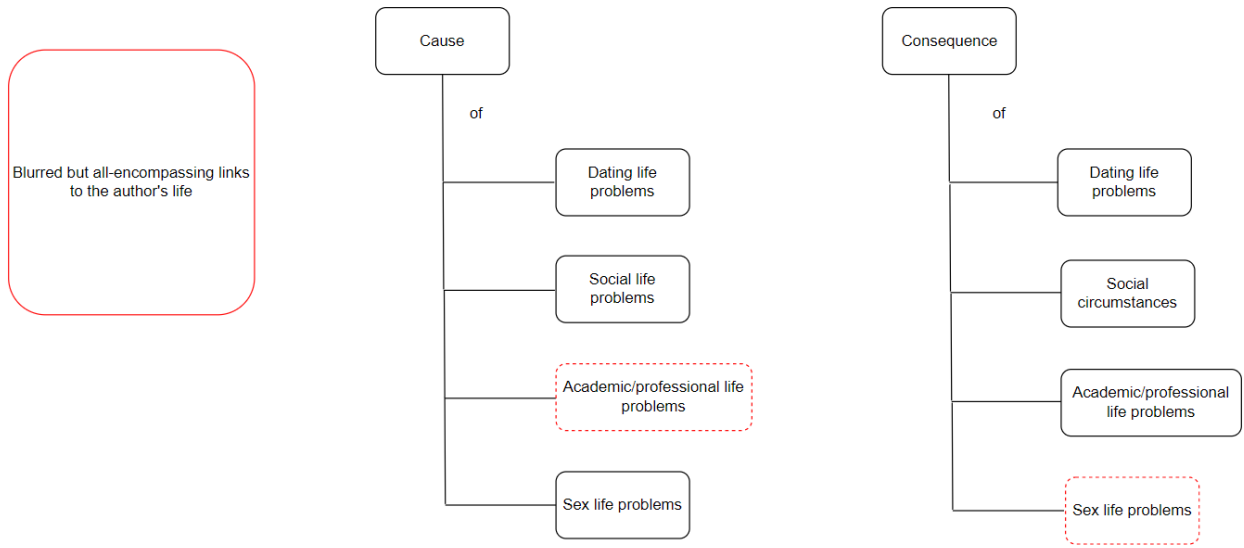
Figure 8: Summary of the themes and sub-themes identified in the depression-related disclosure part of the depression corpus. Red lines represent the difference with respect to Figure 7.

reinforced by previous studies carried out by Endler [28], Endler and Magnusson [12], which "generally indicated that trait anxiety may not be a unitary construct, but may be related to situationally-relevant dimensions."

Nevertheless, it is worth mentioning that depression is similar to anxiety in the fact that it is depicted as a result of shortcomings in the users' dating, social or academic/professional life, or as a cause of issues in the dating life. These common points between both mental health disorders come in agreement with the general idea between the majority of emotions. According to [50], these theories vary in their description for anxiety and depression, but they converge in their view of these two disorders as "general emotions comprised of combinations of more fundamental emotions" (Izard [53], [52] Klerman [54], Plutchik [62]). This conception of anxiety and depression could explain their presence in the majority of aspects of men's lives.

Furthermore, Figures 9 and 10 summarise the themes and sub-themes identified in the questions asked by men when it comes to their anxiety and their depression.

Figure 10: Summary of the themes and sub-themes identified in the questions of the depression corpus.

Figures 9 and 10 show a considerable discrepancy between the themes that can be distinguished from the questions asked when users disclose about their anxiety, and the questions asked when they disclose about their depression. In the former case, the questions can be categorised under the different aspects of the user's life, i.e his dating life, his social life, his
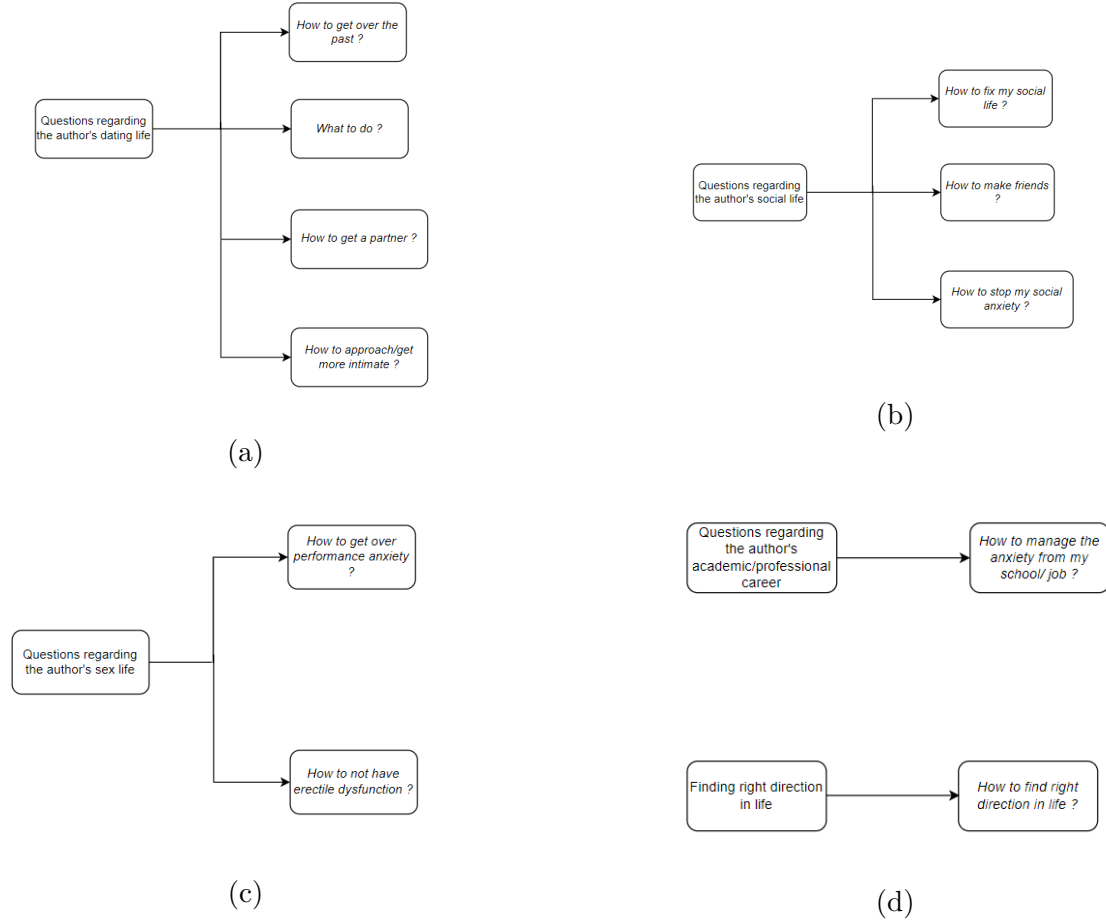
Figure 9: Summary of the themes and sub-themes identified in the questions of the anxiety corpus.

academic/professional life and is sex life. Furthermore, the questions that are asked under these categories are very specific, and either concern the issues themselves (e.g *How to get a partner ?*) or the anxiety itself (e.g *How to deal with performance anxiety ?*). However, the questions asked in the depression related submissions are not specific whatsoever, but all relate to depression itself. This considerable difference between the pattern found in the anxiety-related questions and depression-related questions seem to reinforce the idea mentioned earlier whereby anxiety "may be related to situationally-relevant dimensions." (Endler [28], Endler and Magnusson [12]).

6.2 Contribution to current field

Previous literature concerning web-based interventions to support people's mental health mainly consists of the success that Computerised Cognitive Behavioural Therapy (CCBT) has had with patients suffering of anxiety and depression disorders. Studies like [33], [10], [15] all indicate that CCBT, when compared to the results on a waiting-list group (i.e a group of patients that have been made to wait for the treatment but that later on received it, which allows for the presence of a control group that will eventually receive treatment) is effective for the treatment of depression disorders. On the other hand, studies like [29], [29] and [5] have shown CCBT's effectiveness for the treatment of anxiety disorders. The different techniques used by CBT are according to [38]:

1. Activity Scheduling: "identifying and scheduling helpful behaviors" in order to "increase behaviors [people] should be doing more"

2. Graded Exposure Assignments: technique to slowly stop avoiding the causes of fear

3. cognitive restructuring: "learning to recognise dysfunctional though patterns"

4. behavioural activation: technique to "help us understand how behaviors influence emotions, just like cognitive work helps us understand the connection between thoughts and emotions" [44].

5. problem solving: technique to teach people how to effectively tackle a problem

6. assertiveness skills: technique that aims to teach people that they have the right to " express [their] thoughts, feelings, and needs to others, as long as we do so in a respectful way." [43].

7. Successive Approximation: technique to help people complete tasks they find difficult by making them tackle easier tasks that are similar to the hard one

8. Mindfulness Practice: technique to "help people disengage from ruminating or obsessing about negative things and redirect their attention to what is actually happening in the present moment"

As the current study has helped to identify the link of anxiety and depression to men's lives, the results found could help in providing more informed implementation of techniques 3. *cognitive restructuring* and 4. *behavioural activation*. Indeed, the results from this study could be implemented in these techniques to help the patient recognise the relationship between his anxiety or depression and his thoughts and behaviours.

The type of questions asked by men, as described in 5.3.1 and 5.3.2, could also be of great use for digital therapy as the content offered in support to anxiety/depression sufferers could be better tailored to the answering of their questions. [69] mentions that, as healthcare systems are emerging and are becoming more and more patient driven, the services that are starting to be provided from by health social networks are: emotional support and information sharing, physician QandA, quantified self-tracking and clinical trials access. Knowing what questions men are asking when suffering from depression and/or anxiety could provide more specific, personalised help through emotional support, physician QandA and clinical trials access.

Finally, the topical analysis carried out in this study could contribute to the examination of the differences in mental-health related use of social media platforms intended for therapeutic use, and social media platforms not intended for that, e.g r\AskMen.

6.3   Limitations

One of the limitations of this study was that, as mentioned in 4.1, the study from which the anxiety-related scraping terms were used [55] concerned Twitter users with anxious depression, and not anxiety. First, Twitter being a different social media platform to Reddit, the vocabulary employed by the users targeted may be different to that that would be used if Reddit was the platform concerned by the study. Twitter has a character limit per post, unlike Reddit. Additionally, the theme of a Twitter post is usually indicated by the hashtags (e.g *#depression*) that it contains, whereas on Reddit the overall theme of the post comes in accordance with the subreddit it belongs to. Additionally, even though it was argued that the presence of cognitive

models that view depression as a secondary disorder to anxiety justified the validity of the scraping terms selected, there exist also pluralistic models that view anxiety and depression as two separate disorders with little link between them (Downing and Rickels [51], Prussof and Klerman [6])). Anxiety and depression usually have shared symptomatology and even co-morbidity (i.e happen at the same time) [61]. Therefore, it may be possible that the usage of the terms specified in [55] for the collection of anxiety-related posts had caused the selection of a significant portion of non-anxiety related posts, which would have resulted in the high number of posts discarded during the statistical study described in 4.1.

Furthermore, [73] explains that "Collecting intervals across studies also helps in constructing plausible regions for population parameters. This practice should help prevent the common mistake of assuming a parameter is contained in a confidence interval." This study did not include the collection from other studies of confidence intervals for the proportion of social media texts related to a particular theme. This was due to the lack of previous studies employing this type of method for this specific type of case, to the best of my knowledge.

It is also important to mention that the choice of a population proportion or a confidence interval midpoint greater than or equal to 0.5 as the decision criterion as explained in 4.1 was completely arbitrary. Consequently, the choice of 0.5 as this minimum value might have entailed a great number of non-anxiety/depression-related posts (a maximum of half of each population) to be included in the LDA model. This might have therefore skewed the results produced by the LDA model.

Also, as mentioned in 4.2, only one value of the relevancy factor λ was used to get the results, that is $\lambda = 0.5$. However, in the study from which the relevancy measure was extracted,[8], one of the aims is to find the optimal value of λ to ensure the highest interpretability of the topics. This points out the fact that for each corpus, an ideal value of λ exists which allows the topics to be distinguishable enough thanks to the inclusion of terms exclusive to each topic, but which also includes terms that are globally frequent across the corpus in order not to lose overarching themes.

It is important to explain that, as this study used thematic analysis as topic extraction method, the themes and sub-themes are inherently subjective to an extent. Indeed, these do not emerge from the corpus but rather, as explained in [65], "if themes 'reside' anywhere, they reside in our heads from our thinking about our data and creating links as we understand them."

Finally, when conducting the thematic analysis of the anxiety and depression-related submissions, recurrent structures were identified in the way the posts were written. These particular ways in which the submissions were built entailed ambiguity when determining whether:

- the post had been written by a man or a woman

- the post concerned the author's issues and not his family, friends, acquaintances, etc.

Table 8 gathers these recurrent structures.

Recurrent structure	Example	Assumption
"Men of Reddit" or similar phrase and "my boyfriend" or similar mentioned	*Men of Reddit, when is it a good time to mention to my bf when my depression is getting bad again? [...]*	Author is a woman
"Men of Reddit" or similar and question about how men think their partner/women should act in certain situations	*Men with anxiety, how would you want your partner to ideally help or deal with it?*	Author is a woman
Specific question that includes the effects of anxiety/depression	*Have you ever broken up with someone due to depression?*	The author has the mental health issue(s) mentioned (anxiety and/or depression)
"My boyfriend" or similar and question about how men think their partner/women should act in certain situations	*What makes you feel good that women do for you? What would make you feel confident? What would make you blush? What would make you feel amazing? What would inspire you to be happier and more enthusiastic in life?," My bf is feeling down all the time and anxious. He's very stressed with work. [...]*	Author is a woman
"Asking for a friend" mentioned	*Fellow men when was the time you realized your depression was a big problem?,Asking for a friend*	The situation described concerns the author

Table 8: Recurrent post structures and assumptions made.

7 Suggestions for future work

Future work regarding a topical analysis of the mental-health related posts submitted by men on the subreddit r\AskMen could focus on more psychological disorders apart from anxiety and depression. Additionally, an incredibly interesting approach could be the analysis of the relationship between the role that anxiety/depression play in men's lives and the questions asked. Indeed, this study creates a separation between men's disclosure of their anxious/depressive circumstances and the questions asked. It could be useful to see if certain circumstances (e.g anxiety causing the author to be fired from his job) are more likely to result in the author asking a particular type of question (e.g *How to not let my social anxiety affect my professional life ?*).

Improvements in the LDA model used in this study could be also brought up in future work. For example, a hierarchical Latent Dirichlet Allocation (hLDA) model, which is an extension of the LDA model used in this study, could be employed. hLDA, as described in [**hDLA**], performs topic extraction when the number of topics required is unknown.

Finally, when collecting the data, greater sampling sizes when deciding the validity of a group of posts containing the same number of scraping terms could be chosen, in order to make sure that not too many posts that are not anxiety/depression-related are included in the LDA analysis.

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