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REVIEW

A review study of the effects of the COVID-19 pandemic on individual sexual behavior, purchasing sex toys, and related consequences

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KEYWORDS

Sex;
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Panic buying

Summary Globally, COVID-19, both during and after the pandemic, has not only slowed countries' economic development but has also affected social and daily life. Due to COVID-19, physical contact among couples has been reduced, and physical sexual activities have been affected and decreased. In order to satisfy their sexual needs and avoid mental health issues, individuals have shown an increasing inclination to purchase sex toys. Therefore, we conducted this review study to investigate the impacts of the COVID-19 pandemic on sexual activities, purchasing sex toys, and related consequences. Specifically, the present paper examines 45 studies and focuses on four themes: (1) COVID-19 and sex toys; (2) COVID-19 and sex (i.e. sexual life, sexuality, sexual health, sexual behavior); (3) factors affecting purchasing sex toys; and (4) COVID-19 consequences. The study findings reflect that, during to the pandemic, sex toy sales doubled in Australia, Colombia, Denmark, and the UK, and tripled in New Zealand. Sex toys have entailed positive (i.e. increased satisfaction, confidence, pleasure) and negative (addiction, allergic reaction, risk of sexually transmitted infection, embarrassment, and guilt) implications. In addition, participants all over the world engaged more in using sex toys and watching pornography to satisfy their sexual needs. Further, the use of online dating applications also increased, in order to have sex with close or casual partners. Regarding purchasing sex toys, we postulate that people buy these products due to lack of opportunity, relationship avoidance, loneliness, cost-effectiveness, time-saving, and emotionless behavior. Moreover, the pandemic has worsened family and sexual relationships. It has also increased anxiety, stress, and violence in society. In this context, we assert that there is still a need to explore the factors influencing individuals' intentions toward purchasing sex toys, and studies need to be conducted to understand in more detail COVID-19's effects, both during and after the pandemic.

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Introduction

The coronavirus (hereafter COVID-19) was first detected in late 2019 and, in March 2020, the World Health Organization declared it a global pandemic (Qalati et al., 2021). It has affected most countries since the beginning of 2020 (Giami, 2021). Globally, as of May 18, 2022, there have been 520 million confirmed cases and over 63 million deaths. The regions with the most confirmed cases are Europe (218 million), the Americas (155 million), South-East Asia (58 million), and the Western Pacific region (57 million). To decrease the spread of this deadly disease, over 1166 million vaccine doses have been administered (World Health Organization, 2022). In addition, governments across the world imposed strict measures to control the spread of COVID-19, such as lockdowns and restrictions on socializing and mobility (Eleuteri et al., 2022). Further, people had to cope with many stressors, such as fear of contagion and death, forced cohabitation, limited recreational activities, financial uncertainty, physical and social limitation, and social isolation. The COVID-19 pandemic also adversely impacted people's psychological health, triggering stressful "emotional responses" characterized by an increase in negative (i.e. anxiety and depression) emotions and a decrease in positive emotions (Salari et al., 2020). Moreover, social distancing guidelines provoked dramatic changes in daily routines and individuals' lives, with significant effects on leisure activities, including sex (Lehmiller et al., 2021).

Sex is a "popular form of leisure that fulfills multiple needs and is beneficial to physical and psychological well-being" (Lehmiller et al., 2021, p. 295). However, due to the pandemic, partners had limited access to, and opportunities for, physical or recreational sex. Furthermore, sex is a sexual activity that can be expressed and experienced in several forms. Intimacy is one of these forms; others include massages, vulnerable conversations, kissing, cuddling, and holding hands. Sex is constantly affected by biological, cultural, economic, historical, legal, political, psychological, religious, social, and spiritual factors (Skarłacka and Gerymski, 2019). Furthermore, it is essential for the reproduction of the species and has a significant impact on job performance, mental health, mood, well-being, and life satisfaction (Berdychevsky and Carr, 2020; Skarłacka and Gerymski, 2019). The unfulfillment of sexual needs results in shame, low performance, lack of concentration on work, emotional distress, reduced leisure activities, reduced body growth, and other health-related issues (Assari, 2018; Berdychevsky and Carr, 2020). However, due to the pandemic, governments in some countries suggested: avoiding kissing; trying new sexual positions to prevent face contact; wearing a mask during sex; using condoms and dental dams; masturbating together while maintaining a safe distance; and disinfecting sex toys (Eleuteri et al., 2022).

Sex toys are material in nature and are used to improve or generate sexual arousal and pleasure both in partnered and solo sex. They are made using various materials, such as glass, plastic, steel, and silicone. Some of these make little or no use of technology, while high-tech versions come equipped with mobile applications, motors, and internet connections to provide an interactive function and a

sensation of pulsation, pressure, vibration, thrust, suction, or warmth (Döring, 2021). The use of sex toys has positive as well as negative effects. The positive effects include increased satisfaction, confidence, and pleasure, as well as promoting better sleep, increasing relationship satisfaction, and mitigating sexual dysfunction (Riady, 2020; Waskul and Anklan, 2019), whereas negative effects include discomfort or pain, allergic reaction, and risk of sexually transmitted infection (Riady, 2020). Dahlberg et al. (2019) also reported negative outcomes in the form of sex-toy-related accidents. Waskul and Anklan (2019) observed negative emotional effects, such as embarrassment and shame, feelings of dependency or addiction, irritation regarding sexualizing an impersonal and artificial object, religious and moral concerns, and guilt. Moreover, Döring (2021) recently stated that there are more negative side effects of using sex toys than positive ones.

Previous scholars have conducted empirical studies regarding the consequences of sex toy usage in general and their sale during and after the COVID-19 pandemic. However, to the best of the authors' knowledge, scant literature is available regarding the antecedents of buying sex toys during COVID-19. Therefore, this study conducts a systematic literature review from the beginning of the COVID-19 pandemic to provide insights for future studies.

Materials and methods

This study employed Google Scholar (<https://scholar.google.com/>) and PubMed (<https://pubmed.ncbi.nlm.nih.gov/>) to find literature related to the following themes:

- COVID-19 and sex toys;
- COVID-19 and sexual life, sex, sexuality, sexual health, sexual behavior;
- factors (i.e. affecting, influencing, motivating) the use of sex toys during the COVID-19; and
- COVID-19 consequences.

Both search engines have previously been identified, adopted, and used in COVID-19 studies (Nguyen et al., 2022). This review paper includes articles, letters to the editor, and commentaries published in English, between December 2019 to May 2022, and covering the above themes (using relevant keywords and synonyms).

Results and discussion

A total of 45 studies were identified for use in the present study, comprising two commentaries, one correspondence, one clarification, two letters to the editor, two review studies, and 37 research articles (including qualitative, quantitative, and mixed studies) (see Table 1).

COVID-19 and sex toys

Globally, the pandemic has influenced every aspect of individual life, which has been reflected in unusual human behavior. Panic buying was the one of the immediate results

Table 1 Review of the studies.

Authors/Reference	Main findings	Sample size	Research nature and approach
Arafat et al., 2020a	Individuals are involving in panic buying due to scarcity, increased demand, anticipation of price hike, and importance of products. Furthermore, other factors could be psychological, social learning, past experience, government action, and lack of trust	784 reports	Qualitative
Banerjee and Rao (2020)	Digital intimacy is an effective way of closeness in relationships	Undefined	Quantitative
Döring (2020)	COVID-19 has dramatically changed the daily life and there is a need to look in the implications of the pandemic	N/A	Commentary
Gondwal et al. (2020)	The authors reported gradual decreases in vaginal sex, at the same time anal sex increased.	290	Quantitative
Hensel et al. (2020)	Decreased in sexual activity and change in sexual behavior due to depression, and loneliness. ‘‘Bonding behaviors such as hugging, cuddling, holding hands and kissing, as well as reduced partnered sexual behaviors, such as oral sex, partnered genital touching and vaginal sex’’	1010	Quantitative
Lara et al. (2020)	There is a need for both qualitative and quantitative studied to be conducted on mental and the quality of life during the pandemic	N/A	Letter to editor
Maretti et al. (2020)	COVID-19 pandemic has dramatically affected the quality of life by changing inter-personal relationships, sexual health and community life. Sex toys can be used if washed and disinfected before use. There is a need to avoid any contact with outsiders except close contact.	Undefined	Undefined
Naik (2020)	You are, your safest sex partner. Solo sex or masturbation is quite safe and satisfying option as it does not transmit COVID-19	N/A	Correspondence
Shilo and Mor (2020)	Participants spent more time in dating applications than in the pre–social-distancing period and increased their use of sex phone, webcams, and porn consumption	2562	Quantitative
Vora et al. (2020)	COVID-19 has worsened the domestic violence	N/A	Letter to editor
Aoki and Kimura (2021)	Culture, religion, and human figures has an effect on sex	39	Quantitative
Arafat and Kar (2021)	Individuals during the pandemic buy sex-toys in responses to perceived short supply, the anticipation of price hike, and perceived scarcity.	Undefined	Undefined
Balzarini et al. (2021)	During early stage of pandemic participants had more sex, while later it will decrease due to increase in stress, loneliness, financial strain, or worry.	4993	Qualitative
Ballester-Arnal et al. (2021)	Lockdown has affected nearly half of the populations	1448	Mixed
Blackwell (2021)	The study observed that there is risk of COVID-19 transmission through kissing, oral sex and anal receptive	50,439	Qualitative
Bourne et al. (2021)	Participants involved in masturbation and pornography. In addition, they have sex on weekly basis, while before pandemic it is more than once a week	499	Quantitative

Table 1 (Continued)

Authors/Reference	Main findings	Sample size	Research nature and approach
Bowling et al. (2021)	The pandemic has changed the way of living, sex desire, and time spent with partners	306	Qualitative
Cascalheira et al. (2021)	Most of the participants involved in at least one solitary sexual practice, women were involved. more than men.	565	Quantitative
Collar et al. (2021)	Women use and share sexual enrichment aids or sex toys with their sexual partners	800	Mixed
Coombe et al. (2021)	Participants reported less sex in 2020 relative to 2017. More had sex with spouse relative to boy/girlfriend. In addition, solo sex activities increased. Use of sex toys increased. Dating apps for chatting/texting, and setting up virtual dates increased.	1187	Qualitative
Eleuteri and Terzitta (2021)	Using the Internet to maintain active sexual activity appeared to be an excellent alternative to diminish the distance between partners or to increase online knowledge.	N/A	Clarification
Giami (2021)	Electronic devices provide support for the imagination and maintain sexual arousal for personal satisfaction	12 articles	Review
Gil-Llario et al. (2021)	Lockdown increased the sexual appetite of participants; Individuals were involved in sending their nude images and watch pornography during pandemic.	73	Qualitative
Gleason et al. (2021)	Sex with partners have been decreased, increases in masturbation and pornography use.	1051	Quantitative
Hashem et al. (2021)	COVID-19 affected both mental and social interaction	Undefined	Qualitative
Hille et al. (2021)	Partnered participants masturbated significantly less during physical distancing measures compared to the period before, whereas single males masturbated more often.	1017 (Single) 1498 (Partnered)	Quantitative
Lau et al. (2021)	A stronger COVID-pornography use association was observed with increased social distancing awareness	Undefined	Qualitative
Lehmiller et al. (2021)	Decrease in sex life, involve in sexual behavior by using new ways	1599	Quantitative
Mahanty et al. (2021)	The proportion of watching porn videos, depression, and desire for parenthood and sexual intercourse increased among women and found significant. While, smoking, drinking alcohol, and anxiety increased among men.	262	Quantitative
Melca et al. (2021)	Digital devices and social media usage have changed the sexual behavior	1357	Quantitative
Pennanen-lire et al. (2021)	Sexual activities have a significant influence on psychological health, immune response, and could mitigate psychosocial stressors.	Undefined	Review
Pereira (2021)	Respondents reported that they had sex to pay for food, daily expenses, and utilities bills	13	Qualitative
Rodrigues (2021)	Participants reported that due to solitary and online sex their quality of sex life and intimacy improved.	303	Quantitative
Sansone et al. (2021)	Study evidenced that pornography use increased after pandemic relative to before.	Undefined	Qualitative

Table 1 (Continued)

Authors/Reference	Main findings	Sample size	Research nature and approach
Wiratno (2021)	Sexual activities and use of sex toys have been increased	26 YouTube channels	Qualitative
Wood et al. (2021)	Results evidenced that solitary sexual remained unchanged or were perceived to increase during pandemic.	1504	Quantitative
Duguay et al. (2022)	Usage of virtual dating app increases during pandemic	Undefined	Qualitative
Ellakany et al. (2022)	Due to pandemic, there is a change in sleep, increase in sexual activities, screen use, and food intake.	17,008	Quantitative
Federici et al. (2022)	The study revealed a generally depressed emotional experience associated with the experience of lockdown, both in terms of desire, which seemed to be shifted more to the level of imagination and fantasies, and the actual possibility of experiencing sexual activity as usual.	465	Mixed
Goller et al. (2022)	Partnered sex reduced by pandemic and dating apps usage was increased during pandemic	1828	Qualitative
Masoudi et al. (2022)	Decrease in sexual relations and increases in the frequency of solo sex activity, especially masturbation.	21 studies	Review
Montanaro et al. (2022)	Increased in stress, amount of time with partners, use of technology, and self-exploration.	260	Quantitative
Nessaibia et al. (2022)	Digital environments qualified as “virtual” that can provide safe contexts for erotic imagination and intimacy while both communicating and maintaining arousal. Together, they offer a vehicle for fantasy and entertainment of sexual arousal towards private pleasure.	N/A	Commentary
Eleuteri et al. (2022)	COVID-19 worsening of sexual life seems to be related to couples’ conflict, emotions and psychological difficulties, being female, being single or away from the partner, being a health care worker, and having children	18	Review
Szuster et al. (2022)	Sexual activities increased during pandemic. However, it was higher in first wave than in second wave of pandemic.	1644	Quantitative

of the COVID-19 pandemic across the globe. This refers to “unusual stockpiling of a certain product or a broad range of goods (such as masks, sanitizers, gloves, groceries, food grains, toilet tissues, and medicines) fueled by the fear of stock-out or price increase” (Li et al., 2021, p. 1). It has been stated that panic buying also includes purchases of sex toys (Arafat and Kar, 2021). The sale of sex-related products increased during lockdown in 2020, doubling in countries such as Australia, Colombia, Denmark, and the UK, and even tripling in New Zealand. Sales in France, Italy, and Spain outpaced the estimated targets by 94%, 124%, and 300%, respectively. In India, Ireland, and the United States, a 65%, 177%, and 30% increase in sex toy sales was recorded, respectively. In 2020, Chinese-manufactured sex-related production increased by over 50%, with consumers including France, the United States, and Italy (Arafat and

Kar, 2021). The *Global View Report (2021)* stated that, during the pandemic, the sex-related objects market saw an increase of 26% and was valued at \$33.64 billion in 2020, while in 2021, the market evidenced a decrease of 9% relative to the previous year. However, changes in regulatory structure among Asian and Middle-Eastern countries have increased the acceptance of sex-related objects, which could improve sales in the future. Therefore, forecasts indicate that the market may reach \$36.1 billion by 2027 (*Global Newswire, 2021; Global View Report, 2021*). Previous studies have empirically evidenced that, during the pandemic, the use of sex toys gradually increased to satisfy sexual needs and increase life satisfaction (Coombe et al., 2021; Maretti et al., 2020; Wiratno, 2021). Furthermore, it has been reported that sex toys, sex-arousal websites, and sex-based devices, or the digital environment, have helped to

maintain satisfaction and support individuals' imagination (Giami, 2021; Nessaibia et al., 2022). Similarly, Melca et al. (2021) stated that digital devices have changed both ways of having sex and sexual behavior.

COVID-19 and sex

Sexual health refers to the state of an individual's emotional, mental, physical, and social well-being in relation to sexuality. "Sexual dysfunction" refers to a condition that prohibits individuals from experiencing sexual activity and satisfaction. Predictors underlying dysfunctions can be both psychogenic (i.e. depression, anxiety, stress) and organic (i.e. hormonal, vascular, etc.) (Eleuteri et al., 2022). Globally, the COVID-19 pandemic has affected sexual behavior (e.g. sexual intercourse) and changed social relationships (Eleuteri and Terzitta, 2021).

Bourne et al.'s (2021) study of 499 Jamaicans reported that, during the pandemic, nearly 70% of participants were not living with their sexual partners, due to which 60% engaged in masturbation and viewed pornography videos. Further, relative to pre-pandemic levels, they were having sex less often. Arafat et al. (2020a) conducted a cross-sectional study in three countries, namely Bangladesh, India, and Nepal, revealing that, before the pandemic, 76% of participants were having sex one to five times a week, compared to only 72% during the pandemic. Szuster et al.'s (2022) study of 1644 Polish participants evidenced that there was a significant difference between the early stage and late stage of the pandemic. For example, in the early stage, most participants engaged in sexual activity as before, while in late stage, they were increasingly concerned about their health. Interestingly, Gleason et al. (2021) observed that, in the United States, both men and women reported a decrease in sexual pleasure; however, women reported only a small decrease in sexual desire. In addition, the findings revealed that relationship status, depression, and the perceived importance of social distancing were factors in reducing sexual activities. Furthermore, Gil-Llario et al. (2021) observed that 88% of Spanish people sent nude images of themselves, and over 80% engaged in watching pornography. Hille et al. (2021) conducted a cross-sectional study of 1017 single and 1498 partnered respondents in Austria, Germany, and Switzerland, finding that, during the pandemic, single males masturbated more often, whereas partnered males masturbated less. Further, the frequency of sexual activities significantly decreased. Moreover, Gondwal et al.'s (2020) cross-sectional study on 290 Indian participants showed that there was a decrease in vaginal sex, while the practice of anal sex increased. These authors also observed that sexual life of participants who were female, married, and working in important services was better.

Furthermore, most studies identified that watching pornography videos was one of the dominant consequences of the pandemic globally. For example, Rodrigues (2021) conducted a cross-sectional study in Portugal and found a significant relationship between pornography use and increases in sex life quality. In addition, research has shown that pornography can be used as a sexual pleasure tool to connect with close or casual partners. Similarly, Bourne

et al. (2021), Cascalheira et al. (2021), and Gleason et al. (2021) reported that participants in United States, the UK, and Jamaica increased pornography use during the pandemic. Moreover, Lau et al. (2021) used big data analytics to study daily routine search data and Google trends and found that use of pornography increased after March 2020 when the WHO declared the COVID-19 pandemic a global emergency. The authors reported that this increased traffic towards pornography was due to social distancing.

Factors and sex toys

The COVID-19 pandemic has affected almost every aspect of life, including economics, education, industries, and individuals' sexual life (Masoudi et al., 2022). Due to pandemic, most people in the early phase of COVID-19 were not able to meet their close and causal partners because of lockdowns and social distancing policies imposed by governments (Ballester-Arnal et al., 2021; Federici et al., 2022; Sansone et al., 2021). These restrictions also limited recreational and sexual interaction with partners. Thus, limitations in alternative sources of pleasure, the unavailability of partners, and need to have sex could be the major factors for buying sex toys and the use of pornography (Coombe et al., 2021; Wiratno, 2021). Furthermore, online media reports, movies, psychological factors, extra time to explore sexuality, the absence of other forms of entertainment, and being apart from the other partner could also be factors for buying sex toys (Arafat et al., 2020b). Furthermore, Arafat and Kar (2021) recently stated that, during COVID-19, individuals may have bought sex toys due to the anticipation of a price hike, gaining control over their environment, and perceived supply shortages. Other factors could include uncertainty, social learning, and media influence (Assari, 2018; Yuen et al., 2020). Kwakye (2020) conducted a study in eight countries (Denmark, Egypt, Estonia, Finland, Germany, Ghana, Latvia, and the Netherlands), with the majority of the participants from Germany (38%). The sample comprised 810 women between 18 and 50 years old. The results revealed that religion has a significant influence on buying sex toys and desires to have a sex with toys; this is considered particularly important in the Muslim religion.

COVID-19 consequences

The COVID-19 pandemic and its related confinement had serious effects on individuals' relationships, well-being, security, and health. In addition, social distancing, forced cohabiting, isolation, and restrictions on movement had a substantial impact on all aspect of individuals' lives and their sexuality. A recent study by Stefano Eleuteri et al. (2022) reported the consequences of the COVID-19 pandemic as worsening sexual life, which was shown to be related to psychological difficulties, emotional distress, couple conflicts, being single or married, being female, having children, being away from one's partner, and being a health worker. In addition, adverse effects on sexuality were related to routine, stress, feelings related to distance from one's partner, job anxiety and worries, being unhappy with one's partner, forced cohabitation, and lack of privacy. In

another study, [Bowling et al. \(2021\)](#) stated that the pandemic has changed the purpose of sex, increased stress, changed home responsibilities and living situations, and also altered time spent with one's partner, which has impacted people by either decreasing or increasing their sex desire or drive. Furthermore, [Federici et al. \(2022\)](#) reported that disabled individuals were affected by low self-esteem, feelings of suffering, and inadequacy. In addition, [Vora et al. \(2020\)](#) reported consequences in the form of increases in the incidence of violence against women (especially in India). If a male loses his job, he becomes dependent on the female, which lessens his control over the family. The authors stated that, due to the pandemic, males increased their drinking of alcohol and their sexual activities, which was reflected in an increase in the sale of condoms.

Conclusion

In conclusion, this study offers interesting insights for scholars, industry, and policymakers. First, we argue that people may buy sex toys due to a lack of opportunity to have sex, relationship avoidance (not wanting to have any sort of responsibility), loneliness, needing to have something to satisfy one's sexual needs, cost-effectiveness (having an actual relationship may be costly in terms of marriage, food and medical expenses, etc.), time-saving (e.g. having sex whenever one wants), and emotionless behavior (no involvement with a partner). We therefore assert that there is a need to identify the factors influencing individuals' intentions toward purchasing sex toys. Moreover, this study suggests that scholars should investigate the factors influencing sex-toy purchases before and after the pandemic.

Second, the COVID-19 pandemic has introduced new ways of having sex and new purposes for sex, and has introduced sex toys to a wide range of groups who had never used them before. Changing sexual and buying behavior may increase the demand for, and popularize the use of, sex toys, leading to the adoption and expansion of sex toy industries. The pandemic has also increased the demand for dating applications and pornography use, which has consequently boosted demand for information and communication technologies products and technical staff, as well as for more actors and actresses in the pornography industry. After a minimum of 15 days of pandemic-related restrictions, people could become habitual users of pornography. In addition, more students residing in foreign countries may have begun offering online sexual services to meet their basic needs and to survive.

Third, the consequences of the pandemic were worsened due to increased stress and anxiety, relationship break-ups, changes in sleeping patterns, changes in responsibility, etc. This potentially leads to an increased demand for doctors, especially psychologists. In this context, clinicians should promote intimacy and couples' cohesion, which seems to have a protective role against developing psychological disorders. It would be valuable for clinicians and government across the globe to encourage people to try new forms of sexual activities with their partners, which can be useful in reducing stress. Finally, governments should offer free clinical services and subsidies (in the form of groceries, free electricity, other utility subsidies) to decrease stress levels. Further, governments should provide awareness programs

and instruct employers to provide adequate salaries to employees.

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Competing interest

The authors declare that they have no competing interests.

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