

## Sudden sensorineural hearing loss: What can we learn from examining Reddit posts?

Vinaya Manchaiah,<sup>1,2</sup> Aniruddha K. Deshpande,<sup>3,4</sup> Monica L. Bellon-Harn,<sup>1</sup> & Ryan L. Boyd<sup>5-7</sup>

1. Department of Speech and Hearing Sciences, Lamar University, Beaumont, Texas, USA
2. Department of Speech and Hearing, School of Allied Health Sciences, Manipal, Karnataka, India
3. Department of Speech-Language-Hearing Sciences, Hofstra University, Hempstead, New York, USA
4. Long Island Doctor of Audiology Consortium, Garden City, New York, USA
5. Department of Psychology, Lancaster University, Lancaster, UK
6. Security Lancaster, Lancaster University, Lancaster, UK
7. Data Science Institute, Lancaster University, Lancaster, UK

**Corresponding author:** Dr. Vinaya Manchaiah

**Communication address:** Department of Speech and Hearing Sciences,  
Lamar University, Beaumont, Texas 77710, USA

**Email:** [vinaya.manchaiah@lamar.edu](mailto:vinaya.manchaiah@lamar.edu)

**Tel:** +1 (409) 880 8927

**Fax:** +1 (409) 880 2265

## **Abstract**

**Background:** Many patients with sudden sensorineural hearing loss (SSNHL) may seek hearing health information and social support online, although little is known about the online information seeking behavior.

**Objective:** The present study was aimed at examining the discussions around SSNHL in Reddit posts.

**Method:** 526 Reddit posts about SSNHL were extracted and analysis using qualitative and quantitative methods.

**Results:** The content analysis identified eight main categories. Most of the posts were on topics of sharing personal experiences (34%), describing symptoms (31%), discussing treatment options (36%), and possible causes (19%) of SSNHL. The SSNHL Reddit posts varied significantly in linguistic variables when compared to baseline Reddit posts. Reddit posts by individuals with SSNHL had significantly higher engagement, higher authenticity, and talked more about their body when compared to other users.

**Conclusions:** The study results provide insights that can be helpful for professionals during clinical interactions.

## **Key Words**

Sudden sensorineural hearing loss, Social media, Linguistic analysis

## Introduction

Individuals with sudden sensorineural hearing loss (SSNHL) are highly heterogeneous in terms of etiology, manifestation of symptoms, and the way they manage the traumatic experiences surrounding partial or complete loss of hearing.<sup>1</sup> Most of these patients are likely to seek urgent or emergency care from healthcare providers.<sup>2</sup> In addition, many patients may seek hearing health information and social support online via various websites or social media platforms, due to the ease of access to information. Some of these patients may continue to seek online health information even after consultation with healthcare providers. In part, this may be due to the fact that patients may not get clear information about treatment options and/or about their prognosis.

Despite the concern about the reliability of online information especially on social media platforms,<sup>3,4</sup> patients seek health information online and use it in decision making. Often, they also use it as a discussion point during healthcare interactions. For this reason, it is useful for healthcare professionals to examine the content of online health information. In addition to seeking information, many patients also share their experience with healthcare professionals on social media platforms such as Facebook and Reddit. In particular, due to the anonymous nature of Reddit, users are considered to provide more engaging and valuable descriptions about the topic of interest. Examining the natural language from these posts can provide insights into thoughts, emotions, and behaviors of users.<sup>5</sup>

The present study was aimed at examining the discussions around SSNHL in Reddit posts, in order to understand how people with SSNHL reach out to other people for support (informational, emotional, etc.) when coping with SSNHL. The specific aims include: (a) to

identify the main categories of online discussions around SSNHL using qualitative content analysis, (b) to examine the linguistic aspects of conversations using automated text analysis, and (c) to examine if the linguistic aspects vary across user categories (i.e., individuals with SSNHL vs. others).

## **Method**

The study used a cross-sectional design. Conversations about SSNHL were collected from Reddit and analyzed using automated text analysis software. No ethical approval was required as the data were anonymous in the public domain and no personally identifiable information was included that might compromise the anonymity/identity of users.<sup>6</sup> The EQUATOR reporting guidelines were used to report the methods and results of the study.

## **Data Extraction**

First, a search was performed using key words such as “sudden hearing loss,” “sudden onset hearing loss” and “sudden sensorineural hearing loss” to identify threads specifically discussing SSNHL. Data from these threads were extracted using the Reddit application programming interface (API) with a custom-built script, resulting in a corpus of 996 posts. Of these, 470 (47.2%) posts were excluded as they contained either no information or very limited contextual information (i.e. fewer than 5 words) about SSNHL. The remaining 526 posts were included in further analyses. These posts were generated from over 20 different subreddit threads, although over 80% of the posts belonged to the following threads: r/hearing (30%), r/YouShouldKnow (15%), r/deaf (11.6%), r/MonoHearing (7%), r/AskDocs (6.3%), r/tinnitus (5.7%), and r/hardofhearng (4.8%). This was the primary dataset for the present study. Additionally, a

reference corpus of 273,580 posts was extracted from the r/AskReddit board, serving as a baseline for comparison.

## **Data Analysis**

### ***Content Analysis and Determining the User Category***

A qualitative content analysis was performed to examine the content of extracted posts. The user category (i.e. individuals with SSNHL, all others) was determined by two independent reviewers annotating each post; conflicts were resolved by discussion.

### ***Examination of Linguistic Aspects***

The Linguistic Inquiry and Word Count (LIWC) software (<https://liwc.wpengine.com/>) was used to analyze linguistic aspects of the text data. The software counts and calculates the percentage of words in a variety of linguistic and psychologically meaningful categories. In the current study, 11 key linguistic variables identified by the research team were included for further analysis (see Table 2). LIWC has high internal reliability and external validity as noted in several studies.<sup>5,7</sup> A minimum of a 5-word count was set to include the Reddit posts in the analysis so that results were not biased due to certain words.

### ***Statistical Analysis***

SPSS software was used for statistical analyses. A one-sample *t*-test was performed to compare the linguistic variable results of SSNHL posts with baseline data. An independent sample *t*-test was performed to examine the difference in linguistic analysis variables among SSNHL user categories. A significance level of .01 was used. The Cohen's *d* effect sizes were computed and

were interpreted as small effect size ( $d = 0.2$ ), medium effect size ( $d = 0.5$ ), and large effect size ( $d = 0.8$ ).

## **Results**

### **Review Characteristics**

A total of 526 Reddit posts were extracted. Of these, 73 were original posts and the remaining 453 were responses to the posts. For the original posts, the median up-vote ratio was 1 (mean=0.93, SD=0.12) with a median up-vote ratio value of 3 (mean=58.05, SD=457), suggesting that these posts were quite popular on Reddit. Of the 526 posts, 329 (62.5%) were from people with SSNHL and 197 (37.5%) were from others – which included health professionals, significant others of individuals with SSNHL, and users who could not be identified.

### **Main Themes in SSNHL Reddit Posts**

The content analysis identified eight main categories (see Table 1), which highlighted that Reddit users discuss a wide range of issues related to SSNHL on this platform. Most of the posts were on topics of sharing personal experiences (34%), describing symptoms (31%), discussing treatment options (36%), and possible causes (19%) of SSNHL. Around 12-13% of posts were related to seeking or providing information and/or advice. A discussion about prognosis and diagnosis was noted in less than 10% of the posts.

<Table 1 here>

### **Linguistic Analysis Variables in SSNHL Reddit Posts**

Table 2 presents linguistic analysis results of SSNHL Reddit posts as compared to Reddit baseline data. The t-test results suggest that SSNHL Reddit posts varied significantly in all 11 variables when compared to baseline data. Those who provided SSNHL posts were more engaged and authentic when compared to baseline users – as noted in variables word count, I-words, and authenticity. SSNHL posts had significantly lower social processes and positive emotions but significantly higher negative emotions when compared to baseline posts. SSNHL posts had higher cognitive processing but exhibited less analytical thinking when compared to baseline posts. Finally, as anticipated, SSNHL posts had a significantly higher number of words classified as biological (i.e., body, health) and perceptual (i.e., hearing) as compared to baseline posts. These results suggest that SSNHL posts on Reddit are markedly different when compared to typical Reddit posts.

<Table 2 here>

Analysis of SSNHL Reddit posts across user categories suggested that individuals with SSNHL had significantly higher engagement (word count), higher authenticity (based on I-words and authenticity) and talked more about their body when compared to other users. Conversely, individuals with SSNHL had significantly lower references to others (i.e., social processes) and exhibited less analytical thinking when compared to others as illustrated in table 3.

<Table 3 here>

## Discussion

The present study used a mixed-method design to examine social media (Reddit) posts about SSNHL to gain insights into the type of narrative discourse. The qualitative content analysis identified eight themes, suggesting that the SSNHL Reddit posts relate to various elements including sharing personal experiences, discussing symptoms and treatment options, and also to seek or offer information or advice on managing the condition. These results are consistent with studies that have examined other health conditions such as mental disorders. For instance, Silveira Fraga et al.<sup>8</sup> suggested that requesting for help and offering help is frequently noted in online interactions. In addition, previous qualitative studies have identified that individuals with SSNHL exhibit ambivalence and denial during early stages of their condition and seek information and advice via various sources. However, once they accept the condition, they look for solutions to life adjustments as noted in this study.<sup>9</sup>

The natural language analysis using automated text analysis method is a quick and powerful way to examine open-text data such as social media posts. The linguistic analysis showed that Reddit posts about SSNHL had significantly lower positive emotions and significantly higher negative emotions when compared to baseline data, which may be a result of users describing their frightening symptoms and disturbing experiences.<sup>2</sup> Moreover, it is also interesting to note that SSNHL posts had higher references to their body, health, and hearing when compared to baseline data. They also had fewer content categories (i.e., diagnosis, treatment, prognosis) suggesting that users are probably describing their condition with the intent of seeking medical information rather than seeking social support. Moreover, based on the user category analysis, it is evident that individuals with SSNHL tend to talk more about their body and less about social processes



when compared to other users. Again, these observations strengthen the argument that individuals are sharing and/or seeking medical information on social media. Overall, these results suggest that people with SSNHL may experience psychological disturbances as a result of their condition which can be identified through examination of natural language of these individuals. Moreover, healthcare professionals may gain valuable insights about patients' point of view by examining social media posts about health conditions.

### **Study Implications**

Examining the social media posts about traumatic health conditions such as SSNHL may provide insights about this population, helpful in supplementing clinical studies. This is because, the structured patient-reported outcome measures (PROM) used in clinical examination are often developed by healthcare professionals and may not cover aspects that are relevant to individual patients. However, open-text responses provided by patients, especially anonymously as in reddit posts, may contain information that is most relevant to their experience. For this reason, we believe that the current study results provide insights that can be helpful for professionals during clinical interactions, as well as when building successful online interventions to support individuals with abrupt onset conditions such as SSNHL.

### **Advantages and Limitations of the Study**

To the knowledge of the authors, the present study is the first to examine social media content on SSNHL. The anonymous nature of Reddit discussions may provide a more ecologically valid discussion about the condition. However, this is also a limitation of the study, as not knowing the user demographic limits the generalizability of the findings. Moreover, word counting

approaches such as LIWC may ignore factors like context and intended audience, although they are shown to provide surprisingly clear insights into a person's psychology.<sup>10</sup>

## **Conflict of Interest**

None to declare.

## **Data Sharing**

The data that support the findings of this study are available from the corresponding author upon reasonable request.

## **Author Contributions**

VM conceived the study, analyzed the data and prepared the manuscript. RB helped with data extraction. AD, MH and RB provided comments to the study design and helped with revision of the manuscript. All authors edited the manuscript and approved the final version.

## **References**

1. Kuhn M, Heman-Ackah SE, Shaikh JA, Roehm PC. Sudden sensorineural hearing loss: a review of diagnosis, treatment, and prognosis. *Trends in Amplif* 2013;**15**:91–105.
2. Chandrasekhar SS, Tsai Do BS, Schwartz SR, Bontempo LJ, Faucett EA, Finestone SA, et al. Clinical practice guideline: Sudden hearing loss (Update). *Otolaryngol Head Neck Surg* 2019;**161**:S1–S45.
3. Deshpande AK, Deshpande SB, O'Brien C. A study of social media utilization by individuals with tinnitus. *Am J Audiol* 2018;**27**:559-69.

4. Westerman D, Spence PR, van Der Heide B. Social media as information source: Recency of updates and credibility of information. *J Comput-Mediat Commun* 2014;**19**: 171-83.
5. Tausczik YR, Pennebaker JW. The psychological meaning of words: LIWC and computerized text analysis methods. *J Lang Social Psychol* 2010;**29**:24–54.
6. Eysenbach G, Till JE. Ethical issues in qualitative research on internet communities. *BMJ* 2001;**323**:1103-05.
7. Pennebaker JW, Boyd RL, Jordan K, Blackburn K. *The development and psychometric properties of LIWC2015*. Austin: University of Texas at Austin, 2015.
8. Silveira Fraga B, Couto da Silva AP, Murai F. Online social networks in health care: A study of mental disorders on Reddit. *2018 IEEE/WIC/ACM International Conference on Web Intelligence (WI)*, Santiago (Chile) 2018:568-73.
9. Manchaiah VKC, Stephens D. The 'patient journey' of adults with sudden-onset acquired hearing impairment: a pilot study. *J Laryngol Otol* 2012;**126**:475–81.
10. Boyd RL. Psychological text analysis in the digital humanities. In: Hai-Jew S. ed. *Data analytics in digital humanities. Multimedia systems and applications*. Cham: Springer, 2017;161-89.

## Tables

**Table 1: Content analysis of Reddit posts on sudden sensorineural hearing loss**

Category	Frequency: % (n)	Example (Verbatim)
Personal experiences	34.2 (180)	I just recently got diagnosed with SSNHL on the left ear (you never know about it until it you get it), and I feel pretty bummed. The first and the second doctor that I went to both said partial recovery with treatment is possible (I'm taking corticoids and anti-inflammatories), but they couldn't give me concrete examples of recovery.
Symptoms	30.8 (162)	I have been getting vertigo recently last couple months. I didn't even think about that.
Causes	19 (100)	I was told vertigo can cause seeming hearing loss. Something to do with the equilibrium.
Diagnosis	4.4 (23)	I just got back from the doctors. And they are sending me to yet another doctor. But the hearing test was better today. mild to severe hearing loss in my left ear and just mild hearing loss in my right. and Meniere's is still suspected.
Treatment	36.1 (190)	I already take a diuretic. And allergy meds. I need to go back for further testing to confirm it. Before they decide to give me steroids.

Prognosis	9.5 (50)	Temporary hearing loss occurs for a short period of time and then revert back to normal. If not taken care in early stages it can become worse and lead to permanent hearing loss. Proper treatment and medication is needed.
Seeking information and/or advice	13.1 (69)	I was just wondering if anyone has ever had experience with this? I still don't have my hearing back and there's still ringing in my ear. I'm so perplexed by this as well as many people around me since it happened so suddenly and I'm also very young (23f).
Providing information and/or advice	12 (63)	I'd recommend getting a white noise maker or having some sort of general noise going on in the background. The ringing absolutely feels worse when it's quiet, because it's so much more noticeable. If you have noises going on in the background, it'll be a little easier to deal with. Do your best to just keep your mind off the ringing - if you let it settle into background noise (easier said than done lol), it'll be less noticeable and less annoying.

Note: Each post may have commented on multiple elements. The table presents how many posts of the 526 posts had content in these categories.

**Table 2: Mean and Standard Deviation (SD) of linguistic variables in SSNHL Reddit posts and Reddit baseline data.**

<b>Dimension and its description</b>	<b>Reddit baseline: Mean (SD)</b>	<b>Reddit SSNHL: Mean (SD)</b>	<b><i>t</i>-test results: <i>t</i>-value, <i>p</i>-value</b>	<b>Effect size: Cohen's D</b>
<b>Engagement and authenticity</b>				
<b>Word count:</b> The degree to which users engage in the topic by providing descriptions of their views and experiences.	35.2 (55.9)	102.2 (122.6)	12.5, <0.001	0.7
<b>I-words:</b> I-words (I, me, my) are used when people are looking inward and being self-reflective, and correlate with honesty, anxiety, and self-consciousness.	5.15 (6.2)	6.26 (4.8)	5.6, <0.001	0.2
<b>Authenticity:</b> An algorithm based on a series of deception studies, and correlates with the language of telling the truth.	47.4 (38.2)	65.3 (33.9)	12.1, <0.001	0.49
<b>Social and emotional dimensions</b>				
<b>Social processes:</b> The degree to which users are thinking about the social connections and talking about other people.	10 (9.2)	8.2 (5.8)	-7.16, <0.001	0.23

<b>Positive emotions:</b> The degree to which people express positive emotions.	3.7 (5.7)	2.7 (2.9)	-7.96, <0.001	0.22
<b>Negative emotions:</b> The degree to which people express negative emotions.	1.7 (4.9)	3.0 (2.7)	10.8, <0.001	0.33
<b>Cognitive dimensions</b>				
<b>Cognitive processes:</b> The degree to which users rely on cognitive terms (e.g., think, understand, because) to work through or convey their opinions.	12.8 (9.6)	13.7 (6.0)	3.49, 0.001	0.11
<b>Analytical thinking:</b> The degree to which users think about the topic in a detached professional way.	48.7 (34.7)	44.8 (27.4)	-3.25, 0.001	0.12
<b>Biological and perceptual dimensions</b>				
<b>Body:</b> The degree to which users talk about their body.	1.1 (3.2)	1.7 (2.0)	6.2, <0.001	0.22
<b>Health:</b> The degree to which users talk about their health.	0.68 (0.24)	2.3 (2.8)	13.4, <0.001	0.81
<b>Hearing:</b> The degree to which users talk about their hearing.	0.84 (2.7)	4.9 (3.7)	25.2, <0.001	1.54

**Table 3: Linguistic analysis across user categories**

Linguistic variable	User category		<i>t</i> -test results: <i>t</i> -value, <i>p</i> -value	Effect size: Cohen's <i>D</i>
	SSNHL ( <i>n</i> =329)	Others ( <i>n</i> =197)		
Word count	121.7	69.6	4.8, <0.001	0.46
I-words	8.5	2.47	17.4, <0.001	1.59
Authenticity	80.3	40.3	15.9, <0.001	1.38
Social processes	6.5	10.9	-9.2, <0.001	0.75
Positive emotions	2.8	2.4	1.6, 0.11	0.1
Negative emotions	3.1	2.9	0.53, 0.59	0.07
Cognitive processes	13.7	13.8	-0.17, 0.87	0.002
Analytical thinking	41.4	50.9	-3.98, <0.001	0.35
Body	1.87	1.27	3.3, 0.001	0.3
Health	2.3	2.4	-0.7, 0.48	0.03
Hearing	4.8	4.9	-0.33, 0.74	0.03



## Bullet Point Summary

- Many patients with SSNHL may seek hearing health information and social support online via various websites or social media platforms, due to the ease of access to information. However, little is known about the online health information seeking behavior.
- The content analysis identified eight main categories. Most of the posts were on topics of sharing personal experiences (34%), describing symptoms (31%), discussing treatment options (36%), and possible causes (19%) of SSNHL.
- The SSNHL Reddit posts varied significantly in linguistic variables when compared to baseline Reddit posts. For example, those who provided SSNHL posts were more engaged and authentic, exhibited higher negative emotions, but had significantly lower social processes when compared to baseline posts.
- Analysis of SSNHL Reddit posts across user categories (i.e., individuals with SSNHL versus others) suggested that individuals with SSNHL had significantly higher engagement, higher authenticity, and talked more about their body when compared to other users.
- Conversely, individuals with SSNHL had significantly lower references to others (i.e., social processes) and exhibited less analytical thinking when compared to others.