Word use of female bloggers with a psychiatric disorder in relation to the Covid-19 stressor.

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Abstract

A person's mental state can be shown by their word use. Patterns that can be seen in a person's word use can reflect markers which can indicate symptoms of psychiatric disorders. Studies showed that stressors can have an impact on a person's word use and reveal symptoms of psychiatric disorders. This study aimed to investigate linguistic changes in individuals with a psychiatric disorder during the Covid-19 pandemic. Blog posts of Dutch, English and German female bloggers with a psychiatric disorder and those without a psychiatric disorder were used to analyse changes in first-person singular and plural personal pronouns, negative and positive emotion words and cognitive processing words. Furthermore, the changes over time in these word categories were assessed by means of random-effects meta-analyses over cases. It appeared that patients used more first-person singular and plural personal pronouns and cognitive processing words compared to the control group. There were no changes over time in the emotional tone of the blog posts between the patients and the controls. However, patients had a more negative or a less positive tone during Covid-19 compared to before the pandemic. To conclude, patients were more focused on themselves as well as on others and may have been more preoccupied with cognitive processes than the control group. It was also evident that patients were perhaps more likely to experience negative emotions during stressors such as the Covid-19 pandemic.

1 Introduction

People use language to communicate with each other. Besides this communicative function, language also contributes to the development of the ability to understand and regulate emotions, partake in social interactions and learn (Bolter & Cohen, 2007).

Language can also indicate a person's mental state. According to Beck (1967), patterns in a person's word use can reflect certain mental health markers such as self-focused attention. These markers can point to symptoms of certain mental disorders such as depression. According to a meta-analysis by Edwards & Holtzman (2017), depressed people use more first-person singular pronouns and fewer first-person plural pronouns relative to non-depressed people. So, a person's word use can be a marker for a mental disorder (Edwards & Holtzman, 2017). Another study showed that the use of more first-person singular pronouns by depressed people reflects self-focused attention (Chung & Pennebaker, 2007). Depressed people tend to focus relatively much on themselves by having constant thoughts regarding themselves (Pyszcynski & Greenberg, 1987). This self-focus can lead to the experience of negative emotions (Pyszczynski, Hamilton, Herring & Greenberg, 1989). To decrease these negative emotions, a person tries to reduce the discrepancy between the current and the ideal self (Higgins, 1987). Another study showed that people with other psychiatric disorders, for instance social anxiety disorder, use more words referring to the self in comparison to healthy people due to an increase in self-focused attention (Anderson, Goldin, Kurita, & Gross, 2008). However, according to Robertson, Short, Sawyer & Sweazy (2020), an increase in the use of first-person singular pronouns also seemed to be associated with a decrease in anxiety symptoms. This decrease in anxiety symptoms seemed to be the outcome of an expressive writing intervention that was given to the participants in this study (Robertson et al., 2020). When participants receive an expressive writing intervention on emotional topics or aversive experiences, there can be a change in the meaning given to these experiences (Dunnack & Park, 2009). This change in meaning occurs through the process of writing about the thoughts and feelings surrounding the experience (Dunnack & Park, 2009). The change in meaning also helps reduce the distress that is associated with the aversive experiences (Dunnack & Park, 2009). This can lead to a decrease in symptoms of anxiety. Thus, according to these studies, some people with mental disorders use more first-person singular pronouns but the use of these pronouns is also associated with a decrease in symptoms of anxiety for instance when an intervention is given.

Depressed students used significantly more negative emotion words and fewer positive emotion words compared to non-depressed students in essays about students'

experiences in college (Rude, Gortner & Pennebaker (2004). A study done by Carter and Grenyer (2012) showed that patients with Borderline Personality Disorder also use fewer positive emotion words and more negative emotion words relative to participants without Borderline Personality Disorder. The use of emotion words reflects the degree of immersion (Tausczik & Pennebaker, 2010). Immersion refers to an experience that is analysed from a first-person perspective (McIsaac & Eich, 2004). Thus, a situation is analysed through a person's own viewpoint. This person might ask himself questions such as "Why did I feel that way?". This often leads to rumination because a person is inclined to recount the negative experience including the arousing aspects of the experience (Kross, Gard, Deldin, Clifton & Ayduk, 2012). In the long term, recurring negative thoughts can be experienced (Kross et al., 2012). Rumination is excessively focussing on oneself and one's emotions and having constant negative thoughts (Watkins & Roberts, 2020). Rumination has been associated with an increase in the severity of depression (Hoeksema & Morrow, 1991). This occurs when a person has many recurring thoughts about his depressive symptoms and the causes and consequences of these symptoms. It can also lead to an increased risk of developing a depressive disorder (Driscoll, Lopez, & Kistner, 2009).

A study by Junghaenel, Smyth, and Santner (2008) showed the use of fewer insight words (such as 'know') by psychiatric patients relative to non-clinical participants. Another study showed the use of fewer causation words (such as 'cause' or 'hence') in participants with posttraumatic stress disorder (PTSD) compared to participants without PTSD (Jelinek et al., 2010). The use of these words could reflect a deficit in cognitive functioning commonly observed in different psychiatric disorders (Junghaenel et al., 2008). Patients often experience a discrepancy between their current circumstances and their goals, hence it is difficult for them to formulate goals. These people also tend to have difficulty providing insights or ideas for solutions (Junghaenel et al., 2008). Furthermore, causation and insight words can be used to explain and process a traumatic event (Tausczik & Pennebaker, 2010). The use of these words may help a person make sense of the event and organize their thoughts. The use of more cognitive words seems to also be related to better functioning (Alvarez, Zoellner & Foa, 2001).

1.1 The influence of stressors on linguistic changes

Research shows that symptoms of certain mental disorders can become evident due to life stressors, for instance, war or abuse (Morote, Hjemdal, Martinez & Corveleyn, 2014). According to a study, members of the military have an increased risk for developing

posttraumatic stress disorder or depression due to the combat stressor (Hoge, Auchterlonie & Milliken, 2006). The risk for other mental health problems such as depression and posttraumatic stress disorder are evident for instance in refugee children because of their traumatic experiences in their home countries such as war or violence (Ciaccia & John, 2016). These problems can also be evident due to the occurrence of traumatic experiences during their journey to their destination such as witnessing the deaths of other people (Chan, Mercer, Yue, Wong & Griffiths, 2009).

Stressors can also influence a person's word use. A study by Kleim, Horn, Kraehenmann, Mehl & Ehlers (2018) with trauma survivors showed the use of fewer insight words and a decrease in causation words (such as 'cause') and more first-person singular pronouns when describing a traumatic event relative to describing a non-traumatic event. These word use patterns predicted later posttraumatic stress disorder symptoms. Another study showed the use of more words referring to the self and negative emotion words by high school students when writing about a classmate who passed away in front of them (Margola, Facchin, Molgora & Revenson, 2010). This pattern was found in students who had difficulty adjusting to the passing of their classmate compared to students who adjusted well to the passing.

There have been some studies on linguistic changes in association with stressors in people with mental disorders. Linguistic changes in Twitter posts from a clinical depression sample compared to a non-clinical depression sample showed that stressors such as educational problems are associated with symptoms of depression such as fatigue and low concentration (Mowery et al., 2017). Words such as 'school', 'fail' or 'test' reflected educational problems. Furthermore, the word 'tired' reflected fatigue and words such as 'concentration' and 'focus' reflected the level of concentration. According to this study, a person can experience academic problems due to being tired or not being able to concentrate (Mowery et al., 2017). A study with participants writing about daily stressful events showed that depressed participants used more negative emotion words and first-person pronouns relative to non-depressed participants (Krejtz, Rohnka, Holas, Rusanowska & Nezlek, 2020). However, this result was eliminated when stressful daily events were controlled for. This study suggests that the use of more negative emotion words and first-person pronouns by depressed participants could be due to the experience of more stressful situations instead of an increased self-focus. Another study comparing the use of swear words by cancer or rheumatoid patients showed that the use of swear words in front of other people is related to a decrease in emotional support and an increase in symptoms of depression (Robbins et al., 2011). Further studies on

linguistic changes in association with the influence of stressors in people with mental disorders have been lacking.

1.2 Covid-19 impact on mental health

In 2019 there was an outbreak of the Covid-19 virus. The first Covid-19 infection was registered in Wuhan, China (Rui, Sirui, Xuebei, Xujun & Yanggan, 2020). The most common symptoms of this virus include a fever and a dry cough (Rui et al., 2020). This virus had spread across many countries and infected many people. Since March 2020, there has been a significant increase in the number of Covid-19 infections. However, Covid-19 cases were already present in several countries as early as January 2020. For instance, the first Covid-19 case in Germany was reported on 27 January 2020 (Böhmer et al., 2020). The Netherlands had its first Covid-19 case on 27 February 2020 (RIVM, 2020). Between January 2020 and February 2020, 14 Covid-19 cases were detected in the US (Jorden & Rudman et al, 2020).

Studies show that Covid-19 can have an impact on a person's mental state. According to a meta-analysis of 66 studies from seven populations, the prevalence of depression was 31.4 % and anxiety was 31.9% during the first three months of 2020 when Covid-19 started to spread across most countries (Wu et al., 2021). This meta-analysis showed that the prevalence of these psychiatric disorders was the highest for people who were in quarantine, Covid-19 patients and medical practitioners and nurses. Another meta-analysis showed that the prevalence of anxiety was 31.9% during the first four months of 2020 (Salari et al., 2020). This anxiety prevalence was based on 17 studies. According to this meta-analysis, anxiety symptoms can increase when people are often exposed to the news surrounding Covid-19. News regarding Covid-19 can be distressing and contain rumours. This can lead to worries and anxiety (Salari et al., 2020).

The recent Covid-19 stressor seems to also influence a person's word use. A twelve-week long study by Essam & Abdo (2020) on the reaction of Arabic Twitter users to the Covid-19 pandemic, showed the use of more negative emotion words and sadness relative to the use of positive emotion words. Another study analysing Weibo (a Chinese social media platform) user's words during the first month of January 2020, showed an increase in negative emotion words and a decrease in positive emotion words (Li, Wang, Xue, Zhao & Zhu, 2020). Additionally, these users showed more concerns regarding their health and family (Li et al., 2020). Furthermore, a study regarding linguistic changes in tweets from 12 different countries during the Covid-19 pandemic showed that word categories such as anger, anxiety, swear words, negative and positive emotion words had a significant increase in

March 2020 when the Covid-19 cases started to rise (Dyer & Kolic, 2020). This increase was also evident in May 2020 when the Black Lives Matter protests were occurring. Afterwards, the use of these words decreased (Dyer & Kolic, 2020).

As previously stated, there have been some studies on the effect of Covid-19 on linguistic changes. However, it is still unknown how Covid-19 affects linguistic changes in certain people such as people with a psychiatric disorder. This study will further investigate whether Covid-19 changes a person's word use by analysing blog posts of people with a psychiatric disorder compared to people without a psychiatric disorder. The word use of the participants will be compared between the Covid-19 period (January 2020 to November 2020) and the period before Covid-19 (January 2019 to November 2019). The main word categories that are going to be analysed in this research are the first-person singular and the first-person plural personal pronouns. For further exploration, negative and positive emotion words and insight and causation words are also going to be analysed. As mentioned earlier, a person's mental status can be reflected in their words. Thus, looking at whether word use changes due to Covid-19 can help better understand the impact that Covid-19 has on a person's mental health.

The main hypothesis for this research is that participants with a psychiatric disorder use more first-person singular personal pronouns and fewer first-person plural personal pronouns relative to participants without a psychiatric disorder. Another hypothesis is that Covid-19 is associated with the use of more negative emotion words and less positive emotion words compared to when Covid-19 was absent. Finally, the hypothesis that participants with a psychiatric disorder use fewer cognitive processing words such as insight and causation compared to participants without a psychiatric disorder will be investigated.

2 Method

2.1 Design

This research is a retrospective case-control study.

2.2 Participants

Inclusion criteria for the participants of the experimental group were female bloggers, between 20 and 44 years old, English, German, and Dutch speakers, stating that they have a psychiatric disorder. The inclusion criteria for the control group were female bloggers, between 20 and 44 years old and English, German, and Dutch speakers. The exclusion criteria for the control group were reporting having a psychiatric disorder.

The timeframe of the publication of the blog posts ranged between January 2020 to November 2020 because during this period the covid-19 cases started to rise in Europe and the USA. There has been a significant increase in Covid-19 cases since March 2020, when the virus was officially classified as a pandemic (World Health Organization, 2020). However, several countries started to report cases of Covid-19 as early as January 2020 (ECDC, 2020). Blog posts that served as the control data were blog posts written within the timeframe of January 2019 to November 2019. In this timeframe, there were no known Covid-19 cases.

2.3 Measures

To study the changes in the word categories, a computerized text analysis tool, the Linguistic Inquiry and Word count (LIWC) was used. The LIWC can analyse texts from blogs, essays, poems, novels, or text (Tausczik & Pennebaker, 2010). Analyses are performed word by word. The words are coded into one or multiple word categories of the LIWC. There are about 80-word categories in the LIWC (Tausczik & Pennebaker, 2010). After analysing a text, the LIWC gives the percentage of each word category as a function of total words. The LIWC contains word categories such as prepositions and articles. Prepositions refer to words such as 'above' or 'with' and articles refer to words such as 'a' or 'the'. There have been multiple studies done that show that LIWC is a valid and reliable instrument (Pennebaker, Boyd, Jordan, & Blackburn, 2015). As mentioned above, the word categories first-person singular and plural personal pronouns were used. First-person singular pronouns refer to words such as 'I' or 'me' and first-person plural pronouns refer to words such as 'we' or 'us' (Tausczik & Pennebaker, 2010). The word categories negative and positive emotion words were also used. Words such as 'nice' or 'sweet' indicate positive emotion words and words such as 'hurt' or 'ugly' indicate negative emotion words (Tausczik & Pennebaker, 2010). Positive emotions words were subtracted from the negative emotions words to create the new variable 'emotional tone' to give an overall measurement of the emotional tone of the blog posts. This new variable was used to test the hypothesis that Covid-19 is associated with the use of more negative emotion words and less positive emotion words compared to when Covid-19 was absent. Furthermore, the cognitive processing word categories 'insight' and 'causation' were used. The word category 'insight' refers to words such as 'know' and the word category 'causation' refers to words such as 'because' (Tausczik & Pennebaker, 2010). To obtain an overall measurement of the cognitive processing words, the variable cognitive words was computed to combine the 'insight' and 'causation' word categories. Lastly, the

variable ‘written first wave’ that indicated when the blog posts were written for instance when there were no Covid-19 (January 2019 to November 2019), during the first wave (March 2020), the time between the first and second wave (April 2020 to September 2020) or the second wave (October 2020) was recoded into a different variable to merge and dichotomize the categories.

2.4 Procedure

The experimenters searched online for possible bloggers whose blog posts could be used for this research. A list of possible bloggers was made and narrowed down to a few bloggers who met the inclusion criteria. The blog posts of the bloggers were saved separately as word files. These files were the input for the LIWC. Separate data sets for each language were created instead of 1 data set due to dissimilarities between the word categories in the different language versions of the LIWC. To prepare the data for statistical analyses, other variables were added to the data set and were filled in by the experimenters. These variables contained a number for each blogger, their age and language and if they were a participant with a psychiatric disorder or not. Other variables included whether the blogs contained topics about Covid-19 or not, if the blogs were written during the Covid-19 period or not, the publishing dates and the type and order of the blogs.

2.5 Ethics

The ethical approval from the Psychology Research Ethics Committee and the Medical Ethics Committee was not applicable for this research because this research consisted of already existing anonymized data.

2.6 Statistical analyses

IBM SPSS Statistics (IBM Corp., 2019) and Jamovi (the Jamovi project, 2021) were used to analyse the data of this research. First, descriptive statistics of the data were assessed. Afterwards, the correlations between the variables were assessed using Kendall’s tau correlation coefficient. In SPSS, means and standard deviations for the word categories first-person singular and plural personal pronouns, emotional tone and cognitive processing were calculated for each of the 18 cases separately for the control and the COVID-19 timeframe. Standardized mean differences (Cohen’s *d*) were calculated over these statistics potentially indicating changes in word use over time per case. Cohen’s *d* was used as the outcome measure and specifies the standardized mean difference between the groups (Aarts, Akker &

Winkens, 2013). Cohen's *d* can be small (*d* = 0.2), medium (*d* = 0.5) or large (*d* = 0.8) (Cohen, 1988). The main effects of patient status were assessed by means of an independent *t*-test with patients and controls paired for language. The descriptive statistics were fed into CMA where overall within-subjects effects were calculated by means of random-effects meta-analysis with a confidence level of 95%. The main effects of patient status and language and their interaction with time were assessed through moderator analyses within Jamovi. A correction for multiple comparisons was applied. The standardized mean differences per case and the pooled effect sizes of the combined cases were illustrated in forest plots with their 95% confidence intervals. A forest plot graphically represents the estimates of individual studies and the overall estimate of all the individual studies combined (Verhagen & Ferreira, 2014). Statistical significance was set at a P-value of .05.

3 Results

3.1 Descriptive statistics

The data set contained a total of 3239 blog posts written by all the 18 participants combined. The average age of the participants was 25 (*SD* = 8.12). There were more blog posts written by healthy participants (61.50%, *n* = 1991) than there were blog posts written by participants with a psychiatric disorder (38.50%, *n* = 1248). There were also more English (44.90%, *n* = 1454) blogposts than Dutch (40.30%, *n* = 1304) and German (14.90%, *n* = 481) blog posts. Half of the blog posts were written before Covid-19 (50%, *n* = 1618) and half were written during Covid-19 (50%, *n* = 1621). Most of the blog posts did not contain topics concerning Covid-19 (95.60%, *n* = 3097). The average word count per blog post was 702.73 (*SD* = 458.41). Moreover, the average amount of 'I' words used in the blog posts was 4.44 (*SD* = 3.08) and an average of .83 (*SD* = 1.12) 'we' words were used. Additionally, most of the blog posts had on average a relatively positive emotional tone (*M* = -2.91, *SD* = 1.98). Lastly, an average of 4.09 (*SD* = 1.63) cognitive words were used in the blog posts.

3.2 Correlations

The correlations between word count, the 'I' and the 'we' word categories, the emotional tone word category and the cognitive processing word category were all examined. There was a weak, negative correlation between the word category 'I' and the word category 'we' ($r = -.06$, $p < .01$), with more use of 'I' associated with less use of 'we'. The word category 'I' had a weak, positive correlation with emotional tone ($r = .07$, $p < .01$) and with cognitive words ($r = .07$, $p < .01$) respectively. Furthermore, the word category 'we' had a weak, positive

correlation with emotional tone (r = .08, p <.01). The word categories ‘we’ and cognitive words had a weak, negative correlation (r = -.07, p < .01). The emotional tone word category had a weak, positive correlation with cognitive words (r = .14, p < .01). Word count was positively correlated with ‘we’ *(*r = .15, p < .01), emotional tone (r = .15, p < .01) and cognitive words (r = .06, p < .01) respectively. Lastly, word count was negatively correlated with ‘I’ (r = -.08, p < .01).

3.3 Between-subjects effect

The results suggest that patients (M = 5.54, SD = 2.70) used the word ‘I’ more often than the controls (M = 4.01, SD = 3.06) (d = -.53, 95% CI = -.67, -.40, p = .00). Patients (M = .88, SD = 1.11) also used more ‘we’ compared to the controls (M = .79, SD = 1.12) (d = -.10, 95% CI = .01, .19, p = .03). Furthermore, patients (M = -2.72, SD = 2.10) used more negative or less positive words in comparison to the controls (M = -3.01, SD = 1.89) (d = -.27, 95% CI = -.22, -.09, p = .00). Lastly, patients used more cognitive processing words (M = 4.35, SD = 1.54) compared to controls (M = 3.92, SD = 1.66) (d = -.27, 95% CI = -.42, -.22, p = .00).

3.4 Within-subjects effect

Figures 1, 2, 3 and 4 show forest plots with the results of the changes over time on the word categories ‘I’, ‘we’, emotional tone and cognitive processing for the participants with a psychiatric disorder and the healthy participants with the effect sizes and the 95% CI.

Figure 1 shows the results for the ‘I’ word category. The results showed no changes over time on the use of the word ‘I’ for the patients (95% CI = -.04, .33, d = .15) or for the controls (95% CI = -.27, .19, d = -.04). There were also no differences over time between the patients and the controls on the use of the word ‘I’ (Z = 0.97, p = 0.23).

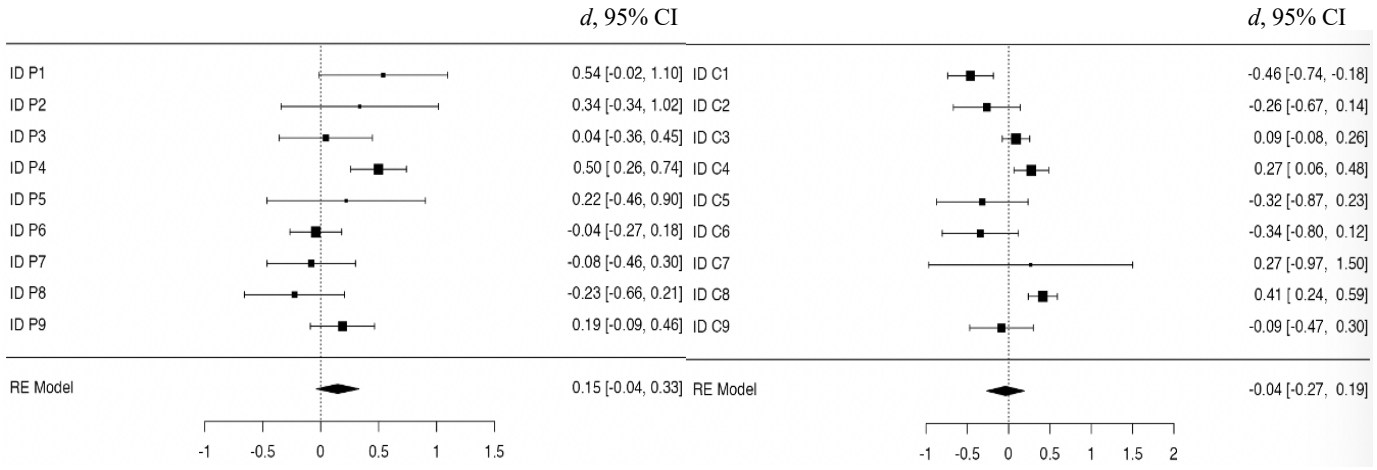

Figure 1. Forest plot on the effects of time on the 'I' word category between patients (ID P) and controls (ID C).

Figure 2 shows the results for the 'we' word category. There were changes over time on the 'we' word category for the patients (95% CI = -.25, -.02, *d* = -.14), indicating that patients used more 'we' during Covid-19 compared to when there was no Covid-19. However, there were no changes over time on the 'we' word category for the controls (95% CI = -.20, .13, *d* = -.04). There were also no differences over time between the patients and the controls on the use of the word 'we' (Z = 1,12 *p* = 0.17).

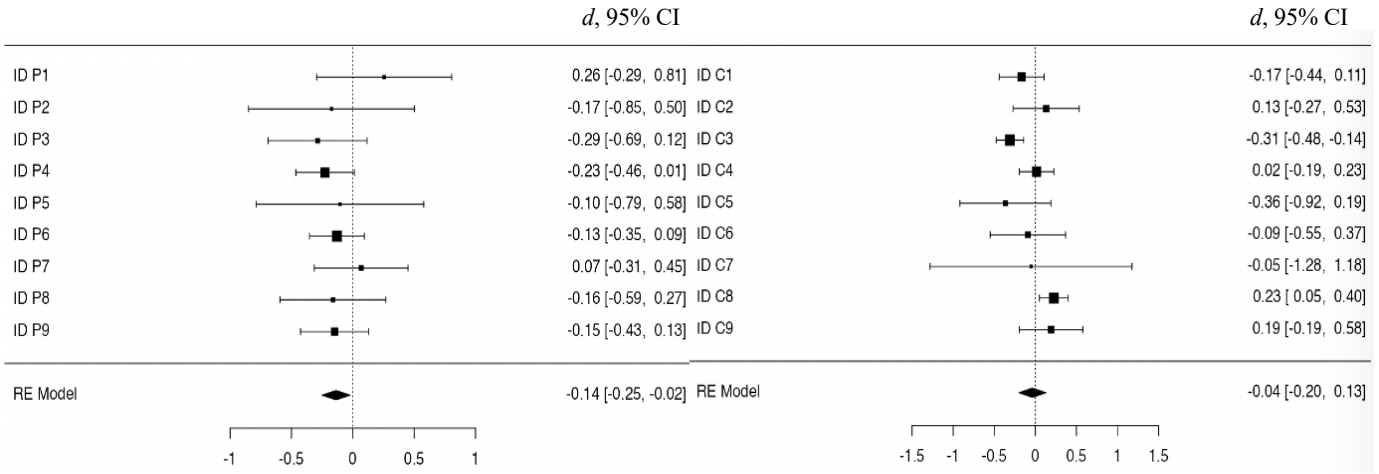

Figure 2. Forest plot on the effects of time on the 'we' word category between patients (ID P) and controls (ID C).

The results for the emotional tone of the blog posts are shown in figure 3. There was an effect of changes over time on the emotional tone word category for the patients (95% CI = -.30, -.01, *d* = -.16) but not for the controls (95% CI = -.14, .04, *d* = -.05), indicating that the patients had a more negative tone or a less positive tone during Covid-19 compared to before Covid-19. There were no differences between the patients and the controls of changes over time on the emotional tone word category (*Z* = .43, *p* = .82).

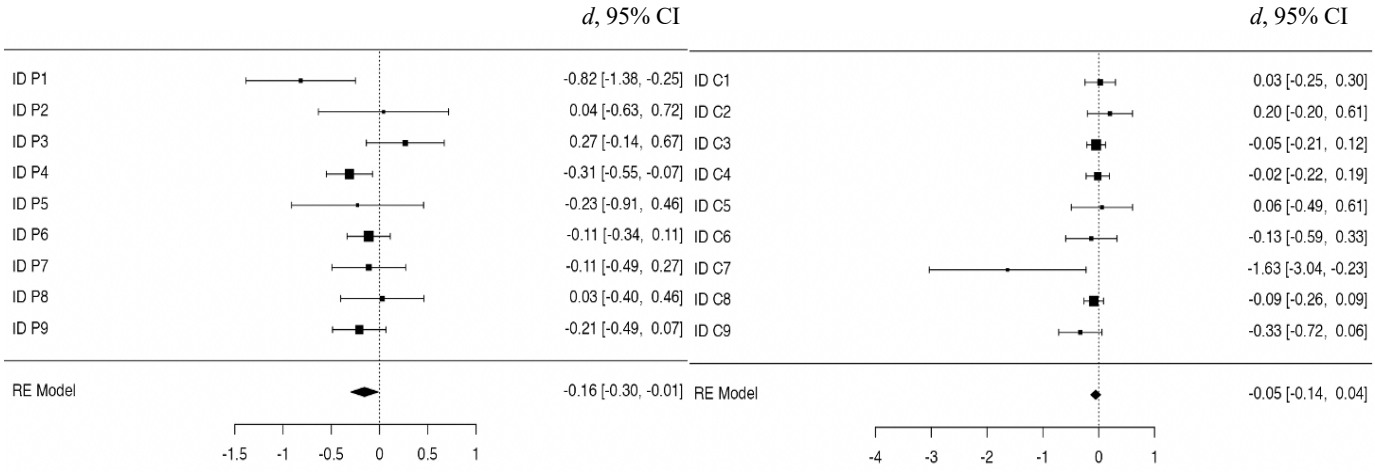

Figure 3. Forest plot on the effects of time on the emotional tone word category between patients (ID P) and controls (ID C).

Lastly, figure 4 shows the results for the cognitive processing word category. The results showed no changes over time on the use of cognitive processing words for the patients (95% CI = -.31, .05, *d* = -.13). Nevertheless, there were changes over time on the cognitive processing words for the control group (95% CI = -.37, -.01, *d* = -.19), showing the use of more cognitive processing words by the control group during Covid-19 compared to when Covid-19 was absent. There were no changes over time between the patients and the controls on the use of cognitive processing words (Z = 0,81, *p* = 0.59)

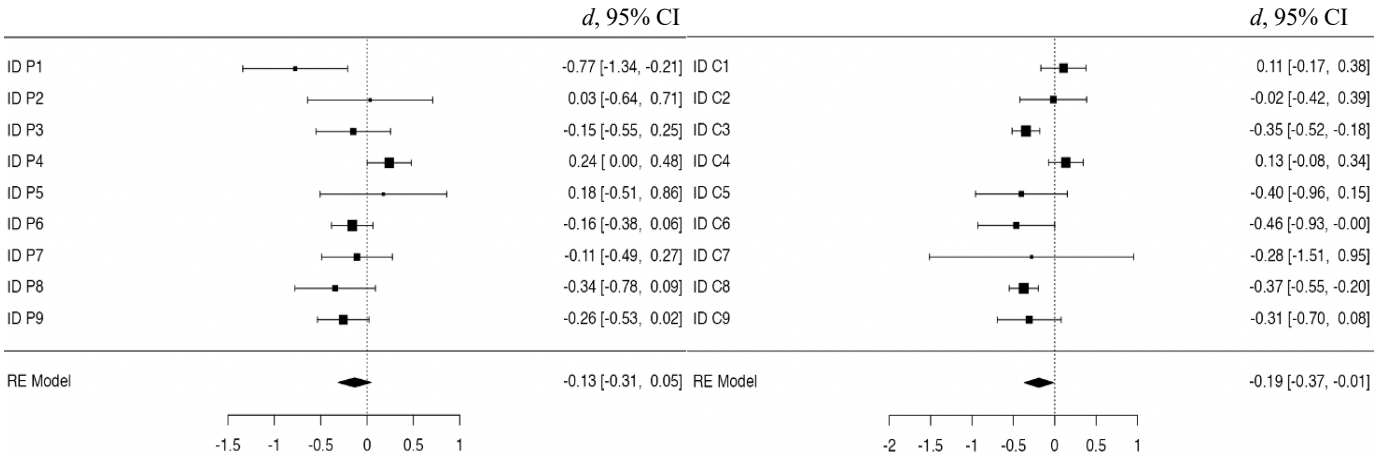

Figure 4. Forest plot on the effects of time on the cognitive processing word category between patients (ID P) and controls (ID C).

4 Discussion

The study aimed to investigate the influence of Covid-19 on changes in word use of people with a psychiatric disorder in comparison to people without a psychiatric disorder. Blog posts of 9 female participants with a psychiatric disorder and 9 female participants without a psychiatric disorder were used to analyse changes in first-person singular and plural personal pronouns, positive and negative emotion words and cognitive processing words.

The results indicate that patients used more 'I', 'we' and cognitive processing words compared to the controls. The patient group also had a more negative or a less positive tone compared to the control group. There were no changes over time between the patient group and the control group on the use of 'I', 'we', cognitive processing words and the emotional tone of the blog posts. In addition, the patient group used more 'we' and had a more negative or a less positive tone during Covid-19 compared to the period when there was no Covid-19. The control group used more cognitive processing words during Covid-19 compared to when Covid-19 was absent. Lastly, there were no changes on the use of 'I' during Covid-19 in comparison to the period without Covid-19 for the patients or the controls. Following these findings, the results relevant to the hypotheses will be discussed next.

The result of this study that showed that patients used the word 'I' significantly more than the healthy participants is in accordance with what was hypothesized. Patients also used words in the category 'we' more often compared to the healthy participants. However, the

effect size was quite small (Cohen, 1988). This result is not in accordance with the second part of the hypothesis that states that participants with a psychiatric disorder use fewer first-person plural personal pronouns relative to participants without a psychiatric disorder. Thus, the first hypothesis can be partially accepted.

The finding that patients used more 'I' compared to the control group is in line with previous studies showing the use of more first-person singular pronouns by individuals varying in psychiatric disorders (Krejtz et al., 2020; Kleim et al., 2018). A prior study showed an association between depression and the use of more first-person singular pronouns (Rude et al., 2004). As previously mentioned, self-focused attention can be reflected by the use of more first-person singular pronouns by individuals with a depressive disorder. According to Pyszcynski & Greenberg (1987), more focus is put on the self when an individual, who lost a sense of their self-worth ends up in a continuous cycle of attempting to recover what they lost. Another study showed that more first-person singular pronouns were used in poems by writers who committed suicide compared to poems that were written by writers who did not commit suicide (Stirman & Pennebaker, 2001). Thus, the finding can perhaps be explained by patterns seen in other psychiatric disorders where individuals often referred to themselves.

The finding that patients used more 'we' than the controls is not consistent with the result of an earlier study that showed that people with a depressive disorder used fewer first-person plural pronouns (Edwards & Holtzman, 2017). It seems possible that the finding in this study could be explained by the tendency that people have, to seek out social contact as a way to cope with fearful situations (Tunçgenç et al., 2021). A study on linguistic changes on Reddit's (a social media platform) support forum during the first 3 months of Covid-19, showed an increase in the use of the word 'we' by individuals who expressed anxiety, depressive or suicidal concerns (Biester, Matton, Rajendran, Provost & Mihalcea, 2020). This study seemed to suggest that the increase in the use of 'we' reflects a sense of togetherness that was formed by sharing experiences with each other. The Covid-19 outbreak seemed to lead to fearful responses (Ornell, Schuch, Sordi & Kessler, 2020). Individuals with certain psychiatric disorders tend to have less social contact than those without a psychiatric disorder (Perese & Wolf, 2005). However, a common coping strategy of the general population during outbreaks is seeking the support of others (Chew, Wei, Vasoo, Chua & Sim, 2020). Thus, the feeling of togetherness that can be formed when an individual seeks contact during stressful situations, may explain the finding in the current study.

The results also indicated that patients used significantly more cognitive processing words compared to the healthy participants, contrary to what was hypothesized. Although,

the effect size was small (Cohen, 1988). This result is not in line with prior studies that showed the use of fewer cognitive processing words by participants with a psychiatric disorder compared to healthy participants (Jelinek et al., 2010; Junghaenel et al., 2008). This may be explained by the impact that the process of writing the blogs can have on the cognitive processing of these participants. A study showed that the process of writing about a traumatic situation can have a positive effect on the cognitive processing of people with posttraumatic stress disorder (PTSD) (Stockton, Joseph & Hunt, 2014). It helps turn the disorganized memories that are associated with a traumatic situation into more organized and coherent memories (Pennebaker, 1993). Cognitive processing is also crucial for positive changes in relationships of people with PTSD and how they see themselves, hence posttraumatic growth (Stockton et al., 2014). This is supported by a previous study that showed a correlation between posttraumatic growth and the use of more cognitive processing words in participants who wrote about their traumatic experience compared to the control group (Stockton et al., 2014). Earlier studies also showed positive changes in participants with a psychiatric disorder, reflected by an increase in the use of cognitive processing words when writing (Pennebaker, 1993; Petrie et al., 1995; Rivkin et al., 2006).

The hypothesis that Covid-19 is associated with the use of more negative emotion words and less positive emotion words compared to when Covid-19 was absent was also tested. The results seemed to indicate that there were no differences over time on the emotional tone of the blog posts between the participants with a psychiatric disorder and the healthy participants. A possible explanation for this result might be that psychiatric patients as well as healthy individuals can experience negative emotions such as feelings of anxiety or fear of catching the Covid-19 virus during the Covid-19 pandemic (Chatterjee, Barikar & Mukherjee, 2020; Li et al., 2020).

Participants with a psychiatric disorder had a more negative tone or a less positive tone during Covid-19 compared to before Covid-19 started. However, the effect size was quite small (Cohen, 1988). A prior study showed that individuals with a history of psychiatric disorders might have more chances of experiencing negative emotions during the Covid-19 pandemic compared to before the pandemic due to a more heightened response to the pandemic (Harper, Satchell, Fido & Latzman, 2020; Hao et al., 2020). Thus, this might be a possible explanation for the finding in this study. The result from this study is also consistent with a previous study analysing google searches and YouTube data that showed that participants with anxiety symptoms had a more negative tone during Covid-19 relative to when Covid-19 was absent (Zhang, Zaman, Silenzio, Kautz & Hoque, 2020).

To conclude, participants with a psychiatric disorder used more first-person singular and plural pronouns and more cognitive processing words compared to the participants without a psychiatric disorder. There were no differences on the emotional tone of the blog posts between participants with a psychiatric disorder and the healthy participants during Covid-19. However, the participants with a psychiatric disorder showed a more negative or a less positive emotional tone during Covid-19 compared to when Covid-19 was absent.

4.1 Limitations

This study had several limitations. First, the symptoms of the psychiatric disorders of the participants were not measured in this study. The inclusion criteria for the participants in the experimental group were bloggers stating on their blogs that they suffer from a psychiatric disorder. However, it might be possible that these participants have recovered since making these statements. This might influence the results in this study and should be considered when interpreting the results. Furthermore, this research only looked at the short-term effects of Covid-19 on the word use of individuals with a psychiatric disorder and those without. However, the Covid-19 pandemic is still ongoing in many countries. Analysing word use over a longer period could help researchers investigate the long-term effects that stressors such as the Covid-19 pandemic might have on the word use of individuals with a psychiatric disorder. In addition, there seemed to be limited studies investigating the emotional tone between psychiatric patients and controls during Covid-19 and limited studies supporting the finding in this study possibly due to Covid-19 being a new area of research. Prior studies showed the risk of developing a psychiatric disorder have increased since the Covid-19 pandemic started due to feelings of loneliness and uncertainty resulting from the preventative measures taken against the spread of the Covid-19 virus including social distancing and isolation (Ahmed et al., 2020; Rajkumar, 2020; Holmes et al., 2020; Muruganandam et al., 2020). Hence, future research should look more into the association between changes in word use such as the emotional tone of individuals with a psychiatric disorder and the Covid-19 pandemic. Lastly, the computerized text analysis tool that was used to analyze the words in the blog posts only counts words and disregards the context of the words (Tausczik & Pennebaker, 2010).

4.2 Strengths

The study also had some strengths. Firstly, the data set contained a large amount of blog posts, allowing a within-subjects comparison possible. A large amount of blog posts also

increases the statistical power of this study. Power increases the chances of finding a significant difference, given that there is a significant difference in the population (Lenth, 2007). The large sample size also makes the sample representative of bloggers. Thus, the results can be generalized to bloggers. Furthermore, the sample in this study included participants with various cultural backgrounds which made this sample diverse and representative of the general population of bloggers, adding to the external validity of this research.

4.3 Theoretical implications & future research

This study revealed some interesting insights. One of those insights was that participants with a psychiatric disorder used more 'we' compared to the healthy participants. The overall trend in the literature tends to focus on psychiatric patients referring more often to themselves and less often to others compared to healthy individuals (Edwards & Holtzman, 2017). However, insights from this study and other studies suggest the opposite effect (Gortner & Pennebaker, 2003; Biester et al., 2020). The inconsistency in the literature can make it difficult to distinguish between markers for symptoms of psychiatric disorders. Therefore, it is important to investigate other contributing factors that might reveal linguistic patterns, explaining why psychiatric patients also refer to others instead of only referring to themselves. Thus, future research should look more into the influence that other factors might have on word use of individuals with a psychiatric disorder.

Another interesting insight was that there were no differences on the emotional tone of the blog posts between the participants with a psychiatric disorder compared to the participants without a psychiatric disorder during Covid-19. As previously mentioned, prior research showed that psychiatric patients might experience more negative emotions during Covid-19 relative to the period before Covid-19 (Harper et al., 2020. It might be that the effect of Covid-19 on the patients can lead to worse outcomes such as worsening of their symptoms. Therefore, it might be interesting for future research to look at whether these findings are reproduced in other stressful settings which might eventually broaden the understanding of this specific phenomenon.

Lastly, it seemed that participants with a psychiatric disorder used more cognitive processing words compared to the participants without a psychiatric disorder. One explanation for this finding might be that the process of writing can contribute to the improvement of the cognitive processing in individuals with a psychiatric disorder (Pennebaker, 1993). The process of writing can also help decrease depressive and anxiety

symptoms (Hemenover, 2003). Decreasing these symptoms can contribute to the recovery process of individuals suffering from a mental disorder. Based on the finding in this study, future research should look more into the influence of writing on the cognitive functioning of individuals with psychiatric disorders.

4.4 Practical implications

Focussing on word use of individuals with a psychiatric disorder could help practitioners better understand the clinical changes that are associated with certain psychiatric disorders during Covid-19. A potential way of doing this is by giving a psychiatric group an expressive writing intervention. During this intervention, participants in the psychiatric group are instructed to write about a personal or a traumatic experience whereas participants in the control group are instructed to write about a neutral topic (Reinhold, Bürkner & Holling, 2018) As previously mentioned, a writing intervention can have a positive influence on symptoms of a psychiatric disorder (Stockton et al., 2014). Expressive writing interventions may also provide practitioners with insights on the mechanisms of therapeutic change (Reinhold et al., 2018).

4.5 Conclusion

This study looked at whether the word use of bloggers with a psychiatric disorder and bloggers without a psychiatric disorder changed in relation to Covid-19. The word use between the two groups did not change in relation to Covid-19. However, the individuals in the psychiatric group were negatively impacted by Covid-19 as reflected by their words. The psychiatric group also focused more on themselves as well as on connecting with others around them. In addition, this group may have focused more on cognitive processes. Other external influences on a person's word use should perhaps be considered in future research. All things considered, this research provided new insights into how a pandemic can influence a person's word use which can ultimately reflect their mental state. This might contribute to a clearer understanding of the psychological toll that the Covid-19 virus might be taking on the lives of individuals.

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