The (mis) use of psychiatric terms on Twitter

A scoping review of research on the (mis) use of terms related

to schizophrenia on Twitter

Master Thesis

Positive Clinical Psychology and Technology

University of Twente

Lukas Witoszek (s3111393)

Peter ten Klooster (1st supervisor)

Jannis Kraiss (2nd supervisor)

Table of contents

Table Directory

Figure Directory

Abstract

Aim

This scoping review aimed to give an overview of the current state of research regarding the (mis-) use of terms related to schizophrenia on Twitter and answer three research questions addressing the number, the design and the key findings of the included studies.

Methods

The search, screening and inclusion of literature was carried out using PubMed and Scopus from the 27th October to the 3rd of November 2023. This scoping review followed the five stages developed by Arksey and O'Malley and the PRISMA reporting guidelines. The results were depicted in tables followed by a narrative summary of the findings.

Results

A total of twelve studies were included that were relevant to the topic. All of the studies employed a (manual) content analysis approach and some additionally analysed quantitative data or used a text-mining/natural-language-processing approach. A majority of the studies found that terms related to schizophrenia in tweets were misused, also compared to other mental and physical health conditions. Only a fraction of tweets opposed misuse and provided scientifically accurate information.

Conclusions

This scoping review suggests that misuse regarding schizophrenia on Twitter is high. Nevertheless, these results have to be interpreted with caution as the research topic appears to be quite recent. Further research is needed and could expand into additional studies on the (mis-) use of psychiatric terms on Twitter as well as possible positive effects of social media on the perception of mental health conditions.

1. Introduction

Schizophrenia is a severe mental health disorder which causes psychosis and can affect several areas of life such as family, personal life and social functioning. This condition contains impairments in reality perception and behavioural changes. Common symptoms are persistent delusions (fixed belief that something is true despite contrary information), persistent hallucinations (sense or feel things that are not there), disorganized thinking and highly disorganized behaviour (doing things that appear unusual or aimless, unpredictable or inappropriate emotional responses) (World Health Organization [WHO], 2022). The onset of schizophrenia is most often during late adolescence or the twenties and it affects 24 million people worldwide with a rate of one in 222 people among adults (WHO, 2022).

Individuals diagnosed with schizophrenia frequently face human rights violations in mental health institutions as well as in community settings (Schomerus et al., 2012). The intense and widespread stigma surrounding this condition results in social exclusion and negatively influences relationships with family and friends (Sarisoy et al., 2013). This further contributes to discrimination which can affect access to several vital areas such as education, housing and employment. Research indicates that the level of social rejection did not change for the better and even worsened over time for people with schizophrenia (Schomerus et al., 2012). With respect to stigmatization, Gerlinger et al. (2013) found that on average 64.5 percent of schizophrenic patients perceived stigma, 55.9 percent actually experienced it and 49.2 percent reported alienation.

In comparison to other mental health disorders such as depression, the labelling of schizophrenia as a mental illness affects emotional reactions negatively for people suffering from schizophrenia. People with schizophrenia are also more often considered to be dangerous, unpredictable and unreliable (Jackowska, 2009). They evoke more fear whereas depression evokes pro-social reactions (Angermeyer & Matschinger, 2003) and these differences in the

perception of dangerousness can also be found across countries and cultures (Angermeyer et al., 2004).

Individuals with schizophrenia also encounter bias and stigma within mental health institutions. Mental health professionals, including psychiatrists, possessed more negative stereotypes about schizophrenia compared to the general population. Research showed that the degree of social distance towards both major depression and non-cases was lower than that towards schizophrenia. Overall, mental health professionals tend to seek emotional distance from individuals diagnosed with schizophrenia (Nordt, Rössler & Lauber, 2006).

It is important to look at the discourse about mental health conditions such as schizophrenia on social media platforms as they have become an outlet to share information and knowledge in a fast and easy manner (McGowan et al., 2012). Social media changed how people look for information about mental health conditions and it has become an important tool for many to find mental health related information (Lee et al., 2014). Especially the social media platform Twitter is used often to discuss and distribute information about mental health conditions (Alvarez-Mon et al., 2018). People used this platform frequently as they felt like it was a space for expression, a means for communication and it was easy to share and receive information (Berry et al., 2017). Overall, it is still unclear how useful social media can be to discuss mental health conditions and for people suffering from them (DeAndrea & Anthony, 2014).

Social media platforms may allow for a wide range of benefits such as enabling people to engage with each other in beneficial ways globally (Wang et al., 2019). They have become a tool for people to foster connections, reduce social isolation and nurture a sense of community with likeminded people (Berry et al., 2017). Nowadays, they can be a source for happiness and positive feelings (Burke & Kraut, 2016, cited by Kender, 2022). Through social media, peer support communities are more accessible than ever before (Kender, 2022).

Nevertheless, there are also potential downsides. Social media platforms contain plenty of misinformation which tends to receive more popularity than accurate information. This bias also exists when looking at health related topics. Misinformation is mostly directed by personal, negative and opinionated tones. Individuals, especially when fearful or doubtful, can become more susceptible to such misinformation which is difficult to alter in those circumstances. Social media allows for misinformation to flourish (Wang et al., 2019). Social media can be seen as a double-edged sword (Kender, 2022), with on the one hand enabling communities to be created and fostering connectedness while on the other hand they allow for misinformation to spread.

Twitter is a social media platform where almost anything can be discussed and shared no matter how sensitive the content of the discussion. Research suggests that the majority of toxic comment datasets, which include insults, threats or hate speech, were collected on Twitter (Risch, 2023). Guberman, Schmitz and Hemphill (2016) found that a fair amount of verbal violence did occur in tweets. In addition, when looking at the "vibe" of social media platforms, Twitter is oftentimes described as angry and toxic (Kender, 2022). This may be due to users having almost no control over what they are trying not to see, which is content filled with negative emotions (Kender, 2022). As of December 2022, Twitter's audience accounted for over 368 million monthly active users worldwide (Dixon, 2022).

Therefore, it is vital to explore the (mis) use of terms related to schizophrenia on Twitter. The aim of this scoping review is to give a clear and concise overview of the current state of research on the use of the term schizophrenia on Twitter. The research questions that this review wants to answer are: "How many studies have been conducted on the topic?", "How were these studies designed?" and "What did these studies find with respect to the use and potential misuse of terms on Twitter?".
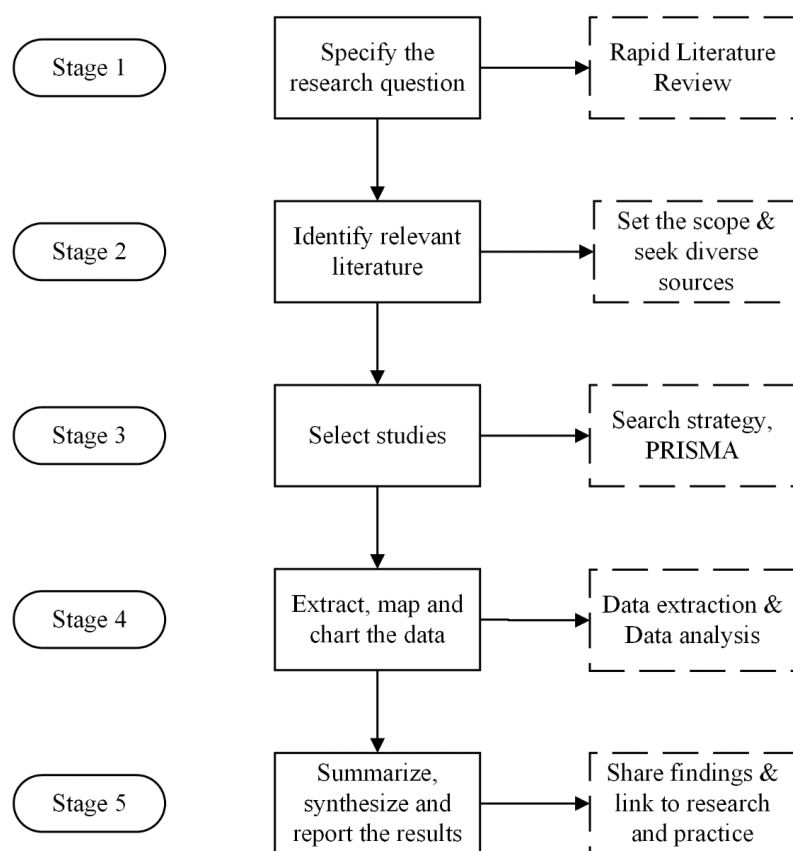
2. Methodology

The type of review that was selected to answer the research question is a scoping review. Scoping reviews are performed to depict key concepts of research fields, construct definitions or explore the contextual limits of a topic (Elm, Schreiber & Haupt, 2019). Scoping reviews give an overview of the current state of the art without a formal evaluation of the methodological quality of the included studies. Their main function is to support future systematic reviews as well as support clinical and practical decision making (Elm, Schreiber & Haupt, 2019). Scoping reviews can mainly be used for hypothesis-generation; they are exploratory in nature (Tricco et al., 2016). In general, they provide an alternative way of collecting and reviewing existing literature compared to more traditional approaches (Rumrill, Fitzgerald & Merchant, 2010).

Due to a lack of clear guidelines on how to conduct scoping reviews, but to be able to ensure replicability, this scoping review followed five stages developed by Arksey and O'Malley (2005). These stages can be seen depicted more clearly in Figure 1 below. The search, screening and inclusion of literature began on the 27th of October and ended on the 3rd of November 2023, spanning a total of one week.

Figure 1

Five stages of Scoping Reviews by Arksey and 0'Malley (2005)

Stage 1	Specify the research question	Rapid Literature Review
Stage 2	Identify relevant literature	Set the scope & seek diverse sources
Stage 3	Select studies	Search strategy, PRISMA
Stage 4	Extract, map and chart the data	Data extraction & Data analysis
Stage 5	Summarize, synthesize and report the results	Share findings & link to research and practice

Literature search

In the first stage it was important to specify the research question by a rapid review of the available literature. To conduct this review, the databases PubMed and Scopus were utilized. PubMed, officially inaugurated in 1997, is a database developed in the USA and covers articles from 1950 to the present while Scopus, officially inaugurated in 2004, was developed in Europe and covers articles from 1966 to the present. Both cover a large number of journals in many different languages and provide links to free full-text articles. It was decided to use both databases because PubMed is a very easy to use and free database while Scopus provides a larger number of journals than PubMed (Falagas et al., 2008).

To get a quick overview on what has already been done in the research field, the only search terms "Twitter" and "Schizophrenia" were kept very general. This produced 31 records on PubMed and 43 records on Scopus, totalling 74 records. It became evident that research data regarding the research topic was rather scarce. Therefore, it was decided to keep the research questions more exploratory as there was not enough evidence to formulate directed hypotheses.

The next step was to set the scope. Based on the findings from stage one, the search terms "use", "misuse" and "psychotic/sis" were added and used in combination with the search terms "Twitter" and "Schizophrenia" to identify relevant articles based on their title, abstract or keywords. The additional search terms did not identify any further records, so the 31 records on PubMed and 43 records on Scopus were kept, totalling 74 records in the course of the search of literature.
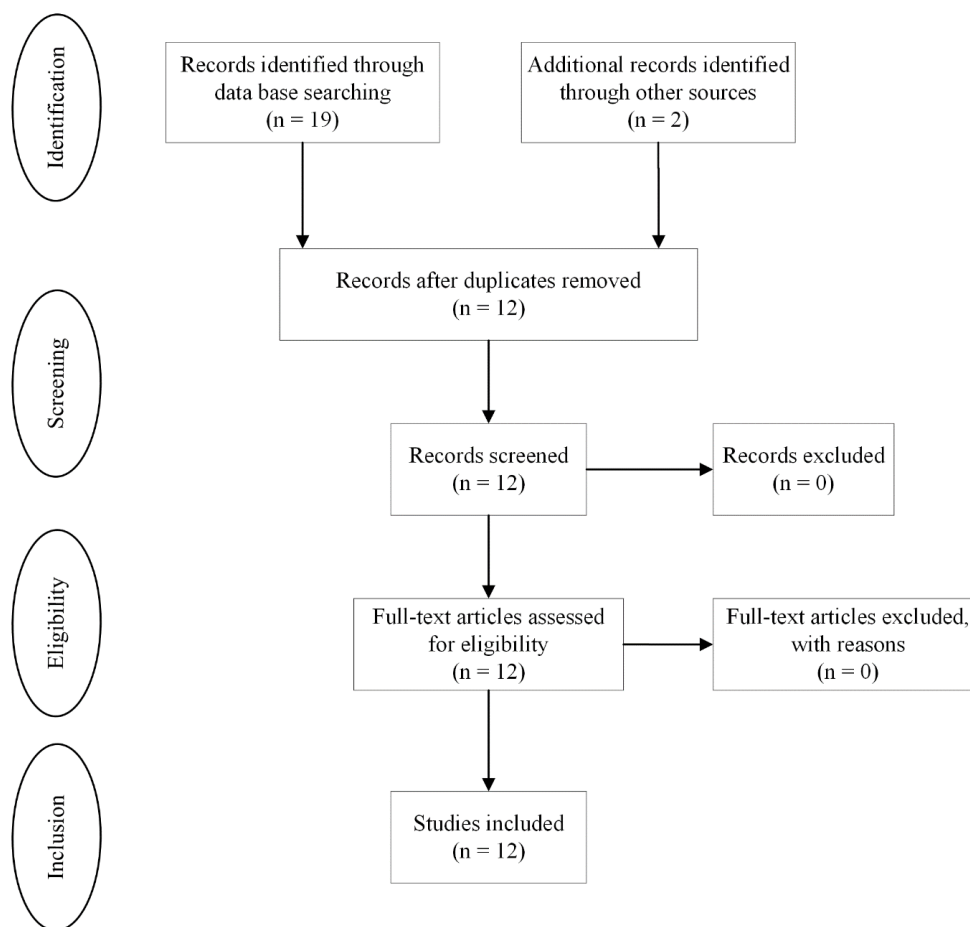
Screening of literature

In the third stage, the studies were screened to be selected for analysis. To have guidance for study selection, this scoping review followed the PRISMA reporting guidelines specifically for scoping reviews which can be seen in Figure 2 (Peters et al., 2015). Additionally, it was also important to set up inclusion and exclusion criteria as they specify which studies will be included or excluded from the database without extensive evaluation (Meline, 2006). The inclusion and exclusion criteria that were developed for this thesis are: the articles included are either written in English, German or Polish, are relevant to the topic and social media platform and are fully accessible.

In the step identification, the total of 74 records combined from PubMed and Scopus were screened regarding their title and marked with a checkmark when they appeared relevant to the topic. These were reduced down to 19 by looking at the titles and reading through the abstract, with two additional records being found from looking through the references of the

remaining records. By comparing the findings from both databases, it became clear by the titles and abstracts that both databases produced similar results, leaving twelve unique records in total after duplicates had been removed. Lastly, these records were checked for full-text-accessibility and all twelve records were fully accessible.

Figure 2

PRISMA Scoping Review Study Selection Process

(Figure inspired by Peters et al., 2015)

Inclusion of literature

Based on the screening, none of the remaining records were excluded since they all fulfilled the inclusion criteria, resulting in twelve records eligible for analysis.

In stage four, the data from the twelve included records was extracted, mapped and charted. Important steps in this stage were data extraction and analysis. For the data extraction and analysis, it was decided that next to the authors, the publication year of the study and type of study, there should be a focus on the aim of the study, number of tweets analysed, the methods and the key findings. To present a clear overview of the current state of research, tables summarizing the important variables were created.

The last stage contained narratively summarizing, synthesizing and reporting the results. Next to the table that was created in stage four, it was important to highlight and compare differences and similarities regarding the results more closely in text.

3. Results

Within the search of studies, a total of 74 records were retrieved from the databases PubMed (31 records) and Scopus (43 records). Among these, 55 records were excluded after screening as they were not relevant to the topic. Additionally, of the remaining 19 records, seven were duplicates and therefore excluded. These exclusions left twelve records for a full-text review based on the screening of titles and abstracts. Following the full-text review, all of them were included in this scoping review. In Table 1 an overview of the included records can be found focussing on the publication year, study design, total number of tweets analysed and aim of the records.

Table 1

Author, publication year, study design, number of tweets analysed and aim of included articles

Author	Published	Study Design	# Tweets analysed	Text-mining/NLP[1]	Aim	
Alvarez-Mon et al. (1)	2019	Qualitative content analysis and quantitative user metrics analysis	15,443	No	-	Analyse the content and key metrics (likes, comments, reposts) of tweets referring to psychosis in comparison to tweets referring to control diseases such as breast cancer, diabetes, Alzheimer and HIV.
Athanasopoulou et al. (2)	2016	Qualitative content analysis	444	No	-	Examine the use of the term schizophrenia in comparison with that of diabetes on Greek Twitter.
Bademli et al. (3)	2023	Qualitative content analysis	7,291	No	-	Evaluate stigmatizing attitudes towards schizophrenia among Turkish Twitter users.
					-	Investigate the use of the terms schizophrenia, schizophrenic, psychosis and psychotic.
Delanys et al. (4)	2022	Qualitative content and sentiment analysis and quantitative term frequency analysis	3,040	Yes Sentiment analysis (Brat tool)	-	Find out how therapeutic psychiatric terms are used on French Twitter.

[1] Abbreviation for natural-language-processing

					- Analyse the type of word use, the polarity of tweets and compare the frequency of these terms to those observed in English-related work.
Dikeç et al. (5)	2023	Sentiment analysis and qualitative content analysis	3,406	Yes Sentiment analysis (BERT)	- Qualitatively examine Turkish tweets about schizophrenia regarding stigmatization and discrimination.
Jilka et al. (6)	2022	Mixed Methods Sentiment analysis	13,313	Yes Sentiment analysis (TextBlob) and machine learning	- Develop a service user supervised machine learning method to identify stigmatising tweets reliably and identify the prevalence of schizophrenia stigma on Twitter.
Joseph et al. (7)	2015	Qualitative content analysis and quantitative analysis	1,838	No	- Examine the use of the adjective and noun forms of the term 'schizophrenia' compared to the term 'diabetes' on Twitter.
Kara et al. (8)	2022	Quantitative analysis and manual qualitative content analysis	3,000	No	- Evaluate the prevalence of stigmatizing and trivializing attitudes and the meanings attributed to schizophrenia and its derivatives on Turkish Twitter.

Passerello et al. (9)	2019	Quantitative analysis and manual qualitative content analysis	840	No		- Compare attitudes towards the terms schizophrenia and psychosis on Twitter.
Reavley et al. (10)	2014	Qualitative content analysis	5,907	No		- Provide insights into how Twitter users share information about depression and schizophrenia, the type of information shared and the relative proportions of supportive or stigmatising attitudes regarding the illnesses.
Robinson et al. (11)	2019	Qualitative manual thematic analysis and quantitative analysis	13,000	No		- Investigate the prevalence of stigmatising and trivialising attitudes on Twitter across several mental and physical health conditions such as schizophrenia, bipolar, AIDS, HIV.
Wynn et al. (12)	2017	Qualitative affective content analysis	2,000	Yes LIWC[2]		- Examine to what degree tweet content could be perceived as negative or non-supportive of various disorders such as schizophrenia, bipolar and breast cancer.

[2] Abbreviation for Linguistic Inquiry and Word Count

The publication years of the twelve included studies have a range of nine years with the first study being published in 2014 and the most recent study being published in 2023. A majority of the studies were published between 2019 and 2023, suggesting that the research interest in the use of terms related to schizophrenia on Twitter is quite recent. Most of the studies used a (manual) qualitative content analysis approach with half of them also covering quantitative data like term frequencies or differences between categories such as word type (noun vs. adjective). Four studies also employed a text-mining/natural-language-processing approach to automatically uncover sentiments or topics in tweets using different methods, namely the BRAT tool (Stenetorp et al., 2012), BERT sentiment analysis (Hoang, Bihorac & Rouces, 2019), TextBlob (Gujjar & Kumar, 2021) and Linguistic Inquiry and Word Count (LIWC) (Francis & Booth, 1993). Sample sizes varied widely, ranging from a minimum of 444 tweets to a maximum of 15,443 tweets used for analysis.

Based on the aims of the studies, the articles were divided into four groups. Group one contains the studies which aimed to compare the use of terms related to schizophrenia with the use of terms regarding various other mental and physical health conditions such as breast cancer, HIV and depression to examine if there is a difference in stigmatization. Group two contains the studies which specifically aimed to compare the usage of terms related to schizophrenia with the somatic illness diabetes. Group three contains the studies which focus on the use of terms related to schizophrenia solely in the context of Turkish Twitter and, lastly, the studies in group four are seen as stand-alone studies as their aims cannot be grouped thematically with any other study. One study aimed to develop a machine learning method to reliably identify stigma regarding schizophrenia on Twitter and the second study aimed to compare the terms schizophrenia and psychosis in particular to find out if there is a difference in the proportion of stigmatization regarding these terms. The different studies were narratively synthesized based on these groupings.

Group one: studies comparing tweets about schizophrenia with tweets about other mental and physical health disorders

Table 2 gives an overview of the methods and key findings of the studies by Alvarez-Mon et al. (2019), Delanys et al. (2022), Reavley and Pilkington (2014), Robinson et al. (2019) and Wynn et al. (2017) that aimed to investigate the use of terms related to schizophrenia compared to the use of terms related to various mental and physical health disorders on Twitter.

Overall, these studies reported mixed findings. On the one hand, it was found that tweets referring to schizophrenia and its derivatives were more trivializing and stigmatizing when compared to various other mental and physical health conditions such as bipolar disorder, depression, HIV or breast cancer. Misuse was high in schizophrenia-related tweets. On the other hand, it was also found that scientific appropriateness was the highest in tweets referring to schizophrenia and they were also mostly neutral or supportive. This suggests Twitter may not consistently be a source of either stigmatization vs. support for people suffering from schizophrenia.

In general, Robinson et al. (2019) found that mental health conditions were more likely to face stigma and trivialization compared to physical health conditions with schizophrenia occurring to be the most stigmatized among mental health conditions. Tweets related to mental health conditions were more prone to be discussed through opinion and these tweets carried stigmatizing tones. In contrast, discussions about physical health conditions were more commonly characterized by informative content. Established subthemes for stigmatising tweets were: negative descriptor (utilizing the illness to portray something in a negative light); wishing illness upon someone; associating the illness with negative characteristics; joking and stereotyping (Robinson et al., 2019).

Specifically for tweets referring to schizophrenia, it was found that they had a significantly higher frequency of misuse and derogatory content as well as a higher percentage of non-medical content when compared to control diseases such as diabetes, HIV, Alzheimer

or bipolar disorder (Alvarez-Mon et al., 2019; Delanys et al., 2022; Wynn et al., 2017). Regarding polarity, it was found that half of the tweets were annotated as having a negative polarity and were especially related to the spectrum of psychotic disorders (Delanys et al., 2022). In particular, the terms psychotic and psycho had a negative polarity, except for the term schizophrenia which primarily had a mixed or neutral polarity (Delanys et al., 2022). Furthermore, most of the studies found that these terms were used as insults in a majority of tweets highlighting the high prevalence of misuse of schizophrenia on Twitter (Alvarez-Mon et al., 2019; Delanys et al., 2022; Robinson et al., 2019).

Among the tweets depicting stigmatizing attitudes towards schizophrenia, the majority conveyed self-stigma, inaccurate beliefs about the condition, mocked or trivialised individuals with schizophrenia, expressed an unwillingness to be in social contact with them or held the belief that individuals with schizophrenia are dangerous (Reavley & Pilkington, 2014). Oftentimes they were also associated with violent events, terrorist attacks or occurred in the context of political tensions (Delanys et al., 2022). Robinson et al. (2019) propose this supports the suggestion that stigma is often fuelled by (misinformed) opinion.

On the contrary, Alvarez-Mon et al. (2019) found that tweets referring to schizophrenia had the highest medical appropriateness and a higher frequency of content about disease prevention when compared to the control diseases. Especially when comparing depression and schizophrenia in particular, the analysis of the attitude in tweets towards depression and schizophrenia revealed that the majority of tweets for both conditions were supportive or neutral. However, stigmatizing attitudes were more prevalent in tweets referring to schizophrenia. Some tweets about schizophrenia even were explicitly anti-stigma. The majority of schizophrenia tweets aimed to increase awareness of schizophrenia or share research findings (Reavley & Pilkington, 2014).

Table 2

Overview of methods and key findings of group one

Author	Methods	Key findings
(1)	Qualitative content analysis and quantitative user metrics analysis.	Psychosis-related tweets had significantly higher frequency of misuse and derogatory content but medical appropriateness was the highest and they had more content about disease prevention.
(4)	Qualitative content and sentiment analysis and quantitative term frequency analysis.	Misuses were especially related to the spectrum of psychotic disorders compared to those related to the spectrum of depression. Terms from the spectrum of psychotic disorders had a negative polarity except for schizophrenia which had a mixed or neutral polarity.
(10)	Qualitative content analysis.	Most tweets for both depression and schizophrenia were supportive or neutral but stigmatising attitudes were more frequent in tweets referring to schizophrenia.
(11)	Qualitative manual thematic analysis and quantitative analysis.	Mental health conditions were more likely to face stigma and trivialization compared to physical health conditions with schizophrenia being the most stigmatized among mental health conditions.
		Tweets related to mental health conditions mainly contained personal opinion while tweets about physical health conditions were characterized by informative content.
(12)	Qualitative affective content analysis. The affective content was analysed using LIWC.	A majority of the tweets containing the hashtag breast cancer were supportive while most tweets using the hashtags schizophrenia and bipolar disorder were non-supportive and mostly in the misuse category.

Group two: studies comparing tweets about schizophrenia with tweets about diabetes

Table 3 gives an overview of the methods and key findings of the studies by Joseph et al. (2015) and Athanasopoulou and Sakellari (2016) that aimed to investigate the use of terms related to schizophrenia compared to the use of terms related to diabetes on Twitter.

Overall, these studies found that tweets referring to schizophrenia tended to be more negative, medically inappropriate, sarcastic and non-medical when compared to tweets referring to diabetes which suggests a misuse of the term schizophrenia and its derivatives on Twitter.

Joseph et al. (2015) and Athanasopoulou and Sakellari (2016) found statistically significant differences in tweets between schizophrenia and diabetes where tweets associated with schizophrenia showed a higher degree of negativity, medical inappropriateness, sarcasm and non-medical use. It was found that the adjective form "schizophrenic" was more closely associated with negative bias and sarcasm, proposing that negative associations are particularly prevalent when schizophrenia is used as an adjective (Joseph et al., 2015). Additionally, Athanasopoulou and Sakellari (2016) found that the majority of tweet sources for schizophrenia tweets came from personal accounts whereas the diabetes tweets were from blogs or informational websites. Common contents of the tweets were something extreme, unpredictable or unreasonable where schizophrenia was used to describe unreasonable actions or situations and contradictions or opposite extremes where schizophrenia for example was used as a synonym to bipolar disorder (Athanasopoulou et al., 2016).

Their findings confirm the presence of misuse of terms related to schizophrenia on Twitter with prevalent negative, inappropriate and sarcastic sentiments. Their findings show that the use of the term is deviating from appropriate medical usage and that this is not as common when compared to another significant illness such as diabetes (Joseph et al., 2015; Athanasopoulou & Sakellari, 2016).

Table 3

Overview of methods and key findings of group two

Author	Methods	Findings
(2)	Deductive qualitative content analysis. Differences calculated with chi-square-tests for source, medical appropriateness, negativity and sarcasm.	Schizophrenia tweets tended to be more negative, medically inappropriate, sarcastic and used non-medically compared to diabetes.
(7)	Qualitative content analysis and quantitative analysis. Chi-square tests to examine differences in the distributions across illness type and word form (noun vs. adjective)	Negative, inappropriate, non-medical and negative sentiments about schizophrenia are prevalent on Twitter and this is unlikely when compared to another significant illness such as diabetes.

Group three: studies investigating tweets about schizophrenia on Turkish Twitter

Table 4 gives an overview of the methods and key findings of the studies by Bademli, Kaya Kiliç and Kayakuş (2023), Dikeç, Oban and Barış Usta (2023) and Kara and Senel Kara (2022) that aimed to investigate the use of terms related to schizophrenia in the context of Turkish Twitter.

Overall, these studies found that a majority of Turkish tweets referring to schizophrenia were stigmatizing and expressed negative sentiments about schizophrenia especially in political context. Most of the terms related to the disorder were used as an insult to mock and humiliate others, although there were also users who actively combatted schizophrenia stigma and mental health professionals who provided scientific information about the disorder. These studies suggested misuse and a lack of awareness and education about schizophrenia among Turkish Twitter users.

Kara and Senel Kara (2022) discovered a significant prevalence of misuse of the term schizophrenia and its derivatives, particularly in the context of political discussions and social interactions on Turkish Twitter. The findings suggest a deviation from proper medical usage of the terms. Schizophrenia related words, especially the adjective "schizophrenic", were often used in an offensive manner and metaphorically to insult, mock and humiliate others. In particular, terms were often used as synonyms for "mad", "insane" and "crazy", especially to describe supporters of opposing political parties. A fraction of tweets associated schizophrenia with unpredictability, dangerousness and homicidal tendencies (Kara & Senel Kara, 2022).

Additionally, the study by Bademli, Kaya Kiliç and Kayakuş (2023) identified three main themes which were insult, negative view and anti-stigma that were prevalent on Turkish Twitter. Similarly, Dikeç, Oban and Barış Usta (2023) were also able to establish four main themes which were news about violent patients where Twitter was used to share these incidents, insults, mockery and information. In accordance with the study by Kara and Senel Kara (2022),

the themes insult, negative view and mockery showed that the vast majority of tweets expressed negative sentiments about schizophrenia and were used to insult, mock, humiliate or degrade others, especially politicians and people in the news. Terms related to schizophrenia were used as behavioural criticism (Bademli, Kaya Kiliç & Kayakuş, 2023; Dikeç, Oban & Barış Usta, 2023).

In contrast, these studies identified the theme anti-stigma and information which showed that a fraction of tweets displayed supportive attitudes for people with schizophrenia. Some tweets specifically contained psychoeducation about its definition, causes, symptoms and treatment. Some tweets directly opposed tweets containing insults and negative attitudes by expressing support for people suffering from the disorder. Also, these studies identified tweets from professional branch organisations which defended patients' rights, provided information about self-help group activities and combatted stigmatization (Bademli, Kaya Kiliç & Kayakuş, 2023; Dikeç, Oban & Barış Usta, 2023).

In alignment with the study by Kara and Senel Kara (2022), these studies suggest misuse and a poor understanding of schizophrenia on Turkish Twitter, especially in political and social context, although they were able to identify support for and education about this mental health condition.

Table 4

Overview of methods and key findings of group three

Author	Methods	Key findings
(3)	Qualitative content analysis.	The terms schizophrenia/c and psychosis/tic were misused and commonly used in tweets depicting negative and stigmatizing attitudes on Turkish Twitter.
(5)	Sentiment analysis (BERT) based on artificial intelligence applications (Tweepy Packet) and qualitative content analysis by two researchers (Colaizzi phenomenological interpretation method).	Majority of the tweets expressed negative sentiments about schizophrenia and the term was often used between individuals to insult, mock, humiliate or degrade politicians, people in the news and others.
(8)	Quantitative term frequency analysis and manual qualitative content analysis	Identified high rates of misuse of the term schizophrenia and its derivatives, suggesting a deviation from appropriate medical usage of the terms. A general lack of awareness and education among the Turkish public regarding this mental health condition.

Group four: the stand-alone studies

Table 5 gives an overview of the methods and key findings of the two stand-alone studies. The study by Jilka et al. (2022) attempted to create a service user machine model to identify schizophrenia stigma on Twitter and the study by Passerello, Hazelwood and Lawrie (2019) compared terms related to schizophrenia with terms related to psychosis on Twitter. It was decided to treat this study also as stand-alone because it stayed within this mental health condition and compared the terms schizophrenia/c and psychosis/tic specifically.

The first stand-alone study by Jilka et al. (2022) showed that machine learning methods can reliably identify stigma in tweets referring to schizophrenia at a larger scope when these models are developed by individuals with experience using mental health services. Utilizing the SVM, they discovered that it identified stigma in 46.7 percent of all included English tweets referring to schizophrenia. These tweets displayed significantly more negative sentiment and subjectivity.

The second stand-alone study by Passerello, Hazelwood and Lawrie (2019) revealed that the term psychosis was more frequently included in tweets conveying negative attitudes, therefore a name change of schizophrenia to psychosis may not have a significant positive impact on the perception of schizophrenia in general. The majority of tweets were neutral for both terms but there was a considerable difference in the prevalence of stigmatising tweets. Specifically, almost 10 percent of the schizophrenia tweets were stigmatising, whereas 31.5 percent of psychosis tweets were stigmatising. A majority of tweets referring to schizophrenia could be allocated in the theme anti-stigma whereas the same relationship could not be established for tweets referring to psychosis. For both illnesses, the majority of tweets were mocking or trivialising the illness with a higher proportion of tweets mocking or trivialising psychosis suggesting more prevalent stigmatising attitudes regarding psychosis (Passerello, Hazelwood & Lawrie, 2019).

Table 5

Overview of methods and key findings of group four

Author	Methods	Key findings
(6)	Sentiment analysis (TextBlob) and machine learning (Support Vector Machine (SVM)).	The SVM was the best performing model and identified public stigma in 47 percent of English tweets which were more negative in sentiment.
		Stigma associated with schizophrenia on Twitter can be accurately identified through the collaborative development of supervised machine learning models, particularly when individuals with lived experience of using mental health services are involved.
(9)	Quantitative analysis and manual qualitative content analysis. Chi-square tests to compare the proportions of different types of tweets.	The term psychosis was more commonly included in tweets expressing negative attitudes than those referring to schizophrenia which suggests that a name change of schizophrenia may not have a more significant impact on the perception of these conditions in general.

4. Discussion

Main findings

The current scoping review aimed to address three research questions. The first question included how many studies have already been conducted on the (mis-) use of the term schizophrenia on Twitter. In total, twelve studies were included. The publication years of these studies range from 2014 to 2023 with a majority of them being published between 2019 and 2023 suggesting that the research field is quite recent and still emerging.

The second research question aimed at synthesizing how these studies were designed referring to the methodology and aims. The majority of the studies used a (manual) qualitative content analysis approach while a few also added a quantitative component by for example analysing term frequencies or statistical differences between categories such as word forms (noun vs. adjective). Interestingly, four of the included studies additionally used a text-mining/natural-language-processing approach using tools such as the Brat tool, BERT sentiment analysis, Text Blob and Linguistic Inquiry and Word Count (LIWC) to automatically uncover sentiments or topics in tweets.

Five studies looked at the difference in stigmatization between schizophrenia and other mental and physical health conditions. Two studies specifically looked at the difference of the usage of terms related to schizophrenia compared to the usage of terms compared to diabetes. Three studies highlighted schizophrenia in the context of Turkish Twitter. One stand-alone study tried to develop a service user machine learning method to identify schizophrenia stigma reliably while another one specifically compared the terms schizophrenia/c with psychosis/tic and stayed within this mental health condition.

The third research question aimed at synthesizing how terms related to schizophrenia are used and potentially misused on Twitter. All in all, this scoping review found that a majority of the studies found strong indications of misuse on Twitter regarding the term schizophrenia

and its derivatives, also when compared to other mental and physical health conditions such as depression, HIV, diabetes and breast cancer. Most commonly, tweets related to schizophrenia were more negative in sentiment, sarcastic and used non-medically than tweets referring to another condition. Terms related to schizophrenia were oftentimes used as insults to mock and humiliate others, especially in the context of social interactions and political context. On the contrary, there were also a few studies that identified tweets about schizophrenia which were mostly neutral or supportive and opposed stigma against this mental health condition by spreading medically accurate information, reporting research findings and increasing awareness (Reavley & Pilkington, 2014). Nonetheless, the proportion of studies that identified misuse outweighed the studies that reported positive results suggesting that Twitter currently may not consistently be a space to seek support and comfort for people suffering from schizophrenia (Wynn et al., 2017). People with this mental health condition appeared to be targets of negative ideas and prejudice on Twitter (Alvarez-Mon et al., 2019), showing that stigma against schizophrenia may be widespread on Twitter.

The findings from this scoping review are consistent with findings from previous works showing that Twitter may not consistently be a source to seek support or comfort. On the one hand, Twitter displayed a considerable amount of misuse regarding different conditions such as menstruation (Urban & Holtzman, 2023), pre-exposure prophylaxis (PrEP) (Schwartz & Grimm, 2017) and mental health in general (Pavlova & Berkers, 2022). On the other hand, Twitter may also be space which could increase open dialogue without feeling judged (Berry et al., 2017), strengthen empowerment (Betton et al., 2015) and support mental health services (Peters, Uible & Chisolm, 2015).

Strengths and limitations

The current scoping review had several strengths and limitations. By following the PRISMA guidelines (Peters et al., 2015), the steps developed by Arksey and O'Malley (2005)

and describing the methods in detail, this scoping review ensured a certain degree of replicability. It gives a concise overview of what has already been done in the field of interest, therefore identifying knowledge gaps and giving orientation in which direction future studies possibly may go. Also, a set period of time was not defined which is an advantage for portraying a broad overview of the current state of the art of research of the use of terms related to schizophrenia on Twitter since choosing a narrow time period could have gravely limited the number of eligible studies (Meline, 2006).

While this scoping review has its strengths, there are also limitations. Scoping reviews have inherent limitations because the focus is to provide width of a research field. As a consequence, a meta-analysis is generally not conducted in a scoping review (Tricco et al., 2016). This can also lead to discussions about the extent to which width (covering all available material) is more important than depth (providing a detailed analysis of a smaller number of studies) (Arksey & O'Malley, 2005). There is no definite guideline on how to conduct a scoping review, so there is a lot of variability in labelling, definition, methodology and reporting which limits their potential (Colquhoun, 2014). This may also lead to different results due to different methods being applied to the same research question (Tricco et al., 2016). Furthermore, a literature review, including the selection and interpretation of articles, is usually carried out by two people. In the current review, this was carried out by a single researcher which may have led to articles not being found and included in this scoping review. Additionally, the literature search was mainly done in the English language, so studies in foreign languages may also have been missed. It has to be noted that the findings may be specific to Twitter and can therefore not be generalized to other social media platforms.

Implications

While this scoping review identified high rates of misuse towards schizophrenia and its derivatives, it is important to briefly shed light on several possible positive effects of social

media. For example, social media can be used to identify people with schizophrenia based on posts users make (McManus et al., 2015), it could help improve the quality of mental health services by being a source of feedback for mental health professionals (Shepherd et al., 2015) and it could help foster a community and sense of belonging (Berry et al., 2017). This scoping review specifically found that medical appropriateness was the highest in tweets referring to schizophrenia and tweets also contained scientifically accurate information, reported research findings and aimed to increase awareness. These potential relations have yet to be examined more closely for schizophrenia and may be subjects of future research.

Conclusion

The current review suggests that Twitter displays much misuse regarding the term schizophrenia and its derivatives. The current state of research already offers studies with diverse aims and approaches which compare the use of terms related to schizophrenia on Twitter with various mental and physical health conditions as control groups. As of the current state, results are greatly homogeneous suggesting a high prevalence of misuse. Further research is needed on this topic which could extend into finding out more about the (mis-) use of schizophrenia on Twitter and other social media platforms such as Reddit or Facebook. Future studies could also focus more on potential positive effects social media could have on the perception of schizophrenia and mental health in general. Overall, Twitter may have an impact on how disorders are perceived and there may be a lot of misuse present on this particular platform.

References

Alvarez-Mon, M. A., Asunsolo del Barco, A., Lahera, G., Quintero, J., Ferre, F., Pereira-Sanchez, V., ... & Alvarez-Mon, M. (2018). Increasing interest of mass communication media and the general public in the distribution of tweets about mental disorders: observational study. *Journal of medical internet research*, *20*(5), e205. doi: 10.2196/jmir.9582

Alvarez-Mon, M. A., Llavero-Valero, M., Sánchez-Bayona, R., Pereira-Sanchez, V., Vallejo-Valdivielso, M., Monserrat, J., ... & Alvarez-Mon, M. (2019). Areas of Interest and Stigmatic Attitudes of the General Public in Five Relevant Medical Conditions: Thematic and Quantitative Analysis Using Twitter. *Journal of medical Internet research*, *21*(5), e14110. https://doi.org/10.2196/14110

Angermeyer, M. C., Buyantugs, L., Kenzine, D. V., & Matschinger, H. (2004). Effects of labelling on public attitudes towards people with schizophrenia: are there cultural differences? *Acta psychiatrica Scandinavica*, *109*(6), 420–425. https://doi.org/10.1111/j.1600-0047.2004.00310.x

Angermeyer, M. C. & Matschinger, H. (2003). Public beliefs about schizophrenia and depression: similarities and differences. *Social psychiatry and psychiatric epidemiology*, *38*(9), 526–534. https://doi.org/10.1007/s00127-003-0676-6

Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. *International journal of social research methodology*, *8*(1), 19-32. Doi: 10.1080/1364557032000119616

Athanasopoulou, C., & Sakellari, E. (2016). 'Schizophrenia' on Twitter: Content Analysis of Greek Language Tweets. In *ICIMTH* (pp. 271-274). Available at https://books.google.de/books?hl=de&lr=&id=3RW3DAAAQBAJ&oi=fnd&pg=PA271&dq=%27Schizophrenia%27+on+Twitter:+Content+Analysis+of+Greek+Languag

e+Tweets.+&ots=d8D4Q3FfPM&sig=TQQ6OmStoalKcMIkyuX4-EIX0J0#v=onepage&q='Schizophrenia'%20on%20Twitter%3A%20Content%20Analysis%20of%20Greek%20Language%20Tweets.&f=false

Bademli, K., Kaya Kiliç, A., & Kayakuş, M. (2023). Using Twitter to Assess Stigma to Schizophrenia and Psychosis: A Qualitative Study. *Turkish journal of psychiatry*, *34*(3), 154–161. https://doi.org/10.5080/u27280

Berry, N., Lobban, F., Belousov, M., Emsley, R., Nenadic, G., & Bucci, S. (2017). #WhyWeTweetMH: Understanding Why People Use Twitter to Discuss Mental Health Problems. *Journal of medical Internet research*, *19*(4), e107. https://doi.org/10.2196/jmir.6173

Betton, V., Borschmann, R., Docherty, M., Coleman, S., Brown, M., & Henderson, C. (2015). The role of social media in reducing stigma and discrimination. *The British journal of psychiatry: the journal of mental science*, *206*(6), 443–444. https://doi.org/10.1192/bjp.bp.114.152835

Colquhoun, H. L., Levac, D., O'Brien, K. K., Straus, S., Tricco, A. C., Perrier, L., ... & Moher, D. (2014). Scoping reviews: time for clarity in definition, methods, and reporting. *Journal of clinical epidemiology, 67*(12), 1291–1294. https://doi.org/10.1016/j.jclinepi.2014.03.013

DeAndrea, D. C., & Anthony, J. C. (2013). Online peer support for mental health problems in the United States: 2004-2010. *Psychological medicine*, *43*(11), 2277–2288. https://doi.org/10.1017/S0033291713000172

Delanys, S., Benamara, F., Moriceau, V., Olivier, F., & Mothe, J. (2022). Psychiatry on Twitter: Content Analysis of the Use of Psychiatric Terms in French. *JMIR formative research*, *6*(2), e18539. https://doi.org/10.2196/18539

Dikeç, G., Oban, V., & Barış Usta, M. (2023). Qualitative and Artificial Intelligence-Based Sentiment Analysis of Turkish Tweets Related to Schizophrenia. *Turkish journal of psychiatry*, *34*(3), 145–153. https://doi.org/10.5080/u26402

Dixon, S. (2022). Number of Twitter users worldwide from 2019 to 2024. Available at https://www.statista.com/statistics/303681/twitter-users-worldwide/

Elm, E., Schreiber, G., & Haupt, C. C. (2019). Methodische Anleitung für Scoping Reviews (JBI-Methodologie). *Zeitschrift für Evidenz, Fortbildung und Qualität im Gesundheitswesen*, *143*, 1-7. https://doi.org/10.1016/j.zefq.2019.05.004

Falagas, M. E., Pitsouni, E. I., Malietzis, G. A., & Pappas, G. (2008). Comparison of PubMed, Scopus, Web of Science, and Google Scholar: strengths and weaknesses. *FASEB journal: official publication of the Federation of American Societies for Experimental Biology*, *22*(2), 338–342. https://doi.org/10.1096/fj.07-9492LSF

Francis, M. E., & Booth, R. J. (1993). Linguistic inquiry and word count. *Southern Methodist University: Dallas, TX, USA*. Available at https://www.researchgate.net/profile/James-Pennebaker/publication/246699633_Linguistic_inquiry_and_word_count_LIWC/links/571e3c1a08aed056fa226996/Linguistic-inquiry-and-word-count-LIWC.pdf

Gerlinger, G., Hauser, M., De Hert, M., Lacluyse, K., Wampers, M., & Correll, C. U. (2013). Personal stigma in schizophrenia spectrum disorders: a systematic review of prevalence rates, correlates, impact and interventions. *World psychiatry: official journal of the World Psychiatric Association (WPA)*, *12*(2), 155–164. https://doi.org/10.1002/wps.20040

Guberman, J., Schmitz, C., & Hemphill, L. (2016). Quantifying Toxicity and Verbal Violence on Twitter. In *Proceedings of the 19th ACM Conference on Computer Supported*

Cooperative Work and Social Computing Companion (pp. 277-280).
https://doi.org/10.1145/2818052.2869107

Gujjar, J. P., & Kumar, H. P. (2021). Sentiment analysis: Textblob for decision making. *Int. J. Sci. Res. Eng. Trends*, *7*(2), 1097-1099. Available at https://ijsret.com/wp-content/uploads/2021/03/IJSRET_V7_issue2_289.pdf

Hoang, M., Bihorac, O. A., & Rouces, J. (2019). Aspect-based sentiment analysis using bert. In *Proceedings of the 22nd nordic conference on computational linguistics* (pp. 187-196). Available at https://aclanthology.org/W19-6120.pdf

Jackowska, E. (2009). Stigma and discrimination towards people with schizophrenia - a survey of studies and psychological mechanisms. *Psychiatria polska*, *43*(6), 655-670. Available at https://pubmed.ncbi.nlm.nih.gov/20209878/

Jilka, S., Odoi, C. M., van Bilsen, J., Morris, D., Erturk, S., Cummins, N., ... & Wykes, T. (2022). Identifying schizophrenia stigma on Twitter: a proof of principle model using service user supervised machine learning. *Schizophrenia*, *8*(1), 1. https://doi.org/10.1038/s41537-021-00197-6

Joseph, A. J., Tandon, N., Yang, L. H., Duckworth, K., Torous, J., Seidman, L. J., & Keshavan, M. S. (2015). #Schizophrenia: Use and misuse on Twitter. *Schizophrenia research*, *165*(2-3), 111–115. https://doi.org/10.1016/j.schres.2015.04.009

Kara, U. Y., & Şenel Kara, B. (2022). Schizophrenia on Turkish Twitter: an exploratory study investigating misuse, stigmatization and trivialization. *Social psychiatry and psychiatric epidemiology*, *57*(3), 531–539. https://doi.org/10.1007/s00127-021-02112-x

Kender, K. (2022). Tumblr is Queer and Twitter is Toxic: Speculating About the Vibe of Social Media Spaces. In *Nordic Human-Computer Interaction Conference* (pp. 1-8). https://doi.org/10.1145/3546155.3547279

Lee, K., Hoti, K., Hughes, J. D., & Emmerton, L. (2014). Dr Google and the consumer: a qualitative study exploring the navigational needs and online health information-seeking behaviors of consumers with chronic health conditions. *Journal of medical Internet research*, *16*(12), e262. doi: 10.2196/jmir.3706

McGowan, B. S., Wasko, M., Vartabedian, B. S., Miller, R. S., Freiherr, D. D., & Abdolrasulnia, M. (2012). Understanding the factors that influence the adoption and meaningful use of social media by physicians to share medical information. *Journal of medical Internet research*, *14*(5), e2138. doi: 10.2196/jmir.2138

McManus, K., Mallory, E. K., Goldfeder, R. L., Haynes, W. A., & Tatum, J. D. (2015). Mining Twitter data to improve detection of schizophrenia. *AMIA Summits on Translational Science Proceedings*, *2015*, 122. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4525233/

Meline, T. (2006). Selecting studies for systemic review: Inclusion and exclusion criteria. *Contemporary issues in communication science and disorders*, *33*(Spring), 21-27.https://doi.org/10.1044/cicsd_33_S_21

Nordt, C., Rössler, W., & Lauber, C. (2006). Attitudes of mental health professionals toward people with schizophrenia and major depression. *Schizophrenia bulletin*, *32*(4), 709–714. https://doi.org/10.1093/schbul/sbj065

Passerello, G. L., Hazelwood, J. E., & Lawrie, S. (2019). Using Twitter to assess attitudes to schizophrenia and psychosis. *BJPsych bulletin*, *43*(4), 158–166. https://doi.org/10.1192/bjb.2018.115

Pavlova, A., & Berkers, P. (2022). "Mental health" as defined by Twitter: Frames, emotions, stigma. *Health communication*, *37*(5), 637-647. https://doi.org/10.1080/10410236.2020.1862396

Peters, M., Godfrey, C., McInerney, P., Soares, C. B., Khalil, H., & Parker, D. (2015).
Methodology for JBI scoping reviews. In *The Joanna Briggs institute reviewers
manual 2015* (pp. 3-24). Available at https://www.researchgate.net/figure/PRISMA-
Flow-Diagram-for-the-scoping-review-process-15_fig1_294736492

Peters, M. E., Uible, E., & Chisolm, M. S. (2015). A Twitter Education: Why Psychiatrists
Should Tweet. *Current psychiatry reports*, *17*(12), 94. https://doi.org/10.1007/s11920-
015-0635-4

Reavley, N. J., & Pilkington, P. D. (2014). Use of Twitter to monitor attitudes toward
depression and schizophrenia: an exploratory study. *PeerJ*, *2*, e647. doi:
10.7717/peerj.647

Risch, J. (2023). Toxicity. In *C. Strippel, S. Paasch-Colberg, M. Emmer, & J. Trebbe (Eds.),
Challenges and perspectives of hate speech research*, 219-230.
https://doi.org/10.48541/dcr.v12.13

Robinson, P., Turk, D., Jilka, S., & Cella, M. (2019). Measuring attitudes towards mental
health using social media: investigating stigma and trivialisation. *Social psychiatry
and psychiatric epidemiology*, *54*(1), 51–58. https://doi.org/10.1007/s00127-018-
1571-5

Sarisoy, G., Kaçar, Ö. F., Pazvantoğlu, O., Korkmaz, I. Z., Öztürk, A., Akkaya, D., ... &
Sahin, A. R. (2013). Internalized stigma and intimate relations in bipolar and
schizophrenic patients: a comparative study. *Comprehensive psychiatry*, *54*(6), 665-
672. https://doi.org/10.1016/j.comppsych.2013.02.002

Schomerus, G., Schwahn, C., Holzinger, A., Corrigan, P. W., Grabe, H. J., Carta, M. G., &
Angermeyer, M. C. (2012). Evolution of public attitudes about mental illness: a
systematic review and meta-analysis. *Acta psychiatrica Scandinavica*, *125*(6), 440–
452. https://doi.org/10.1111/j.1600-0447.2012.01826.x

Schwartz, J., & Grimm, J. (2017). PrEP on Twitter: Information, barriers, and stigma. *Health Communication*, *32*(4), 509-516. https://doi.org/10.1080/10410236.2016.1140271

Shepherd, A., Sanders, C., Doyle, M., & Shaw, J. (2015). Using social media for support and feedback by mental health service users: thematic analysis of a twitter conversation. *BMC psychiatry*, *15*, 29. https://doi.org/10.1186/s12888-015-0408-y

Stenetorp, P., Pyysalo, S., Topić, G., Ohta, T., Ananiadou, S., & Tsujii, J. I. (2012). BRAT: a web-based tool for NLP-assisted text annotation. In *Proceedings of the Demonstrations at the 13th Conference of the European Chapter of the Association for Computational Linguistics* (pp. 102-107). Available at https://aclanthology.org/E12-2021.pdf

Tricco, A.C., Lillie, E., Zarin, W., O'brien, K., Colquhoun, H., Kastner, M., ... & Straus, S. E. (2016). A scoping review on the conduct and reporting of scoping reviews. *BMC medical research methodology*, *16*, 1-10. https://doi.org/10.1186/s12874-016-0116-4

Urban, A., & Holtzman, M. (2023). Menstrual Stigma and Twitter. *Sociological Focus*, *56*(4), 483-496. https://doi.org/10.1080/00380237.2023.2243588

Wang, Y., McKee, M., Torbica, A., & Stuckler, D. (2019). Systematic literature review on the spread of health-related misinformation on social media. *Social science & medicine*, *240*, 112552.https://doi.org/10.1016/j.socscimed.2019.112552

World Health Organization [WHO]. (2022). Schizophrenia facts sheet. Available at https://www.who.int/news-room/fact-sheets/detail/schizophrenia

Wynn, R., Oyeyemi, S. O., Johnsen, J. A., & Gabarron, E. (2017). Tweets are not always supportive of patients with mental disorders. *Int J Integr Care*, *17*(3), 149. http://dx.doi.org/10.5334/ijic.3261

Statement of Authorship

I, Lukas Arkadius Witoszek, hereby declare that this Master Thesis at the University of Twente is solely my creation. I take full responsibility for the integrity and authenticity of the work and I have properly acknowledged the contributions of others through appropriate citations and references.

Schlangen, 21.01.24

Place, date

Signature