


Artificial Intelligence-Based Sentiment Analysis and Qualitative Analysis of Turkish X Posts about Down syndrome

Down Sendromuna Yönelik Türkçe X İletilerinin Yapay Zekâya Dayalı Duygu Çözümlemesi ve Niteliksel Olarak İncelenmesi

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ABSTRACT

Objective: This study aims to analyze Turkish X messages about Down syndrome with AI-based sentiment analysis and qualitative analysis.

Method: The design of the study was mixed method. Using the criterion sampling technique, the sample of the study consists of 73,840 posts searched with the hashtag "Down syndrome". Data extracted using Tweepy Package and feature extraction was performed using BERT method. Sentiment analysis was classified with artificial neural networks. The 738 posts with the most likes and shares analyzed according to Colaizzi's phenomenological analysis steps.

Results: Among the Turkish messages about Down syndrome, 30.23% were negative, 39.87% were neutral and 29.90% were positive. The findings obtained from Turkish X messages about Down syndrome were grouped under four themes: 'Social Stigmatisation', 'Awareness and Support', 'Representation in Media' and 'Supportive and Solidarity-Oriented Posts on Social Media'.

Conclusion: Approximately one-third of the Turkish messages about Down syndrome analyzed with artificial intelligence-based sentiment analysis contain negative sentiments. In addition, Down syndrome perceived as a disease rather than a genetic disorder and individuals identified with stereotypical identities such as "happy" or "angel". The term "Down syndrome" continues to be used as an insult and individuals discriminate against people with Down syndrome. While their participation in daily life portrayed as extraordinary in the media, awareness and support content appears on social media and families share stories about their experiences. Non-governmental organizations emphasize that Down syndrome is a genetic difference and success stories support social participation. In addition, the social media solidarity network makes the demands for rights visible.

Keywords: Down syndrome, natural language processing, machine learning, social media, social stigmatization

ÖZ

Amaç: Bu çalışmada Down sendromuna yönelik Türkçe X iletilerinin yapay zekâya dayalı duygu çözümlemesi ve niteliksel olarak incelenmesi amaçlanmıştır.

Yöntem: Çalışmanın tasarımı karma yöntemdir. Ölçüt örnekleme tekniği kullanılan araştırmanın örneklemini "Down sendromu" anahtar kelimesiyle taranan 73.840 gönderi oluşturmuştur. Veriler Tweepy Paketi kullanılarak elde edilmiş olup BERT yöntemi kullanılarak özellik çıkarımı gerçekleştirilmiştir. Duygu analizi yapay sinir ağlarıyla sınıflandırılmıştır. En fazla beğeni ve paylaşım alan 738 gönderi Colaizzi'nin fenomenolojik analiz basamaklarına göre analiz edilmiştir.

Bulgular: Down sendromu ile ilgili paylaşılan Türkçe iletilerin %30.23'ünün olumsuz, %39.87'sinin nötr ve %29.90'ının olumlu duygular içerdiği belirlenmiştir. Down sendromuna yönelik Türkçe X iletilerinden elde edilen bulgular "Sosyal Damgalama", "Farkındalık ve Destek", "Medyada Temsilîyet" ve "Sosyal Medyada Destekleyici ve Dayanışmacı Paylaşımlar" olmak üzere dört tema altında toplanmıştır.

Sonuç: Bu çalışmada yapay zekâ temelli duygu çözümlemesi ile incelenen Down sendromuyla ilgili Türkçe iletilerin yaklaşık üçte birinin olumsuz duygular içerdiği saptanmıştır. Ayrıca, Down sendromu, genetik bir bozukluk yerine hastalık olarak algılanmakta ve bireyler "mutlu" ya da "melek" gibi kalıplaşmış kimliklerle tanımlanmaktadır. "Down sendromlu" ifadesi hakaret amaçlı kullanılmakta, bu bireyler ayrımcılığa uğramaktadır. Medyada gündelik yaşama katılımları olağanüstü gösterilirken, sosyal medyada farkındalık ve destek içeriği bulunmakta, aileler deneyim paylaşmaktadır. Sivil toplum kuruluşları Down sendromunu genetik bir farklılık olarak vurgulamakta, başarı öyküleri toplumsal katılımı desteklemektedir. Ayrıca, sosyal medyada oluşturulan dayanışma ağı hak taleplerini görünür kılmaktadır.

Anahtar sözcükler: Down sendromu, doğal dil işleme, makine öğrenmesi, sosyal medya, sosyal damgalama

Introduction

Down syndrome is a genetic variation caused by the presence of 47 chromosomes and is one of the most common syndromes observed worldwide (Antonarakis et al. 2020). Individuals with this syndrome may exhibit certain differences in their physical, cognitive, and social development; however, with appropriate education, social support, and healthcare services, their quality of life can be significantly improved (de Graaf et al. 2021). In recent years, the shifting perception of disability in society, the growing prevalence of social awareness

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campaigns, and increased support for the active participation of individuals with Down syndrome in social life have heightened the importance of research in this field. Social media—particularly platforms such as X—has become an important source of data for raising awareness about disability and genetic differences, sharing experiences, and observing societal attitudes (Tremain 2022). However, social media platforms are not limited to informative and supportive messages; they can also serve as spaces where stigmatization, prejudice, and discriminatory discourse may proliferate (Goggin and Newell 2020). In this context, the content analysis of social media posts related to Down syndrome stands out as a valuable research avenue for understanding general public attitudes and monitoring the evolution of perceptions regarding disability.

In particular, artificial intelligence-based sentiment analysis techniques enable the systematic classification of social media content and the identification of societal trends across large datasets (Feldman 2013). Accordingly, the evaluation of Turkish X posts related to Down syndrome through sentiment and thematic analysis may help fill a significant gap in the existing literature. In the literature, some studies have shown that social media analyses related to Down syndrome have predominantly been conducted using English-language content (Sani-Bozkurt 2018, Rogers and Ziviani 2022). For instance, a study examining the sentiment analysis of social media content shared during World Down Syndrome Day events found that 4.06% of the words in tweets expressed positive emotions, while 0.94% conveyed negative emotions (Sani-Bozkurt 2018). However, no prior study has been identified that examines the content of Turkish social media posts regarding Down syndrome. However, both national and international literature includes studies that conduct sentiment analysis of Twitter posts related to individuals diagnosed with dementia, schizophrenia, autism, and those who identify as Lesbian, Gay, Bisexual, Transgender, Queer or Questioning, Intersex, Asexual, and other (LGBTQIA+) identities (e.g., Budenz et al. 2020, Pavlova and Berkers 2020, Dikeç et al. 2023, Doğan et al. 2023, Göksel et al. 2023, Cho et al. 2024). Moreover, previous studies have mostly been limited to qualitative analysis methods based on individual interviews, and the potential of AI-supported sentiment analysis to systematically evaluate such content has been explored only to a limited extent (Rooney 2014, Alhaddad et al. 2018).

In line with this background, the aim of the present study is to perform an artificial intelligence-based sentiment analysis and a qualitative examination of Turkish posts on X (formerly Twitter) concerning Down syndrome. The study aims to reveal societal emotional attitudes and perceptions toward Down syndrome as reflected in Turkish X posts through AI-assisted sentiment analysis. The findings of this study will provide data that enhance public awareness, reduce prejudice, and identify areas where positive attitudes prevail, thereby guiding policymakers, educators, and healthcare professionals in developing targeted intervention strategies. The outcomes of the research will offer a scientifically grounded basis for increasing awareness, promoting inclusivity, and eliminating negative stereotypes. Accordingly, the research seeks to answer the following questions: (1) What is the distribution of sentiments in Turkish X posts related to Down syndrome based on AI-supported sentiment analysis? (2) What themes emerge from the qualitative analysis of these posts?

Method

During the writing process of this study, the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline (Vandenbroucke et al. 2014) was followed for the reporting of quantitative data, while the Consolidated Criteria for Reporting Qualitative Research (COREQ) guideline (Tong et al. 2007) was adopted for the reporting of qualitative data. These guidelines were utilized to ensure a systematic and transparent presentation of the study.

Type of the Study

This study employed a mixed-methods design. In the first phase of the study, a quantitative descriptive research design was used. In the second phase, a qualitative descriptive phenomenological design was adopted. A convergent (integrative) design was used to guide the data collection and analysis processes. The findings and discussion sections were reported in an integrated manner, combining results from both methodological strands (Fetters et al. 2013, Creswell and Plano Clark 2017). The descriptive phenomenological design, grounded in qualitative methodology, aims to understand individuals' lived experiences, perceptions, and interpretations in depth. This approach focuses on capturing participants' subjective experiences of a specific phenomenon directly and as authentically as possible. Based on the philosophical foundations of Edmund Husserl, this design requires the researcher to adopt a nonjudgmental and unbiased stance, aiming to describe participants' experiences as objectively as possible (Husserl 1960, Creswell 2020, Kurtgöz and Genç 2024). The rationale for selecting a descriptive phenomenological research design lies in the study's objective to qualitatively examine the content of Turkish X posts related to Down syndrome.

Sample

In the quantitative component of the study, which included sentiment analysis, the population consisted of Turkish-language posts shared on the X platform during a four-week period between April 1 and April 30 2024. The sample comprised a total of 73,840 unique, non-reposted posts retrieved using the keyword “Down syndrome” within the specified date range, excluding duplicates. For the qualitative data analysis, 738 posts—representing 1% of the total dataset and consisting of those with the highest number of likes, shares, and reach—were selected for thematic analysis. In the analysis of the qualitative data, the criterion sampling method, one of the purposive sampling techniques, was employed. The sample size was determined based on data saturation, and the analysis was concluded when repetition in the data was observed (Polit and Beck 2006).

Ethical Considerations

As this study is based on the analysis of publicly available posts shared on the X platform, no ethics committee approval or institutional permission was required. The study involves only publicly accessible social media data and does not include direct data collection from individuals or any form of intervention; therefore, ethical approval was not required. Similarly, since social media is a public platform and the content analyzed consists of voluntarily shared posts, no institutional permission was deemed necessary. The study was conducted in accordance with the Personal Data Protection Law (2016) and the Ethical Guidelines for Internet Research (Franzke et al. 2021). Personal identifiers were protected, and particular attention was paid to ensuring anonymity. Names of individuals, usernames, names of institutions or organizations, hashtags, mentions, and website links (URLs) included in the posts were removed from the dataset. The posts selected for qualitative analysis were identified among those that received the highest engagement (likes and shares), and this selection process was conducted by an independent academic who was not directly involved in the study process. The columns containing users' names were completely removed to ensure the protection of personal identities. Proper names and institutional titles mentioned in the text were coded with initials to maintain anonymity. Accordingly, the research was conducted in line with principles of public data use, ethical standards, and confidentiality, and it adhered to widely accepted methods in social media analysis.

Study Team and Reflexivity

The researcher is a faculty member in the Department of Psychology at a Faculty of Science and Letters. They are trained and experienced in both qualitative and quantitative research methods. The researcher who conducted the analysis has completed training in cognitive behavioral therapy and actively conducts studies in the field of developmental psychology. Although the researcher had previously observed posts related to Down syndrome on the X platform, an AI-assisted sentiment analysis approach was adopted during the study to ensure an impartial analytical perspective. The researcher first evaluated the results obtained from the AI-assisted sentiment analysis to minimize the influence of subjective interpretation and then followed a systematic coding process during the qualitative content analysis (Tong et al. 2007).

Trustworthiness

The trustworthiness of this study was ensured through four key criteria: credibility, transferability, dependability, and confirmability (Lincoln and Guba 1985). Credibility was established through the systematic analysis of the data. For sentiment analysis, the AI-based BERTurk model and a Multilayer Perceptron (MLP) were employed, while in the qualitative phase, coding and theme development were carried out using the MAXQDA 20.0 software. In addition, the phenomenon was described in detail, and findings were compared with those of previous research. Transferability was ensured by clearly and thoroughly presenting the research context, data collection procedures, and stages of analysis. The criteria for selecting posts from the X platform and the procedures followed in their analysis are detailed in the study, along with an explanation of the criterion sampling method employed for participant selection. Dependability was ensured by adopting a systematic and transparent approach during the data analysis phase of the study. All data collection tools, raw data, AI models used for sentiment analysis, and coding procedures employed during the qualitative analysis phase were thoroughly documented. As the study was conducted by a single researcher, systematic coding methods were applied and the analysis process was detailed step by step to minimize subjectivity. Confirmability was achieved through reflective evaluations during the research process and by employing AI-assisted methods to enhance the objectivity of the analyses. To increase the transparency of the study, a systematic approach was adopted throughout the data processing, analysis, and interpretation of findings. The findings were validated by

comparing them with the general discourse observed in the analyzed posts, ensuring the consistency of the qualitative analysis.

Strengths and Limitations

One of the strengths of this study is its comprehensive examination of posts related to Down syndrome on the X platform through both AI-supported sentiment analysis and qualitative content analysis. The study, conducted on a large-scale dataset, offers a broad perspective for identifying general societal attitudes and discourses toward Down syndrome. The use of artificial intelligence techniques—specifically the BERTurk model and multilayer artificial neural networks—for sentiment analysis ensured a high level of accuracy and objectivity in emotion classification. Additionally, the use of MAXQDA 20.0 software during the qualitative analysis facilitated the systematic coding of data and the detailed identification of themes. However, the study also has certain limitations. Since the study was carried out by a single researcher, intercoder reliability could not be established, which may pose a risk of increasing the influence of subjective interpretation during the qualitative analysis phase. Nevertheless, to minimize this limitation, a systematic approach was adopted during the identification and interpretation of themes, and AI-assisted analyses were employed to enhance objectivity. Another limitation of the study is that the analysis was confined to posts obtained solely from the X platform, and therefore does not include data from other social media platforms or different types of media. Therefore, the findings of the present study should be interpreted within the context of the X platform only, and caution should be exercised when making generalizations. Moreover, the analyzed posts are based on users' public content, which may not fully reflect their private views or attitudes expressed in other contexts. Finally, this study is qualitative in nature, and the sample was selected using the criterion sampling method. Although this approach enabled the attainment of data saturation, it does not encompass all posts related to Down syndrome. However, focusing on the most highly engaged posts provided a significant advantage in identifying the most common and influential discourses within the society.

Data analysis

The data for this research were collected from the X platform between April 1 and April 30 2024, using the Tweepy package, an AI-based data collection tool (Roesslein 2009). The final data retrieval was completed on April 30 2024. During the sentiment analysis process, Natural Language Processing (NLP) techniques were employed to extract features from the posts, specifically utilizing the Bidirectional Encoder Representations from Transformers (BERT) method (Search Engine Land 2019). BERT (Bidirectional Encoder Representations from Transformers), a state-of-the-art method developed by Google, is widely used in text processing across various languages. In this study, the BERTurk model, which was specifically trained for Turkish texts, was utilized (Schweter 2020). For the classification of the data, the Multilayer Perceptron (MLP) method—an advanced form of Artificial Neural Networks (ANN)—was used. This model is frequently employed in the field of mental health and has proven effective in text-based sentiment analysis tasks. Feature extraction and classification techniques were integrated and applied at different stages of the analysis process.

Statistical Analysis

The data were analyzed using the MAXQDA 20.0 software package, and the analysis was guided by Colaizzi's (1978) phenomenological method. Initially, the posts shared on the X platform were read repeatedly to identify the emotions and meanings conveyed in posts related to Down syndrome. Key statements directly related to the topic were identified, and these statements were examined in detail to formulate meanings. The formulated meanings were then grouped into specific themes, sub-themes, and codes. Following this step, the results were synthesized within the content context to conduct a more comprehensive analysis. After defining the conceptual framework of the research topic, the most frequently shared and highly engaged posts were reviewed to enhance the accuracy of the findings. The emerging themes were then validated by comparing them with the general content of the posts. This process enhanced the trustworthiness of the study and ensured that the qualitative data were analyzed in a systematic and rigorous manner.

Results

AI-Based Sentiment Analysis

Over the course of one month in Türkiye, a total of 184,600 posts related to Down syndrome were shared on the

X platform. Among these, 73,840 were original posts 110,760 were reposts, and the posts received a total of 688,578 likes. According to the sentiment analysis, 30.23% of the posts expressed negative emotions ($n = 22,321$), 39.87% were neutral ($n = 29,439$), and 29.90% conveyed positive emotions ($n = 22,077$).

Qualitative Examination of Turkish X Posts Related to Down Syndrome

The qualitative analysis of Turkish posts on Down syndrome revealed four main themes: “Social Stigmatization,” “Awareness and Support,” “Representation in the Media,” and “Supportive and Solidarity-Oriented Posts on Social Media.”

Social Stigmatization

The Social Stigmatization theme was divided into three sub-themes: Negative Discourse and Prejudices, Insults and Diminishment, and Discrimination and Exclusion.

Negative Discourse and Prejudices

In the analyzed posts, users were found to express negative remarks about individuals with Down syndrome. These included misinformed statements such as the belief that individuals with Down syndrome are “*always happy and incapable of experiencing other emotions*,” or the misconception that “*Down syndrome is a disease rather than a genetic condition*.” Prejudices such as “*they cannot be successful in academic life*” were frequently encountered. Stereotypical views were also identified, such as referring to all individuals with Down syndrome as “angels” and assuming they share the same personality traits, or the belief that “*Down syndrome is always hereditary and will be present in every child*.”

“I had heard that these children are always happy and never get upset. Isn’t that true?”

“Can Down syndrome be cured? Isn’t there a treatment for it?”

“How can someone with Down syndrome go to university— is that really possible?”

“People with Down syndrome are always like angels, very sweet, but they live a difficult life.”

“Please don’t ask my mother if the other sibling also has Down syndrome.”

Insults and Diminishment

In the analyzed posts, the term “Down syndrome” was found to be used with derogatory, mocking, or belittling intent. Users were observed to frame Down syndrome as a means of insult, thereby reinforcing negative perceptions toward individuals with the condition.

“*What kind of behavior is that? Are you Down or something?*” (post created using a video of someone perceived to be behaving unusually in public)

“*Stop acting stupid, you look like someone with Down syndrome.*” (comment posted under a video of someone dancing)

“*You look like you have Down syndrome when you pose like that.*” (caption written over a photo of a young girl posing)

Discrimination and Exclusion

The analyzed posts revealed instances of discrimination faced by individuals with Down syndrome in areas such as education, employment, social life, and even the right to life. These individuals were reported to encounter difficulties in accessing their right to education, to be excluded from social activities, and to face inequalities in professional opportunities. Due to prevailing societal prejudices, individuals with Down syndrome were often not recognized as individuals with equal rights, leading to social exclusion and, in some cases, even the questioning of their fundamental right to life.

“*We went to register for school, but the principal didn’t want to accept [our child], saying ‘there might be an adaptation issue in the classroom.’ Isn’t education a right for everyone?*”

“*Students with Down syndrome are excluded from school activities. They should be able to participate in social events just like everyone else!*”

“*They invited us for a job interview, but when they found out the applicant had Down syndrome, they said, ‘It’s not a good fit for us.’ Is that what equal opportunity looks like?*”

"As far as I know, it can be detected during pregnancy—so why do they decide to give birth?"

Awareness and Support

The Awareness and Support theme was categorized into three sub-themes: positive experiences of families and individuals, posts shared by non-governmental organizations and associations, and educational and informational content.

Positive Experiences of Families and Individuals

The analyzed posts revealed that individuals with Down syndrome and their families shared their positive life experiences. These posts not only contribute to breaking down societal prejudices but also highlight how individuals with Down syndrome overcome challenges in education, communication, and employment.

"When my daughter started primary school, some parents said she would lower the class standard. Today, she learned to read and write—and received an award from her teacher!"

"Some people said my son would never be able to speak. Now he sings his favorite song and moves us to tears."

"Today, my son received his first paycheck. He hugged us and said, 'I work too.' His pride was worth everything."

"My graduation ceremony—my mother was in tears."

Posts by Non-Governmental Organizations and Associations

The analyzed posts revealed that positive experiences of individuals with Down syndrome and their families were frequently shared. It was observed that families shared their children's progress in education, communication, and professional life, often accompanied by individual success stories.

"Let's stand together to ensure greater inclusion of individuals with Down syndrome in society!"

"Our differences make us unique! Wear your socks inside out to raise awareness for equal rights for individuals with Down syndrome!"

"What defines a person's success is not the number of chromosomes, but the opportunities they are given. Let's unite for a more inclusive world!"

"Would you like to help a child achieve their dreams? Join our volunteer program and make a difference!"

Educational and Informative Content

The analyzed posts demonstrated efforts to disseminate accurate information about Down syndrome. These posts addressed topics such as the genetic nature of Down syndrome, the importance of individualized educational support, and the need for an inclusive societal approach.

"Down syndrome is not a disease—it's a genetic difference! While most people have 46 chromosomes, individuals with Down syndrome have 47."

"Special education support and individualized learning methods make a significant difference in the development of children with Down syndrome. We are working to ensure equal opportunities in education!"

"The most important advice for families : Don't limit your child's potential! Believe in them and support them in discovering their talents."

"When you see someone with Down syndrome on a bus, at work, or at school, don't look at them with pity. Approach them with love and equality."

Representation in the Media

The Representation in the Media theme was divided into two sub-themes: Use of Negative and Discriminatory Language and Success Stories.

Use of Negative and Discriminatory Language

Some of the analyzed posts were found to originate from news content. In certain news reports, the achievements of individuals with Down syndrome were highlighted; however, these accomplishments were often portrayed as extraordinary or unexpected events. It has also been observed that some news articles emphasize the participation of individuals with Down syndrome in daily activities such as education, social life, or religious practices, and that such involvement is often described as 'different' or 'special'. In some news

reports, Down syndrome was mentioned in conjunction with negative events, with an emphasis placed on the individual's diagnosis. Additionally, it was observed that news stories often highlighted a "special" or "different" approach toward individuals with Down syndrome in the context of providing supportive services, and such expressions were frequently repeated throughout the reports.

"Young individual with Down syndrome achieves major success!"

"New education center opened for special needs children."

"In [location], a child with Down syndrome, aged X, threw a neighbor's baby out of the window. The baby did not survive."

"X, who attends five daily prayers at the mosque with his grandfather, is greatly loved by the local congregation."

Success Stories

The analyzed posts revealed that stories of individuals with Down syndrome who achieved success in fields such as sports and business were frequently shared. These posts highlighted that individuals with Down syndrome were actively participating in various domains and achieving both national and international successes.

"Ellie Goldstein: The first model with Down syndrome."

"The national Down syndrome judo and athletics team became world champions."

Supportive and Solidarity-Oriented Posts on Social Media

The Supportive and Solidarity-Oriented Posts on Social Media theme was divided into two sub-themes: Family Solidarity and Demand for Rights and Inclusion.

Family Solidarity

The analyzed posts revealed that families of individuals with Down syndrome came together to share their experiences and formed support groups. Moreover, the posts revealed that families communicate with one another and share experiences related to their children's lives.

"Children with Down syndrome and their mothers participated together in the event organized by the X association."

"Mothers of children with Down syndrome were brought together by teachers."

Demand for Rights and Inclusion

The analyzed posts revealed that individuals with Down syndrome and their families shared content aimed at raising awareness about disability rights. These posts emphasized topics such as the full and equal participation of individuals with Down syndrome in society, recognition of their roles as productive members of the community, and the correction of widespread misconceptions.

"Who says they move slowly or have weak muscles? Getting the right education is just as important for us as it is for anyone else." (post by a child with Down syndrome sharing a dance video)

"We are productive members of society too."

"We aspire to be honest and hardworking individuals."

"Every child learns at their own pace. As families and teachers, we must accompany them on their journey with patience."

Discussion

By conducting an AI-based sentiment analysis and qualitative examination of Turkish posts related to Down syndrome, this study offers a unique contribution to the literature within the context of mental health and societal perception. It also provides a comparative perspective with research on Down syndrome and other mental disorders. The present study found that approximately 30% of Turkish posts shared on the X platform expressed negative sentiments, while another 30% conveyed positive sentiments. For instance, a study examining the sentiment analysis of social media content shared during World Down Syndrome Day events found that 4.06% of the words in tweets expressed positive emotions, while 0.94% conveyed negative emotions (Sani-Bozkurt 2018). Outside of the present study, no research has been identified in the literature that directly

focuses on sentiment analysis of posts created by individuals with Down syndrome. Existing literature includes sentiment analysis studies based on Twitter posts related to individuals diagnosed with dementia, schizophrenia, autism, and those identifying as LGBTQIA+ (Budenz et al. 2020, Pavlova and Berkers 2020, Dikeç et al. 2023, Doğan et al. 2023, Göksel et al. 2023, Cho et al. 2024). According to the findings of a study by Cho et al. (2024), which examined the sentiment analysis of English-language tweets related to dementia, 55.12% of user-generated tweets were reported to be entirely or predominantly negative. In studies conducted in Türkiye, the proportion of negative sentiments was found to be 63.4% for schizophrenia 14.7% for Autism Spectrum Disorder, and 69.5% regarding anti-LGBTI+ hate speech (Dikeç et al. 2023, Doğan et al. 2023, Göksel et al. 2023). The findings of the present study indicate that societal perceptions of Down syndrome exhibit a dual structure. The fact that approximately 30% of the posts expressed positive emotions while another 30% conveyed negative sentiments suggests that both supportive and discriminatory attitudes are widespread within society. Indeed, the qualitative findings of this study, which revealed both supportive and discriminatory approaches, reinforce this conclusion. The presence of positive sentiments may reflect an increased awareness and strengthened societal support for individuals with Down syndrome and their families. However, the comparable proportion of negative sentiments highlights that stigmatization, discrimination, and misinformation about Down syndrome remain prevalent. This situation serves as an important indicator of how perceptions of disability are shaped by cultural and social factors. The relatively balanced distribution of sentiments related to Down syndrome, compared to studies concerning schizophrenia and LGBTI+ individuals, may suggest that awareness-raising initiatives and family solidarity efforts in this area have been more effective. Among the reasons for these differences, the severity of societal stigmatization, media representations, the effectiveness of awareness campaigns, and individual experiences are considered to play significant roles. Mental disorders such as schizophrenia are frequently associated with violence and crime in the media, while LGBTI+ individuals are more often targeted through political and religious discourses (Dikeç et al. 2023, Doğan et al. 2023). In contrast, Down syndrome, as a condition known from birth and typically surrounded by strong family support, may have achieved greater acceptance within society. The largely neutral sentiment observed in posts related to autism suggests that the topic is often addressed within an informational framework rather than through emotionally charged discourse.

The analyzed posts further revealed that Down syndrome is commonly perceived as a disease rather than a genetic condition, and that individuals with Down syndrome are frequently reduced to singular identities, such as being “always happy” or “angelic.” These findings indicate that such misconceptions remain widespread in public perceptions. The findings revealed that the term “Down syndrome” was used as an insult and that individuals with Down syndrome experienced discrimination not only in the media but also in areas such as education, employment, social life, and the right to life. It was also observed that the media often portrayed the participation of individuals with Down syndrome in everyday activities as extraordinary. Consistent with the results of the present study, previous research has shown the persistence of stereotypes that depict individuals with Down syndrome as warm, friendly, affectionate, happy, and sociable (Gilmore et al. 2003, Evans and Rice 2018, Rezaee 2024). A recent study by Rodríguez et al. (2018) indicated that feelings of compassion toward individuals with Down syndrome contribute to their perception as “not sufficiently capable but good with people.” This perception was noted to increase the sense of inequality between individuals and could lead to the view that individuals with Down syndrome are “in need of help.” The study emphasized that such perceptions could negatively impact the full and equal participation of individuals with Down syndrome in society (Rodríguez et al. 2018). Similarly, the findings of a study by Johnson and West (2021) based on Facebook posts revealed that social media content often contains substantial hate speech directed toward individuals with Down syndrome and their parents. In the posts analyzed, Down syndrome was frequently perceived as a genetic “defect,” and opinions suggesting that individuals with Down syndrome should be excluded from society were commonly expressed. The same study emphasized that while some participants approached individuals with Down syndrome from a perspective of “cuteness” or as a “special gift,” such seemingly positive perceptions could also be paternalistic and contribute to othering (Johnson and West 2021). Moreover, individuals with Down syndrome have historically been perceived as deficient, problematic, aggressive, irrational, and a burden to society, and have been labeled with derogatory terms (e.g., “retarded”) (Heinemann 1990, Pary 2004). It is also well-documented that the term “Down syndrome” has been used as an insult in various ways throughout history (Edgerton 1980, Taylor 2013, Rodríguez et al. 2018). Additionally, numerous studies have reported that individuals with Down syndrome face discrimination not only in the media but also in education, employment, social life, and even with regard to their fundamental right to life (Rodríguez et al. 2018, Rodríguez Díaz 2019, Zerres et al. 2021). In a study by Pace et al. (2010), it was found that 25% of adults opposed the inclusion of individuals with Down syndrome in education, while one-third of adolescents did not want to work with them on class projects or spend time with them after school. Similarly, consistent with the findings of the present

study, a study conducted by Alhaddad et al. (2018) with a community sample in Saudi Arabia reported that 11.2% of participants stated they would not allow individuals with Down syndrome to attend their school if they were school administrators, and 69.1% indicated they would not consider employing individuals with Down syndrome if they were employers. The same study also found that 22.3% of participants did not view Down syndrome as a genetic disorder, and 33.6% believed it to be a curable disease. Additionally, 90% of the participants expressed the belief that the siblings of individuals with Down syndrome would also always have Down syndrome (Alhaddad et al. 2018). These findings can be explained in light of Werner's (2015) stigma model. According to Werner (2015), stigma is a contradictory phenomenon, wherein individuals are perceived through both positive and negative stereotypes and attitudes. Individuals with Down syndrome are simultaneously idealized and marginalized through reductive and singular identities such as being "always happy" or "angelic," while also being perceived not as having a genetic variation but as having a "disease," leading to their exclusion from social life. This dual perception manifests in various forms, from the use of the term "Down syndrome" as an insult to discrimination faced by individuals in fundamental areas such as education, employment, and the right to life. In the media, the participation of individuals with Down syndrome in everyday activities is often portrayed as extraordinary, thereby reinforcing an approach that prevents their acceptance as ordinary members of society. Werner's (2015) model illustrates how such contradictory perceptions impede the full and equal inclusion of individuals with Down syndrome in society and why breaking the cycle of stigmatization remains particularly challenging for these individuals.

In contrast, the posts examined in this study demonstrated the presence of awareness-raising efforts and supportive content regarding Down syndrome on social media. Families share their experiences by highlighting their children's progress in education and employment processes. In the content disseminated by non-governmental organizations and educational initiatives, the message that Down syndrome is not a disease but a genetic difference is frequently emphasized. Moreover, it was observed that the achievements of individuals with Down syndrome in fields such as sports and fashion were often showcased. In a study conducted by Sani-Bozkurt (2018), it was found that tweets posted on World Down Syndrome Day contained a variety of discourses. Consistent with the findings of the present study, some posts shared on March 21 were aimed at promoting a campaign, sharing a story or personal experience, or supporting/celebrating World Down Syndrome Day. Additionally, some tweets portrayed Down syndrome not as a syndrome but as something "cute," a "special gift," an "extra +1 chromosome," or associated individuals with unique talents (Sani-Bozkurt 2018). Furthermore, Dale Evans' book *Angel Unaware* is reported to have played a significant role in promoting awareness regarding the inclusion of individuals with Down syndrome and in reducing stigmatization. Following the publication of the book, it was noted that many families ceased hiding their children, and the accomplishments of individuals with Down syndrome—such as their increased participation in public events like rodeos—became more visible to society. This finding is consistent with the results of the present study, which also highlighted the achievements of individuals with Down syndrome in fields such as sports and fashion (Evans and Rice 2018).

In a different study conducted by Rooney (2014), the effects of indirect contact strategies (e.g., imagined positive interactions and positive imagery) on reducing prejudice and promoting positive attitudes toward individuals with Down syndrome were examined. Participants were presented with scenarios and images related to individuals with Down syndrome, and the impact of these experiences on their attitudes and intentions was subsequently evaluated. The study found that imagined positive interactions and positive imagery significantly reduced prejudices and increased positive attitudes as well as intentions for social interaction and providing support (Rooney 2014). Similarly, a study by Johnson and West (2021) analyzing Facebook posts revealed the emergence of counter-narratives that opposed hate speech and prejudice against individuals with Down syndrome and their parents, emphasizing the human dignity and societal contributions of individuals with Down syndrome. These resistance narratives highlighted the capacity of individuals with Down syndrome to participate in education, employment, and broader social life (Johnson and West 2021). The findings of the present study may be explained by the increased societal awareness and the effective use of digital media tools. Families' tendency to share their children's achievements in education and employment processes contributes to inspiring other individuals by sharing their experiences and hopes. The emphasis on defining Down syndrome as a genetic difference within the content disseminated by non-governmental organizations and educational initiatives also plays a role in challenging traditional prejudices. Moreover, the highlighting of successes in areas such as sports and fashion suggests that societal perceptions are evolving toward a more diverse and inclusive perspective.

It was also observed that individuals with Down syndrome and their families have formed solidarity networks through social media platforms. Moreover, families were found to engage in mutual communication by sharing their experiences, thereby fostering social connection and solidarity. In posts shared within the scope of rights

and inclusion advocacy, it was observed that the full and equal participation of individuals with Down syndrome in society was emphasized, and expressions aimed at correcting misconceptions were frequently used. The results of a study conducted to examine the role of social media content shared during World Down Syndrome Day in raising awareness, as well as to analyze the structure, content, and impact of social media interactions, reported that the majority of the shared content focused on themes of love, support, and awareness (Sani-Bozkurt 2018). The same study also highlighted that some tweets promoted a positive narrative by defining Down syndrome not as a "disease," but rather as a "special gift" or an "extra chromosome." Moreover, in the word cloud generated in the study, terms related to love/compassion, support/awareness, and stories/experiences associated with Down syndrome were found to be prominently featured (Sani-Bozkurt 2018).

Similarly, in a face-to-face study conducted in Saudi Arabia, 74.5% of participants reported that they would be willing to play a role in improving the quality of life of individuals with Down syndrome, and 59.5% stated that they would support individuals with Down syndrome in leading a normal life (Alhaddad et al. 2018). The results of a different study analyzing the online resistance that emerged on Twitter through the hashtags #worldwithoutdowns and #justaboutcoping following the documentary *A World Without Down's Syndrome?* demonstrated that social media provided a powerful platform for challenging negative narratives about Down syndrome and for promoting alternative discourses advocating for the rights of individuals with disabilities (Burch 2016). This phenomenon can be attributed to the broad interactive space that social media provides, which facilitates communication among individuals with Down syndrome and their families through the sharing of personal experiences. These platforms, where families share both the challenges they face and their success stories, strengthen mutual support and solidarity networks while also making demands for rights and inclusion more visible. Thus, efforts to break down societal prejudices and to promote the full and equal participation of individuals with Down syndrome in society are supported, and awareness aimed at correcting misconceptions is enhanced.

Conclusion

In this study, approximately 30% of the Turkish posts shared on the X platform conveyed negative sentiments, while another 30% expressed positive sentiments. The analyzed posts reveal that Down syndrome is often perceived not as a genetic variation but as a disease, and that individuals are frequently reduced to singular identities such as being "always happy" or "angelic." Additionally, the term "Down syndrome" was found to be used as an insult, and individuals with Down syndrome were observed to face discrimination in media, education, employment, social life, and even in their fundamental right to life. While the media often portrayed the participation of individuals with Down syndrome in everyday activities as extraordinary, social media platforms were found to feature awareness campaigns and supportive content about Down syndrome, with families sharing their children's progress in education and employment, thereby facilitating experience-sharing. Moreover, in the content provided by non-governmental organizations and educational initiatives, Down syndrome was emphasized as a genetic difference rather than a disease, and success stories in fields such as sports and fashion presented a positive framework supporting the active participation of individuals with Down syndrome in social life. The solidarity networks formed by individuals with Down syndrome and their families through social media have also contributed to making demands for rights and inclusion more visible.

In line with the findings of this study, it is recommended that comprehensive awareness campaigns be organized to correct widespread misconceptions about Down syndrome within society. In media and digital platforms, the active participation of individuals with Down syndrome in daily life and their success stories should be reflected in a scientifically grounded, balanced, and accurate manner. It is crucial to develop policies that enhance inclusivity in education and employment and to implement practices that promote collaboration among relevant institutions. Moreover, strengthening the solidarity networks created by families through sharing their experiences and transforming these networks into effective platforms for advocating rights and inclusion should be prioritized. Efforts should continue to emphasize that Down syndrome is a genetic difference, not a disease, and to promote sensitivity in language and expression, thereby preventing derogatory and belittling discourse. It is of great importance for media content producers to represent individuals with Down syndrome in a more balanced and inclusive manner. Policymakers should develop strategies to enhance access to education and employment opportunities for individuals with Down syndrome and promote inclusive policies. Awareness initiatives should be implemented to encourage the dissemination of supportive content on social media platforms and to reduce negative discourse. In doing so, sustainable increases in societal awareness can be achieved.

References

- Alhaddad MH, Anwer F, Basonbul RA, Butt NS, Noor MI, Malik AA (2018) Knowledge and attitude towards Down syndrome among people in Jeddah, Saudi Arabia. *Proc Shaikh Zayed Postgrad Med Inst*, 32:56-65.
- Antonarakis SE, Lyle R, Dermitzakis ET, Reymond A, Deutsch S (2020) Chromosome 21 and down syndrome: From genomics to pathophysiology. *Nat Rev Genet*, 11:885-899.
- Budenz A, Klassen A, Purtle J, Yom Tov E, Yudell M, Massey P (2020) Mental illness and bipolar disorder on twitter: Implications for stigma and social support. *J Ment Health*, 29:191-199.
- Burch L (2017) A world without down's syndrome? Online resistance on twitter: #worldwithoutdowns and #justaboutcoping. *Disabil Soc*, 32:1085-1089.
- Cho H, Kim KM, Kim JY, Youn BY (2024) Twitter discussions on #digitaldementia: Content and sentiment analysis. *J Med Internet Res*, 26:1-17.
- Colaizzi PF (1978) Psychological research as the phenomenologist views it. In: *Existential-Phenomenological Alternatives for Psychology*, (Eds RS Valle, King M):48-71. New York, Oxford University Press.
- Creswell JW (2020) Felsefi varsayımlar ve yorumlayıcı çatılar [Philosophical assumptions and interpretive frameworks]. In *Nitel araştırma yöntemleri: Beş yaklaşıma göre nitel araştırma ve araştırma deseni*, 2nd ed. (Eds Bütün M, Demir SB):15-42. Ankara, Siyasal Publisher.
- Creswell JW, Plano Clark VL (2017) *Designing and Conducting Mixed Methods Research*, 3rd ed. Thousand Oaks, Sage.
- de Graaf G, Buckley F, Skotko BG (2021) Estimation of the number of people with down syndrome in the United States. *Genet Med*, 23:629-635.
- Dikeç G, Oban V, Usta MB (2023) Şizofreniye yönelik Türkçe twitter iletilerinin nitel ve yapay zekâ temelli duygu çözümlemesi. *Turk Psikiyatri Derg*, 34:145-153.
- Doğan MB, Oban V, Dikeç G (2023) Qualitative and artificial intelligence-based sentiment analyses of anti-LGBTI+ hate speech on twitter in Turkey. *Issues Ment Health Nurs*, 44:112-120.
- Edgerton R (1980) The study of deviance: marginal man or everyman? In *The Making of Psychological Anthropology*, (Ed Spindler GD):444-476. Berkeley, University of California Press.
- Evans HH, Rice ST (2018) Angel unaware and down syndrome awareness. *Pediatrics*, 142:1-5.
- Feldman R (2013) Techniques and applications for sentiment analysis. *Commun ACM*, 56:82-89.
- Fetters MD, Curry LA, Creswell JW (2013) Achieving integration in mixed methods designs: Principles and practices. *Health Serv Res*, 48:2134-2156.
- Franzke AS, Muis I, Schäfer MT (2021) Data Ethics Decision Aid (DEDA): A dialogical framework for ethical inquiry of AI and data projects in the Netherlands. *Ethics Inf Technol*, 22:1-17.
- Gilmore L, Campbell J, Cuskelly M (2003) Developmental expectations, personality stereotypes, and attitudes towards inclusive education: Community and teacher views of Down syndrome. *Int J Disabil Dev Educ*, 50:65-76.
- Goggin G, Newell C (2020) *Disability in Australia: Exposing Social Apartheid*, 1st ed. London, Routledge.
- Göksel P, Oban V, Dikeç G, Usta MB (2023) Qualitative and artificial intelligence-based sentiment analysis of Turkish Twitter messages related to Autism Spectrum Disorders. *Cureus*, 15:1-7.
- Heinemann W (1990) Meeting the handicapped: A case of affective-cognitive inconsistency. *Eur Rev Soc Psychol*, 1:323-338.
- Husserl E (1960) *Cartesian Meditations: An Introduction to Phenomenology* (Trans Cairns D). Dordrecht, Springer.
- Johnson B, West R (2021) Ableist contours of down syndrome in Australia: Facebook attitudes towards existence and parenting of people with down syndrome. *J Sociol*, 57:286-304.
- Kurtgöz A, Genç M (2024) Spiritual care perspectives of elderly individuals with parkinson's disease and formal caregivers: A qualitative study in Turkish nursing homes. *J Relig Health*, 63:2106-2124.
- Lincoln YS, Guba EG (1985) *Naturalistic Inquiry*, 1st ed. Newbury Park, Sage.
- Pace JE, Shin M, Rasmussen SA (2010) Understanding attitudes toward people with Down syndrome. *Am J Med Genet A*, 152:2185-2192.
- Pary RJ (2004) Behavioral and psychiatric disorders in children and adolescents with Down syndrome. *Ment Health Asp Dev Disabil*, 7:69-76.
- Pavlova A, Berkers P (2022) "Mental Health" as defined by Twitter: Frames, emotions, stigma. *Health Commun*, 37:637-647.
- Polit DF, Beck CT (2006) *Essentials of Nursing Research*, 6th ed. Philadelphia, Lippincott Williams & Wilkins.
- Rezaee K (2024) You look at the face of an angel: An innovative hybrid deep learning approach for detecting Down Syndrome in children's faces through facial analysis. *J AI Data Min*, 12:287-303.
- Rodríguez Díaz B (2019) Mission impossible? Preventing discrimination on grounds of disability of fetuses with Down syndrome in Spain after the emergence of non-invasive prenatal testing. *Int J Discrim Law*, 19:178-199.
- Rodríguez ND, Mateo EA, Rodríguez VB, Rodríguez-Pérez A (2018) Intergroup trust and anxiety: The two sides of stigma towards people with Down syndrome. *An Psicol*, 34:117-122.
- Roesslein J (2009) Tweepy documentation. <http://docs.tweepy.org/en/v3.5.0/> (Accessed 01.11.2024).
- Rogers K, Ziviani J (2022) Social media representations of Down syndrome: A content analysis of Twitter discussions. *J Intellect Disabil Res*, 66:421-435.

- Rooney NM (2014) Promoting positive attitudes toward individuals with Down syndrome: The relationship between indirect contact interventions and the quality of previous contact (Honors thesis). Minnesota, Macalester College.
- Sani-Bozkurt S (2018) Identifying network structure, influencers and social mood in digital spheres: A sentiment and content analysis of Down syndrome awareness. *World J Educ Technol Curr Issues*, 10:10-19.
- Schweter S (2020) BERTurk - BERT models for Turkish (Version 1.0.0). Zenodo. Retrieved from <https://zenodo.org/record/3770924> (Accessed 30.05.2024)
- Search Engine Land (2021) BERT now used on almost every English query. <https://searchengineland.com/google-bert-used-on-almost-every-englishquery-342193> (Accessed 01.11.2024)
- Taylor DC (2013) Stigma and prejudice in the language of sickness. *Epilepsy Behav*, 27:204-205.
- Tong A, Sainsbury P, Craig J (2007) Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care*, 19:349-357.
- Tremain S (2022) Foucault and the Government of Disability, 2nd ed. Ann Arbor, University of Michigan Press.
- Vandenbroucke JP, von Elm E, Altman DG, Gøtzsche PC, Mulrow CD, Pocock SJ, Poole C, Schlesselman JJ, Egger M, STROBE Initiative (2014) Strengthening the reporting of observational studies in epidemiology (STROBE): explanation and elaboration. *Int J Surg*, 12:1500-1524.
- Werner S (2015) Public stigma in intellectual disability: do direct versus indirect questions make a difference? *J Intellect Disabil Res*, 59:958-969.
- Zerres K, Rudnik-Schöneborn S, Holzgreve W (2021) Do non-invasive prenatal tests promote discrimination against people with Down syndrome? What should be done? *J Perinat Med*, 49:965-971.

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