ARAŞTIRMA MAKALESİ / RESEARCH ARTICLE

The COVID-19 Infodemic: Misinformation About Health on Social Media in Istanbul

COVID-19 İnfodemi: İstanbul Örneklemi Kapsamında Nicel Bir Araştırma

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Abstract

Misinformation and conspiracy theories can spread as quickly as the COVID-19 pathogen itself. The infodemic, which describes false or misleading information about this recent epidemic on the internet, has become a serious problem all over the world, and has been declared as an "enemy" by the World Health Organization. In this sense, in order to combat the epidemic, it becomes important to reveal the nuances of COVID-19 related infodemic available on the internet. Particularly, internet users in Turkey are increasingly utilizing social media –a platform synonymous with misinformation– to access news coverage regarding the pandemic (World Health Organization, 2020). In this quantitative study focusing on the city of Istanbul (n=399), which is at the epicenter of the outbreak in Turkey, the social media usage of individuals, their trust in these platforms, exposure to misinformation and conspiracy theories, and fact-checking behaviors were examined. Our results indicate that participants tended to believe in misinformation and conspiracy theories rather than confirming information through fact-checking platforms. Nearly half of all participants believed at least one of four widespread conspiracy theories about the virus. Moreover, when fact-checking did identify misinformation, the participants' trust in social media showed a slight decrease. Based on these findings, our study proposes a comprehensive model for pandemic-related trust, misinformation, conspiracy theories, and fact-checking factors on digital platforms.

Keywords: Covid-19 Infodemic, Misinformation, Conspiracy Theories, Fact-Checking, Social Media

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Öz

Yaşanan COVID-19 salgını, yanlış-yalan haber ve komplo teorilerinin, salgının kendisi kadar hızlı yayılabildiğini ortaya koymuştur. İnternetteki salgın ile ilgili yalan-yanlış bilgileri tarif eden infodemi, tüm dünyada ciddi bir sorun haline gelmiş ve Dünya Sağlık Örgütü (2020) tarafından "düşman" ilan edilmiştir. Bu anlamıyla, salgın ile mücadele etmek için, internette bulunan COVID-19 ile ilgili infodeminin nüanslarını ortaya koymak önem kazanmaktadır. Türkiye'deki internet kullanıcıları, salgın ile ilgili haberlere erişmek için, yanlış bilgilerin de çokça paylaşıldığı sosyal medya platformlarını kullanmaktadır. Salgının merkez üslerinin başında gelen İstanbul (n = 399) kentine odaklanan bu nicel çalışmada, bireylerin sosyal medya kullanımları, bu platformlara olan güvenleri, yanlış bilgi ve komplo teorilerine maruz kalışları ve son olarak bilgileri teyit etme alışkanlıkları incelenmiştir. Çalışmamız, katılımcıların gerçek bilgiyi teyit etmeden, yanlış bilgilere ve komplo teorilerine inanma eğiliminde olduklarını göstermektedir. Katılımcıların yaklaşık yarısı, virüsle ilgili tespit edilen dört yaygın komplo teorisinden en az birine inandığını belirtmektedir. Bununla birlikte, katılımcıların inanma eğiliminde oldukları haberin/bilginin yanlış çıkması halinde, sosyal medyaya olan güvenlerinde nispi bir azalma olduğu anlaşılmaktadır. Çalışmamız bu bulgular ışığında, dijital platformlar ve pandemi bağlamında güven, yanlış bilgi, komplo teorileri ve teyit faktörlerini kapsayan bir model önermektedir.

Anahtar Kelimeler: Kovid-19 Infodemi, Yanlış Bilgi, Komplo Teorileri, Teyit, Sosyal Medya

Introduction

Social media has developed into a mainstream media instrument for many due to the increasing access (directness, speed and volume) to instant information on the internet, making it a powerful communication tool that has significantly changed how news is being consumed (Pentina & Tarafdar, 2014; Rauniar, Rawski, Yang, & Johnson, 2014). Likewise, the internet has developed into a vital source of health information worldwide. At the same time, there is considerable concern about the propagation of disinformation through social media, particularly during precarious times. In periods of uncertainty, misinformation, myths and conspiracy theories about important issues can lead to irreversible consequences (Larson, 2018; Tunçer, 2018; Tuncer & B'Beri, 2021).

According to World Health Organization (2020), the recent Coronavirus disease (COVID-19) – caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pathogen– along with its response has led to a massive infodemic: "An overabundance of information –some accurate and some not– that makes it hard for people to find trustworthy sources and reliable guidance when they need it." COVID-19 can be described as the first major pandemic of the social media age. Resulting in social distancing and lockdowns around the world, conspiracy theories and misinformation about COVID-19 have taken root in many countries (World Health Organization, 2020). This novel coronavirus has caused a pandemic search for information and broad dissemination of false or misleading health information (Ashrafi-rizi & Kazempour, 2020). In the early days of the outbreak, messages and news-like articles about false origins and so-called miracle cures proliferated due to the absence of clear scientific information about the symptoms, transmission, and effective treatments for the disease.

Conceptual Framework and Hypotheses Development

Fake news is a general catch-all term used in the social sphere, referring to any information or news that is false or misleading. Even though the term fake news is used by academics, politicians, and the public, it is a very contentious one (Lazer et al., 2018). Some scholars suggest (Gelfert, 2018, p. 96; Rini, 2017, p. 52) that fake news often involves lies and they consider it to be a species of information, not merely a method of framing based on misattribution. For this reason, misinformation and disinformation in terms of definitional rigour provide a more solid foundation. Misinformation has been defined as unintentionally false information that is shared without intent to cause harm, while disinformation is the act of intentionally distorting information (Gelfert, 2018). In this research, the term misinformation was used as an umbrella term that includes any false information related to health referring to as Wang, McKee, Torbica and Stuckler (2019).

Social media platforms have started to play a significant role as a news channel for many to seek out health-related information (Chou, Oh, & Klein, 2018). During the pandemic, the consumption of news and the frequency of its consumption have increased (Nielsen, Fletcher, Newman, & Brennen, 2020). It should be noted that false information in the form of news stories travels faster than truth (Vosoughi, Roy, & Aral, 2018). According to Waszak, Kasprzycka-Waszak and Kubanek (2018), misinformation in health news can be categorized into three groups:

1. Fabricated news-like contents, which is entirely fictitious information regarding health issues;

2. Manipulated news, which includes half true-half fabricated information and false conclusions; and

3. Advertisement news, which provides misleading information about traditional treatment methods (p. 116).

It is important to note that misleading health information may directly affect health problems, and therefore, efforts to identify and debunk such information become a priority (van der Meer & Jin, 2020). For example, a recent study conducted between December 31, 2019 and April 5, 2020 found a total of 2,311 false information possibly posing health threats that were shared in 87 countries and 25 languages, leading to an estimated 800 deaths (Islam et al., 2020, p. 1624).

Misinformation Theories

A systematic literature review of misinformation and disinformation conducted by Li, Cheung, Shen, & Lee (2019) revealed that only a small number of studies has solid theoretical foundations and that biases play an essential role when individuals are assessing daily issues. Nevertheless, two central theory clusters in fake news studies are mounting: (1) News-related theories where fake news content is compared and contrasted to true news content regarding writing style and quality, and (2) User-related theories that focus on users' fake news activities such as posting, forwarding, liking, and commenting (Zhou & Zafarani, 2020, p. 4). For example, Golman, Hagmann and Loewenstein (2017) underlines an attitude of "referring the knowledge," that is defined as ignoring opposing people and information and only considering "a priori truth" information from people seen as

affinity (p. 102). In other words, "our inherent cognitive biases make us ripe for manipulation and exploitation by those who have an agenda to push, especially if they can discredit all other sources of information" (McIntyre, 2018, p. 68). Likewise, the "backfire effect" (Nyhan & Reifler, 2010) states that when presented with evidence that their beliefs are wrong, people may reject this evidence and "double down" on their initial beliefs, trying to debunk these false beliefs may potentially even increasing their dedication to their initial beliefs. However, other scholars claim that nudging online users seems beneficial, but interventions and messages must be based on science and evidence (Cinelli et al., 2020; Tangcharoensathien et al., 2020). Another theory cited in the literature is "rumor theory" (Li, Cheung, Shen, & Lee, 2019, p. 7). Rumoring refers to a "collective and collaborative transaction in which community members offer, evaluate, and interpret information to reach a common understanding of uncertain situations, to alleviate social tension, and to solve collective crisis problems" (Oh, Agrawal, & Raghav, 2013, p. 409).

Due to its dissociative and asynchronous nature, the internet has a tendency to amplify such effects (Suler, 2004). Likewise, in the social media sphere, the concepts of "echo chambers" and "filter bubbles" amplify users beliefs. As a closed system, "echo chambers" amplify and reinforce beliefs through repetition. "Filter bubbles" shape what users see online using algorithms to essentially create echo chambers in the digital realm. These algorithms effectively create unique worlds of information for users on digital platforms, changing how ideas and information are consumed (Pariser, 2012). In other words, users become insulated from contrary perspectives as their own beliefs and ideas are reinforced, thus limiting meaningful interactions with other groups.

Infodemic in Turkey

In Turkey, the first COVID-19 related death occurred on March 17, 2020. Since the beginning of the pandemic, Turkey's Health Minister Fahrettin Koca, setting up an advisory board composed of medical experts and scientists, has shared the number of cases, occupied ICU beds and deaths daily through traditional and social media. These informative meetings were also widely discussed on social media regarding the accuracy of the information. On December 12, 2021, the total number of cases was around 9 million, with total deaths from COVID-19 was over 80 thousand (Ministry of Health, 2021).

Approximately 70% of the world population lives in cities, and the rate of spread of the coronavirus in these densely packed areas, where interaction between larger groups people is also more prevalent, is higher than in rural areas. In addition to urban density, social and economic differences among citizens are determinant in the pandemic's pace and spread. Particularly, the transmission of the virus is much faster and broader in urban areas with high levels of poverty and inequality. Even though worldwide trends show that the coronavirus tends to spread heterogeneously, differences based on regions are evident. For instance, Istanbul claims more than 60% of Turkey's COVID-19 cases (Ministry of Health, 2021). In May 2020, to control the flow of information and alleviate discussions surrounding the country's pandemic data, the Ministry of Health launched the "Life Fits into Home" (Hayat Eve Sığar) online application to monitor patients and prevent the spread of the virus (Figure

1). When the location services are turned on in the application, a map shows the "risky areas" where the pandemic is considered intense. It is also possible to see the official and current number of cases across the country through the application. According to these data, amongst all cities in Turkey, Istanbul has the highest concentration of COVID-19 infections.
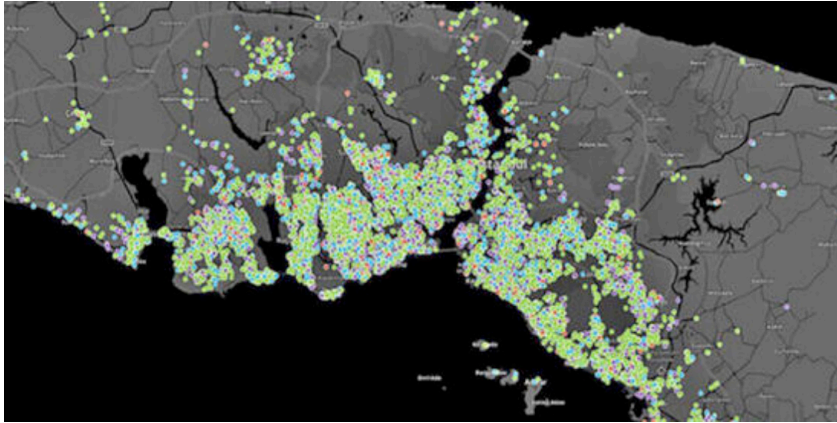
Figure 1. Map of Istanbul from Life Fits into Home Application

In terms of social media usage, in Turkey, approximately 59.36 million people use the internet (72% of the country's population), and 52 million are active social media users (63% of the population) (Kemp, 2020). According to a Reuters report (Yanatma, 2018), one out of every two social media users in Turkey believes they encounter "fake news" every week, the highest reported rate amongst the 37 countries covered in the report Fake news has become almost an integral part of social media news consumption in Turkey (Andı, Aytaç, & Çarkoğlu, 2020).

Another phenomenon that Turkish society is familiar with is conspiracy theories. Among such claims regarding the COVID-19 pandemic are that "the Chinese produced the virus in the laboratory," "gargling warm water-lemon water prevents the virus stuck in the throat," and "virus can spread this fast with 5G technology". Many conspiracy theories report fictitious claims that Microsoft founder Bill Gates released the virus as a bioweapon, while others claim that if a person eats and drinks certain foods and beverages, they will not get infected or recover very quickly (Islam et al., 2020).

Based on the conceptual framework outlined above, the research questions are as follows:

(RQ1): Is misinformation on social media platforms common during the COVID-19 pandemic in Istanbul?

(RQ2): Are conspiracy theories on social media platforms common during the COVID-19 pandemic in Istanbul?

(RQ3): Do internet users utilize fact-checking options to validate COVID-19 news?

Methodology

This research uses quantitative methodology to collect and analyze data. To describe the demographic segment's nature, descriptive research was utilized. The study was prepared using a survey research method, which numerically describes the trends, attitude and opinions of the sample in quantitative research (Williams, 2007). This research aims to analyze the COVID-19 infodemic by focusing on social media users in the city of Istanbul which has been shown to be the epicentre of the outbreak in Turkey.

All empirical studies have their limitations, and this also applies here. Our study is limited to the city of Istanbul. Additionally, due to the nature of the research, it was conducted online and thus may not fully represent Istanbul's population distribution, as may be seen in the median education and income levels being higher than average. Also, women's representation is higher than the population average. Moreover, this study was conducted without external funding, through the researchers' own means. It was conducted based on the decision of the Trabzon University ethics committee (Number: 81614018-000-E.183).

Measurements

Based on the misinformation, conspiracy theories, trust and fact-checking literature outlined above, the survey questions were prepared based on three different scales, determined to be compatible with the study's aim and after obtaining permission from the original authors. Our proposed misinformation scales are as follows:

1. Social Media Fact-checking / Trust Scale: Adapted based on a study conducted by (Çömlekçï & Başol, 2019), Social Media Fact-checking / Trust Scale consists of 10 items under three factors: three questions under the Institutional Trust Factor, three questions under the Individual Trust Factor, and four questions under the Fact-checking Factor.

2. News Reliability Scale of the User in Social Media: Developed by (Kılıç & İspir, 2017), the News Reliability Scale of the User in Social Media consists of 16 items under four factors (with four questions under each factor): Trust, Freedom and Speed on the Internet, Misinformation and Resource Reliability.

3. The Generic Conspiracist Beliefs Scale: The Generic Conspiracist Beliefs Scale, developed by (Brotherton, French, & Pickering, 2013), consists of 15 items under five factors (with three questions under each factor): Government Malfeasance, Extraterrestrial Cover-up, Malevolent Global Conspiracies, Personal Well-being, Control of Information.

Participants were asked to answer these questions on a five-point Likert scale between Strongly Disagree, Disagree, Undecided, Agree, and Strongly Agree. The survey also includes questions about participants' practices of social media use, and socio-demographic information.

Participants and Data Collection

In Turkey, the city of Istanbul saw the first case of COVID-19 and has seen the most cases nationwide (Ministry of Health, 2021). Therefore, for the purposes of this study, Istanbul was taken as the target population. The sampling was achieved through a two-step procedure:

1. Non-probability sampling: Sharing the survey link via various social media platforms (Facebook, Instagram, Twitter), and

2. Probability sampling: Using paid advertising to share the link through the same platforms to reach more respondents from various demographics and overcome the sampling bias (Dillman, Smyth, & Christian, 2014). This achieved a total of 85,630 impressions, 53,121 people were reached, of those 727 people clicked through to the survey. Particularly, a broad range of socio-economic status was targeted within the city of Istanbul region.

Internet sampling was preferred because of the nature of the research, and because of the physical interaction limitations as a result of the COVID-19 pandemic. Internet sampling also allowed for a random sample within the study's target population. Thus, those who did not use social media were prevented from participating in the research, and only those residing in Istanbul were allowed to participate.

The survey was completed online by 427 participants residing in Istanbul over a one-month period (from June 15 to October 20, 2020). Of the total, 28 did not properly complete the survey. Therefore, these responses were disregarded, and the data of 399 participants were analyzed. The data on the scale in question had a standard distribution assumption (± 1,500), and therefore parametric tests could be performed.

Data Analysis and Results

A pilot study was conducted with 94 participants, with the feedback obtained stating that the expressions of the three scales were reliable (α = .713). Problematic research questions were rearranged according to the feedback. To ensure the content validity of the new questionnaire, three faculty members working in the field of communications, two lecturers and a communication specialist were asked to evaluate the final scale using the Lawshe (1975) technique. It was stated by field experts that the expressions in the scale were suitable for the research subject and that the research questions met the measured phenomenon (Table 1).

Table 1. COVID-19 Infodemic Scale Items

Trust (T)	T1	**1.** Social media is reliable as a source of information.
	T2	**2.** Traditional media (TV, Radio, Newspaper, Magazine) is a reliable source of information.
	T3	**3.** In the news about the coronavirus on social media, the posts of people with life perspective similar to mine are more reliable.
	T4	**4.** Social media posts about the coronavirus by well-known journalists are reliable.
Misinformation (M)	M1	**5.** News about the coronavirus contains exaggerated headlines on social media.
	M2	**6.** The coronavirus news on social media is biased.
	M3	**7.** There is misleading, incomplete and false information in the news about the coronavirus on social media.
	M4	**8.** Even if the news presented on social media about the coronavirus is true, people's comments exaggerate the events.
Fact-Checking (FC)	FC1	**9.** I research the accuracy/reliability of the news I see on social media about the coronavirus.
	FC2	**10.** I verify the news I see on social media about the coronavirus from different sources on social media.
	FC3	**11.** I confirm the news I see on social media about the coronavirus from different sources outside the internet.
	FC4	**12.** I confirm the news I see on social media about the coronavirus through fact-checking platforms (such as teyit.org, yalansavar.org, dogrulukpayi.com, verila.org etc.).
Conspiracy Theories (CT)	CT1	**13.** The coronavirus, which many people are infected with, was created in a laboratory as a bioweapon.
	CT2	**14.** The coronavirus has been deliberately disseminated to infect certain populations.
	CT3	**15.** Cures for the coronavirus exist but are being deliberately withheld.

Based on a survey of internet users in Istanbul (n=399), although people tended not to trust the news on social media, they preferred to utilize these platforms as they were more easily accessible due to the restrictions encountered resulting from the COVID-19 lockdowns. The participants of the study were mainly women (66.2%), single (67.2%), undergraduate (46.1%), and working in professional occupations (44.9%). The median age of the participants is 30.5, and the median income is 3724 TL. The results indicated (Table 2) that participants spent on average 3.25 hours on social media channels before the pandemic; however, this average time spent increased to 4.96 hours during the COVID-19 outbreak. This group, which frequently follows the news of the pandemic through social media applications (48.4%), accessed this news more frequently on Twitter (58.8%) and Instagram (55.6%) platforms. On the other hand, most of them avoided sharing any content themselves (73.2%). Among these social media networks, Twitter (57.1%) took the lead in regard to "trusted news source". Across all social media platforms, participants stated that they most frequently encounter the claim that "the spread of coronavirus will decrease with the warming of the weather" (86.9%), followed by the claim that "flushing your nose with salt water prevents coronavirus disease" (52.5%).

While the majority of respondents (74%) used digital platforms to reach information about the pandemic, their trust in these platforms is significantly low (24%). Nearly half of all participants (48%) believed at least one of four widespread conspiracy theories about the virus. The most common

of which, though frequently discredited, is that the coronavirus is a biological weapon engineered in the laboratory for secret purposes. On the other hand, the number of those who stated, "I confirm a piece of news I have reached on social media during the coronavirus period from different sources" was relatively high (67%).

Table 2. Descriptive Statistical Results

1. Gender	n	%	10. Most followed social media platforms during COVID-19	N	%
Male	135	33.8	Twitter		58.8
Female	264	66.2	Instagram		55.6
2. Marital status			WhatsApp		38.1
Single	268	67.2	YouTube		23.2
Married	131	32.8	Facebook		15.2
3. Education			None		5.1
Primary	5	1.3	**11. Most trusted social media platforms for COVID-19 news**		
High-school	131	32.8	Twitter		57.1
Undergraduate	184	46.1	Instagram		23.7
Masters	63	15.8	YouTube		12.9
PhD	16	4.0	WhatsApp		7.1
4. Job			Facebook		3.8
Arts	9	1.8	None		20.2
Unqualified labour	28	5.7	**12. Frequency of sharing information about COVID-19 on social media channels**		
Professional careers (doctor, lawyer, etc.)	221	44.9	I do not share information	292	73.2
Unemployed (incl. homemaker, retired)	141	28.7	I share information once a week	60	15.0
5. Median age		30.5	I share information 2-4 times a week	35	8.8
6. Median salary		3724 TL	I share information every day	7	1.8
7. Social media use prior to pandemic (hours)		3.25	I share information several times in a day	5	1.3
8. Social media use post-pandemic (hours)		4.96	**13. Most common claims about COVID-19 on social media**		
9. Platforms used to follow COVID-19 news			The spread of coronavirus will decrease with the warming of the weather.		86.9
Social media	193	48.4	Flushing your nose with salt water prevents coronavirus disease.		52.5
Traditional media	108	27.1	Herbal cures (ginger, turmeric, thyme, etc.) protect you from coronavirus disease.		39.7
Online news sites	44	11.0	Being able to hold your breath for more than 10 seconds without coughing or feeling discomfort means you do not have coronavirus.		34.6
Official institutions' web pages	43	10.8	5G technology causes the spread of coronavirus.		30.3
Do not follow	11	2.8	**Total**	**399**	**100.0**

Scale Validity and Reliability

The Confirmatory Factor Analysis (CFA) that was used to verify the construct validity of the scale was Exploratory Factor Analysis (EFA) (details of the analyzes are given below). The validity scale tested was in accordance with the internal validity value (α≥ .70) suggested by the literature (Flynn, Sakakibara, Schroeder, Bates, & Flynn, 1990). The Cronbach's Alpha value (α) of the scale prepared with a five-point Likert scale and containing 15 expressions was .749. Thus, it can be stated that the scale used in the research is valid and reliable.

The suitability of the data set for factor analysis was confirmed through the number of samples, the number of samples greater than the number of variables, and the number of observations per statement, and the relationship between the correlations analysis and the statements (≥ .300), KMO (.700) and Bartlett's Test results (χ2 = 1126.012; sd = 105; p = .00). EFA was performed using the Maximum Likelihood method. In EFA, the factor load of expressions was taken as .30 (Yong & Pearce, 2013, p. 78). The distribution that reveals the factors is shown in Figure 2.
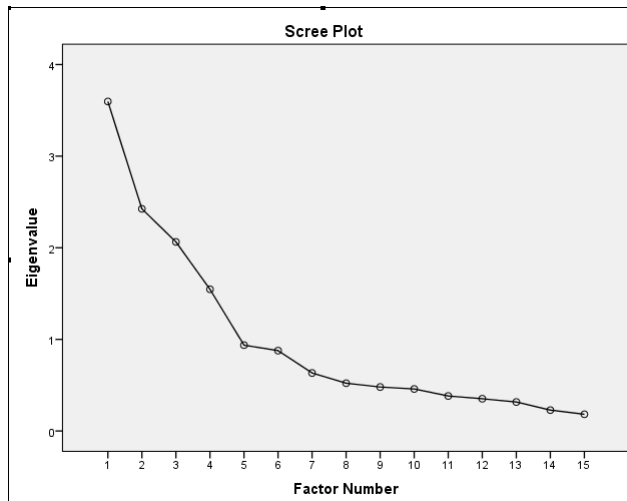

Figure 2. Scree Plot for EFA

As a result of the Exploratory Factor Analysis (EFA) scale (Table 3), four factors (n = 200, Kaiser-Meyer-Olkin -KMO- = .700; Total Variance Explained = 64.210; Bartlett's Test: χ2= 1126.012; sd = 105; p= .00) exceeding the Eigenvalue 1.0 were determined. As a result of the analysis, the total variance explained ratio of the dataset meets the percentile (≥%60) accepted by the literature (Hair, Black, Babin, & Anderson 2009, p. 109).

Table 3. Exploratory Factor Analysis (EFA)

Maximum Likelihood, Direct Oblimin Rotation, n=200					
Dimensions	Items	F1	F2	F3	F4
Trust	T1	.673			
	T2	.927			
	T3	.400			
	T4	.343			
Misinformation	M1		.764		
	M 2		.688		
	M 3		.759		
	M 4		.793		
Fact-Checking	FC1			.850	
	FC2			.826	
	FC3			.578	
	FC4			.372	
Conspiracy Theories	CT1				.835
	CT2				.886
	CT3				.718
Total Factor Items		4	4	4	3
Total		3,596	2,425	2,064	1,547
% of Variances		23,975	16,165	13,759	10,311
Cumulative Variances (%)		23,975	40,140	53,899	64,210
Factor Cronbach's Alpha		.681	.840	.761	.856
AVE		.470	.337	.491	.717
CR		.780	.648	.782	.881
Bartlett's Test	X^2= 1126,012; Sd:105; p =.00				
Total Variance Explained: 64,210%					
Kaiser-Meyer-Olkin (KMO): .700					
Scale Cronbach's Alpha: .749					

CFA was performed on the data set bearing the assumption of multiple normality (Table 4). As a result of the EFA performed, CFA was applied to test the validity of the scale in question (Figure 3). The factors and dimensions obtained in EFA have model fit values accepted for CFA (n = 199; χ2 = 195.803; χ2 / df = 2.331; p = .00; RMSEA = .08; RMR = .095; NFI = .84; CFI = .90; GFI = .88; SRMR = .726), so the relevant scale has been statistically validated (Bollen, 1989; Hu & Bentler, 1999).

Table 4. Assessment of Normality of the Items

Assessment of normality (Group number 1)

Variable	min	max	skew	c.r.	kurtosis	c.r.
T1	1,000	5,000	-,017	-,096	-,506	-1,456
T2	1,000	5,000	-,295	-1,699	-1,062	-3,058
T3	1,000	5,000	-,255	-1,467	-,937	-2,697
T4	1,000	5,000	-,263	-1,517	-,821	-2,365
CT3	1,000	5,000	,239	1,375	-,566	-1,630
CT2	1,000	5,000	-,156	-,897	-,919	-2,645
CT1	1,000	5,000	-,085	-,491	-,646	-1,860
FC1	1,000	5,000	-1,031	-5,938	,338	,974
FC2	1,000	5,000	-,731	-4,211	-,532	-1,532
FC3	1,000	5,000	-,506	-2,916	-,749	-2,156
FC4	1,000	5,000	,049	,281	-1,147	-3,304
M4	1,000	5,000	-,686	-3,953	-,501	-1,443
M3	1,000	5,000	-,488	-2,812	-,552	-1,590
M2	1,000	5,000	-,104	-,602	-,619	-1,782
M1	1,000	5,000	-,356	-2,050	-,852	-2,453
Multivariate					32,540	10,163
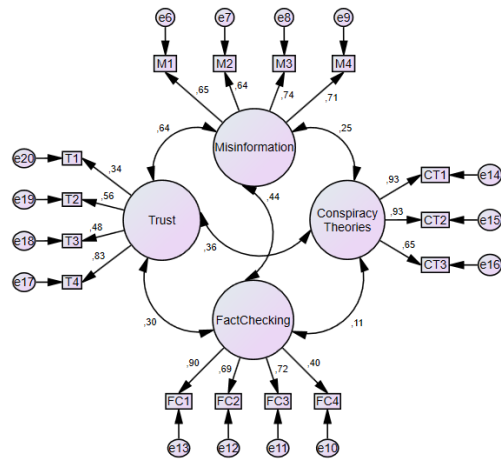
CMIN=195,803; DF=84; CMIN/DF=2,331; p=,000; RMSEA=,082; CFI=,900; GFI=,888

Figure 3. Confirmatory Factor Analysis Model

When looking at Standardized Regression Weights, the threshold value for the expressions in question was taken as .300 (Brown, 2015). Accordingly, the Standardized Regression Weight (p = .00) of the model in question, respectively; conspiracy theories (≥ .647), misinformation (≥ .636), fact-checking (≥ .395) and trust (≥ .335) dimensions. The sub-dimensions of each related factor were compatible with each other (p = .00).

Prior to SEM analysis, the following assumptions were made: The data shows a normal distribution, each factor has at least three observed variables, the proposed sample size is present, and no missing data are included in the research data.
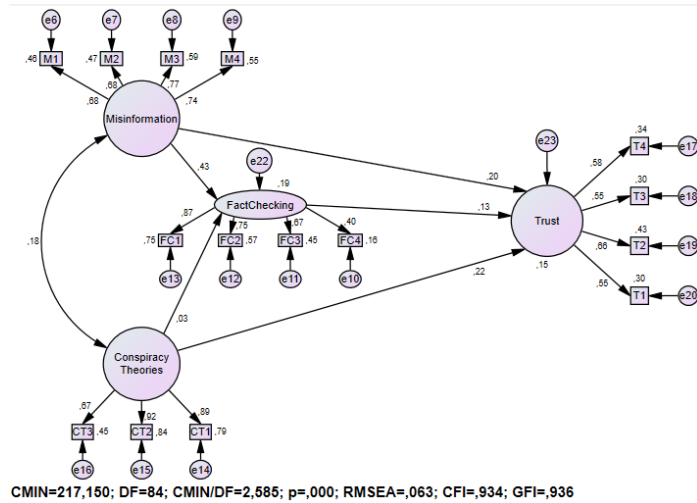
CMIN=217,150; DF=84; CMIN/DF=2,585; p=,000; RMSEA=,063; CFI=,934; GFI=,936

Figure 4. Structural Equation Modelling (SEM)

Accordingly, a new SEM was drawn by taking the fact-checking mediator variable and it was found that it was suitable for the values accepted in the literature (n = 399; $\chi2$ = 217,150; $\chi2$/df = 2.585; p = .00, RMSEA = .63; NFI = .898; CFI = .934; GFI = .936; SRMR = .553). According to the mediator SEM (Figure 4); misinformation predicts fact-checking (β = .269; SE = .052; p <.001; R^2 = .190) but conspiracy theories with fact-checking (β =.014; SE = .027; p> .05) and between fact-checking and trust (β = .165; SE = .098; p> .05). As a result of statistical analysis of indirect effects; the indirect effect of misinformation and conspiracy theories on trust through the fact-checking mediator was found to be significant (β = .002; Lower & Upper Bounds = .008 & .015).

Based on our data analysis, a model that consists of our four factors (misinformation, conspiracy theories, trust, and fact-checking) was developed. The model was validated by using the above-mentioned statistical testing procedures. The following correlations have been confirmed in our study:

- Misinformation has a significant impact on trust.

- Conspiracy theories have a significant influence on trust.

- Misinformation has a significant effect on fact-checking.

- Fact-checking variable has a significant effect on trust in relation to misinformation and conspiracy theories.

On the other hand, our findings indicate that conspiracy theories did not significantly impact fact-checking, and fact-checking did not have a significant impact on trust. Based on the findings, it is proposed that this model for pandemic related misinformation on digital platforms (Figure 5) is valid and may be used in further research.
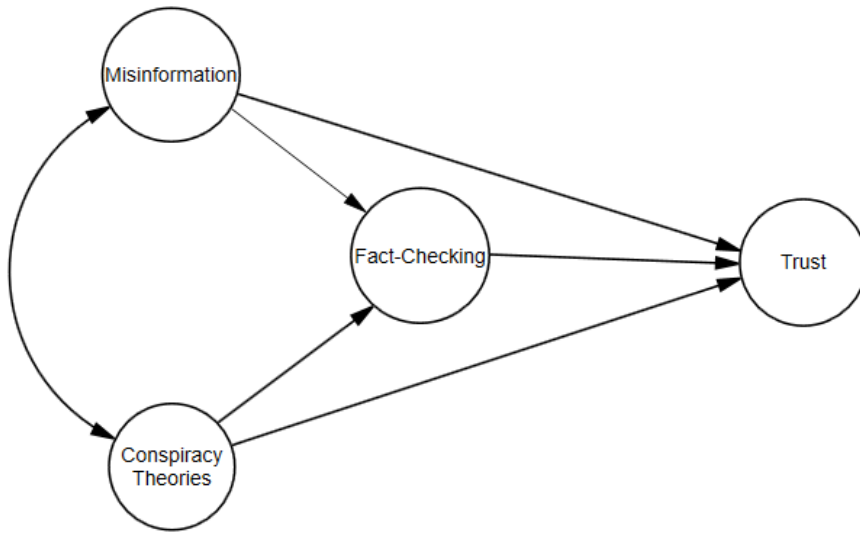
Figure 5. Proposed Model for Pandemic Related Misinformation on Digital Platforms

Conclusion

Misinformation and manipulated information on social media may be considered a global public-health threat (Larson, 2018). COVID-19 has caused an unprecedented global health crisis. As the new virus emerged, many questions about the new pandemic related to its spread, transmission and treatment remained unanswered. This situation has also fuelled a thirst for information globally; however, the lack of it causes many false claims about the pandemic to be made, and some of them have gained a broad range of acceptability.

Turkey, particularly the epicentre of the nation's COVID-19 cases, Istanbul, is "a vivid laboratory" for misinformation studies. The COVID-19 infodemic has created misinformation ranging from the origins of the pandemic to the disease's treatment. Half of all social media users in Turkey believe they encounter misinformation online every week (Yanatma, 2018), placing Turkey the first out of 37 countries listed with the highest reported misinformation rate. Our research focused on determining whether misinformation, conspiracy theories, trust, and fact-checking affected each other within this infodemic in Istanbul. Based on our study of misinformation about COVID-19 on social media in Istanbul, the following key findings were identified:

Prevalence of COVID-19 Misinformation and Conspiracy Theories in Istanbul

Nearly half of all participants believed at least one of four widespread conspiracy theories about COVID-19. This is significant because it has both direct and indirect effects on trust in science and health practices (Chayinska et al., 2021). Moreover, it is evident from the data that people in Turkey over the age of 65 tend to unconditionally believed in any COVID-19 information (Binark, Arun,

Özsoy, Kandemir, & Şahinkaya, 2020). Likewise, our study indicated that people aged 60 and over believed the pandemic conspiracy theories more often than any other age group. This result indicates that health concerns during the pandemic may have ties with conspiracy theories (Alper, Bayrak, & Yilmaz, 2021). Another point that should be noted are that many factors can be determining factor when it comes to conspiracy theories. As (Akyüz, 2021) pointed out, those who identify themselves as conservative/religious, are less likely to get vaccinated as oppose to those who see themselves as liberal or secular. Therefore, it is recommended that further research be conducted amongst subcultural and vulnerable groups to identify the factors causing this phenomenon. As vaccines for the virus are being developed and vaccination programs implemented, misinformation and conspiracy theories have turned their focus on them.

Fact-checking Behaviors Significantly Affect Trust in Social Media

As a recent study indicated (Ünver, 2020), most internet users try and fact-check online news through various measures. However, fact-checking platforms were the least used, at less than 10%. Our findings also reveal online fact-checking to be relatively low. Nevertheless, higher education, professional careers, and younger age tended to increase reliance on fact-checking options. As more internet users turn to social media and spend longer hours there, it becomes more vital for people, particularly for vulnerable groups, to be taught media literacy regarding online health information and to learn how to combat misinformation.

It can be seen that the methods of combatting misinformation have been multiplying in recent years. The same trend can also be seen in Turkey. Among the fact-checking platforms, Doğruluk Payı and Teyit.org stand out as the most popular. Nevertheless, if they include complex information, such measures cannot keep up with the pace of spreading false information (Ünver, 2020). For this reason, many social media platforms have implemented instantaneous fact-checking services to combat misinformation. Likewise, nudging techniques are also being implemented by the social media platforms to discourage users from sharing misinformation and conspiracy theories. For instance, Twitter now asks users who have not clicked to open and read content if they would like to share this content without having done so.

Our findings also hinted at the presence of the "backfire effect" (Nyhan & Reifler, 2010). The "backfire effect" refers to a behaviour where, presented with evidence that their beliefs are wrong, people may reject this evidence and even "double down" on their initial beliefs. When fact-checking did identify misinformation, the participants' trust in social media decreased. Therefore, it is recommended that this effect be studied further within the scope of social media COVID-19 news.

Limitations and Recommendations

As the COVID-19 pandemic and infodemic continue, new relationships and concepts may develop in social media. Therefore, the proposed model should be retested at the end of the infodemic. Thus, new factors may help evolve the model and changes in existing dimensions can be observed. The scale used in this study may be applied to individuals aged 18 and over. For use of participants

under 18 years of age, it is recommended that the questionnaire's language be appropriately simplified. Additionally, scale expressions can be developed by demonstrating intercultural differences by testing with sample groups from different countries.

Finally, all empirical studies have their limitations, and this also applies to this study. Our study is limited to the city of Istanbul. Additionally, due to the nature of the study, it was conducted online and thus may not fully represent Istanbul's population distribution, as may be seen in the median education and income levels being higher than average. Also, women representation is higher than the population average. Moreover, this study was conducted without external funding, through the researchers' own means.

References

Akyüz, S. S. (2021). Aşı karşıtlığı ve şeffaflık algısında iletişim pratikleri ve siyasal aidiyetlerin rolü. *Yeni Medya Elektronik Dergisi*, *5*(2), 172–185.

Alper, S., Bayrak, F., & Yilmaz, O. (2021). Psychological correlates of COVID-19 conspiracy beliefs and preventive measures: Evidence from Turkey. *Current Psychology*, *40*(11), 5708–5717.

Andı, S., Aytaç, S. E., & Çarkoğlu, A. (2020). Internet and social media use and political knowledge: Evidence from Turkey. *Mediterranean Politics*, *25*(5), 579–599.

Ashrafi-rizi, H. & Kazempour, Z. (2020). Information typology in coronavirus (COVID-19) crisis; a commentary. *Archives of Academic Emergency Medicine, 8*(1), e19.

Binark, M., Arun, Ö., Özsoy, D., Kandemir, B., & Şahinkaya, G. (2020). Covid-19 sürecinde yaşlıların enformasyon arayışı ve enformasyon değerlendirmesi. *TRDizin.gov.tr*. Retrieved July 31, 2021 from https://app.trdizin.gov.tr/proje/TWpFME9EYzM/covid-19-surecinde-yaslilarin-enformasyon-arayisi-ve-enformasyon-degerlendirmesi.

Bollen, K. A. (1989). A new incremental fit index for general structural equation models. *Sociological Methods & Research*, *17*(3), 303–316.

Brotherton, R., French, C., & Pickering, A. (2013). Measuring belief in conspiracy theories: The generic conspiracist beliefs scale. *Frontiers in Psychology*, *4*(279), 1-15.

Brown, T. A. (2015). *Confirmatory factor analysis for applied research (2nd edition).* New York: The Guilford Press.

Chayinska, M., Uluğ, Ö. M., Ayanian, A. H., Gratzel, J. C., Brik, T., Kende, A., & McGarty, C. (2021). Coronavirus conspiracy beliefs and distrust of science predict risky public health behaviours through optimistically biased risk perceptions in Ukraine, Turkey, and Germany. *Group Processes & Intergroup Relations*, 1-19, https://doi.org/10.1177/136.843.0220978278.

Chou, W.-Y. S., Oh, A., & Klein, W. M. P. (2018). Addressing health-related misinformation on social media. *JAMA*, *320*(23), 2417–2418.

Cinelli, M., Quattrociocchi, W., Galeazzi, A., Valensise, C. M., Brugnoli, E., Schmidt, A. L., Zola, P., Zollo, F., & Scala, A. (2020). The COVID-19 social media infodemic. *Scientific Reports*, *10*(1), 1-10.

Çömlekçi, M. F. & Başol, O. (2019). Sosyal medya haberlerine güven ve kullanıcı teyit alışkanlıkları üzerine bir inceleme. *Galatasaray Üniversitesi İletişim Dergisi*, *30*, 55–77.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: The tailored design method (4th edition).* New Jersey: Wiley Publishing.

Flynn, B. B., Sakakibara, S., Schroeder, R. G., Bates, K. A., & Flynn, E. J. (1990). Empirical research methods in operations management. *Journal of Operations Management*, *9*(2), 250–284.

Gelfert, A. (2018). Fake news: A definition. *Informal Logic*, *38*(1), 84–117.

Golman, R., Hagmann, D., & Loewenstein, G. (2017). Information avoidance. *Journal of Economic Literature*, *55*(1), 96–135.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate data analysis (7*th *edition)*. New Jersey: Pearson.

Hu, L. & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55.

Islam, M. S., Sarkar, T., Khan, S. H., Mostofa Kamal, A.-H., Hasan, S. M. M., Kabir, A., Yeasmin, D., Islam, M. A., Amin Chowdhury, K. I., Anwar, K. S., Chughtai, A. A., & Seale, H. (2020). COVID-19–related infodemic and its impact on public health: A global social media analysis. *The American Journal of Tropical Medicine and Hygiene*, *103*(4), 1621–1629.

Kemp, S. (2020). Digital 2020: Turkey. Global digital insights. *Datareportal*. Retrieved May 12, 2021 from https://datareportal.com/reports/digital-2020-turkey.

Kılıç, D. & İspir N.B. (2017). *Sosyal medyada kullanıcının haber güvenilirliği algısı*. Paper presented at 1. Uluslararası İletişimde Yeni Yönelimler Konferansı, İstanbul: İstanbul Ticaret Üniversitesi, pp. 402-409. 4-5 May, 2017. Retrieved April 2, 2021 from http://acikerisim.ticaret.edu.tr/xmlui/handle/11467/1634.

Larson, H. J. (2018). The biggest pandemic risk? Viral misinformation. *Nature*, *562*(7726), 309–310.

Lazer, D. M. J., Baum, M. A., Benkler, Y., Berinsky, A. J., Greenhill, K. M., Menczer, F., Metzger, M. J., Nyhan, B., Pennycook, G., Rothschild, D., Schudson, M., Sloman, S. A., Sunstein, C. R., Thorson, E. A., Watts, D. J., & Zittrain, J. L. (2018). The science of fake news. *Science*, *59*(6380), 1094-1096.

Li, Y.-J., Cheung, C. M. K., Shen, X.-L., & Lee, M. K. O. (2019). Health misinformation on social media: A literature review. *PACIS 2019 Proceedings*. Retrieved July 10, 2021 from https://aisel.aisnet.org/pacis2019/194.

McIntyre, L. (2018). *Post-truth (Second edition)*. London: MIT Press.

Ministry of Health. (2021). [Government]. *COVID-19 bilgilendirme platformu*. Retrieved June 21, 2021 from https://covid19.saglik.gov.tr/.

Nielsen, K., Fletcher, R., Newman, N., & Brennen, S. (2020). Navigating the 'infodemic': How people in six countries access and rate news and information about coronavirus. *Reuters Institute for the Study of Journalism*. Retrieved February 21, 2021 from https://reutersinstitute.politics.ox.ac.uk/infodemic-how-people-six-countries-access-and-rate-news-and-information-about-coronavirus.

Nyhan, B. & Reifler, J. (2010). When corrections fail: The persistence of political misperceptions. *Political Behavior*, *32*(2), 303–330.

Oh, O., Agrawal, M., & Rao, H. R. (2013). Community intelligence and social media services: A rumor theoretic analysis of tweets during social crises. *MIS Quarterly*, *37*(2), 407–426.

Pariser, E. (2012). *The filter bubble: How the new personalized web is changing what we read and how we think*. New York: Penguin.

Pentina, I. & Tarafdar, M. (2014). From "information" to "knowing": Exploring the role of social media in contemporary news consumption. *Computers in Human Behavior*, *35*, 211–223.

Rauniar, R., Rawski, G., Yang, J., & Johnson, B. (2014). Technology acceptance model (TAM) and social media usage: An empirical study on Facebook. *Journal of Enterprise Information Management*, *27*(1), 6–30.

Rini, R. (2017). Fake news and partisan epistemology. *Kennedy Institute of Ethics Journal*, *27*(S2), 43–64.

Suler, J. (2004). The online disinhibition effect. *CyberPsychology & Behavior*, *7*(3), 321–326.

Tangcharoensathien, V., Calleja, N., Nguyen, T., Purnat, T., D'Agostino, M., Garcia-Saiso, S., Landry, M., Rashidian, A., Hamilton, C., AbdAllah, A., Ghiga, I., Hill, A., Hougendobler, D., Andel, J. van, Nunn, M., Brooks, I., Sacco, P. L., Domenico, M. D., Mai, P., … Briand, S. (2020). Framework for managing the COVID-19 infodemic: Methods and results of an online, crowdsourced WHO technical consultation. *Journal of Medical Internet Research*, *22*(6), 5-11.

Tunçer, S. (2018). Reinterpreting crisis communications in the post-truth era. *Moment Dergi*, *5*(2), 368–382.

Tuncer, S. & De B'béri, B.E. (2021). Social media and the changing discourse of immigration. In U. Bakan & M. L. Lengel (Eds.) *Social media archaeology from theory to practice* (pp. 215-229). London: MacroWorld Pub.

Ünver, A. (2020). Fact-checkers and fact-checking in Turkey. *EDAM Research Reports.* Retrieved May 12, 2021 from https://ssrn.com/abstract=3644285.

van der Meer, T. G. L. A. & Jin, Y. (2020). Seeking formula for misinformation treatment in public health crises: The Effects of corrective information type and source. *Health Communication*, *35*(5), 560–575.

Vosoughi, S., Roy, D., & Aral, S. (2018). The spread of true and false news online. *Science*, *359*(6380), 1146–1151. Retrieved June 12, 2021 from https://www.science.org/doi/10.1126/science.aap9559.

Wang, Y., McKee, M., Torbica, A., & Stuckler, D. (2019). Systematic literature review on the spread of health-related misinformation on social media. *Social Science & Medicine, 240*(112552), 1–12.

Waszak, P. M., Kasprzycka-Waszak, W., & Kubanek, A. (2018). The spread of medical fake news in social media – The pilot quantitative study. *Health Policy and Technology*, *7*(2), 115–118.

Williams, C. (2007). Research methods. *Journal of Business & Economics Research (JBER)*, *5*(3), 78-95.

World Health Organization. (2020). *Coronavirus disease 2019 (COVID-19): Situation report.* Retrieved May 14, 2021 from https://apps.who.int/iris/handle/10665/331686.

Yanatma, S. (2018). Reuters Institute digital news report 2018. Turkey supplementary report (Reuters Institute for the study of journalism reports). *Reutersinstitute.politics.ox.ac.uk.* Retrieved May 14, 2021 from https://reutersinstitute.politics.ox.ac.uk/our-research/digital-news-report-2018-turkey-supplementary-report.

Yong, A. G. & Pearce, S. (2013). A beginner's guide to factor analysis: Focusing on exploratory factor analysis. *Tutorials in Quantitative Methods for Psychology*, *9*(2), 79–94.

Zhou, X. & Zafarani, R. (2020). A survey of fake news: Fundamental theories, detection methods, and opportunities. *ACM Computing Surveys*, *53*(5), 1-40.

Appendix 1: COVID-19 Infodemic Scale Items

Trust (T)	T1	**1.** Social media is reliable as a source of information.
	T2	**2.** Traditional media (TV, Radio, Newspaper, Magazine) is a reliable source of information.
	T3	**3.** In the news about the coronavirus on social media, the posts of people with life perspective similar to mine are more reliable.
	T4	**4.** Social media posts about the coronavirus by well-known journalists are reliable.
Misinformation (M)	M1	**5.** News about the coronavirus contains exaggerated headlines on social media.
	M2	**6.** The coronavirus news on social media is biased.
	M3	**7.** There is misleading, incomplete and false information in the news about the coronavirus on social media.
	M4	**8.** Even if the news presented on social media about the coronavirus is true, people's comments exaggerate the events.
Fact-Checking (FC)	FC1	**9.** I research the accuracy/reliability of the news I see on social media about the coronavirus.
	FC2	**10.** I verify the news I see on social media about the coronavirus from different sources on social media.
	FC3	**11.** I confirm the news I see on social media about the coronavirus from different sources outside the internet.
	FC4	**12.** I confirm the news I see on social media about the coronavirus through fact-checking platforms (such as teyit.org, yalansavar.org, dogrulukpayi.com, verila.org etc.).
Conspiracy Theories (CT)	CT1	**13.** The coronavirus, which many people are infected with, was created in a laboratory as a bioweapon.
	CT2	**14.** The coronavirus has been deliberately disseminated to infect certain populations.
	CT3	**15.** Cures for the coronavirus exist but are being deliberately withheld.