

Global web trends analysis of sex toys

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Abstract

Background: Individuals from all over the world are increasingly using the internet to purchase sex toys and gadgets to enhance their sexual experience and provide variety and excitement to their sexual encounters.

Aim: This study examined the trends about the most popular preferred sex toys by nation/region from 2009 using data from Google Trends (GT).

Methods: GT was used to generate a “line-graph” that displays how interest in a topic in certain places has risen or diminished over time. Search terms were generated for vibrator, dildo, anal plug, strap-on, and masturbator. The data were included “globally” from January 1, 2009 to June 30, 2023.

Outcomes: The search values for certain terms were indexed using the relative search volume (RSV), which is shown on a scale of 0–100.

Results: In the linear regression analysis, the trends by strength were sorted as follows: dildo, vibrator, strap-on, anal plug, and masturbator. In 2018, vibrator surpassed strap-on and came in second, while the regression analysis showed a positive trend for dildo between 2009 and 2016 ($P = .014$). It had a negative trend after 2016. Strap-on was the only one to have a downward trend ($P = .029$). Regression analysis revealed positive trends for vibrator and masturbator ($P = .030$, $P = .045$). The upward trends have continued uninterruptedly since 2009.

Clinical implications: According to our research, interest in online trends relating to sex toys has increased along with advancements in technology and clinical applications. This rise is linked to the worldwide sex toy industry’s development in response to consumer demand and ease of accessibility.

Strengths and limitations: This is the first research of this sort, looking into the interests of internet users about sex toys by country over time using GT. GT data is anonymous, and analysis of subpopulation groups is not possible.

Conclusion: Individual preferences for sex toys have different trends on different continents around the world. The compatibility of sex toys with technology over time, their clinical use, and sex toy-related injuries play an important role in the selection process. Web trends seem appropriate to reflect how the demand for sex toys has changed over time.

Keywords: Google Trends; dildo; vibrator; strap-on; anal plug; masturbator; real-world evidence; public interest

Introduction

Pleasure is one of the most notable reasons people take part in sexual activity. Sex toys and devices may improve and broaden sexual pleasure while also adding alternatives and excitement to sexual intercourse.¹ As a result, they are popular among women, men, and transgender individuals all around the world. Sexual enhancement objects, such as sex toys, are readily accessible nowadays through in-home sex toy parties, adult bookstores, women’s magazines, boutiques, drugstores, retail channels, and the internet.² Vibrators and dildos are two popular toys.³ Vibrators are moveable gadgets that emit pulses of varied amplitude and frequency, increasing sexual desire and delaying climax in both men and women.⁴ A dildo is a phallus-shaped object intended for penetration or stimulation of the vagina or the rectal area.⁵ Strap-ons, anal plugs, and masturbators are among other sex toys and devices that are becoming more popular. These objects are not only part of the sexual experience for individuals, but they also play an essential role in the optimization and clinical treatment of anorgasmia, female sexual dysfunction, erectile dysfunction, and sexual issues associated with cancer treatment.⁶ Also, injuries resulting from the use of sex toys have begun to be reported more frequently.³ The COVID-19 pandemic, as well

as resulting lockdown regulations, raised technology-based sexual trends.¹ In addition to their use for pleasure during sexual intercourse, it is important that sex toys, which are also used as pharmaceutical therapy in the medical profession according to the underlying pathology, are addressed globally, both in terms of preferences and awareness of societies and for manufacturers. Our earlier research demonstrated that there is a correlation between sales numbers and antibiotic trends, as well as between the number of operations and endourological operation trends.^{7,8} Companies are increasingly turning to GT to acquire information about potential consumer interest, as well as variations in that interest over time and across geographical areas.^{7,8} Knowledge about web trends will give doctors an advantage in understanding patients’ interests. Regional studies have so far examined the prevalence and inter-individual preferences for sex toys and devices. However, no global web trend study was done on this topic. How have e-commerce and growing technological advancements affected global patterns in the use of sex toys? Global data about the popularity of searched terms over time is provided by Google Trends (GT). In this study, GT data was used to detect to trend changes in geographical location, time-based preferences, and popularity of sex toys and devices over time.

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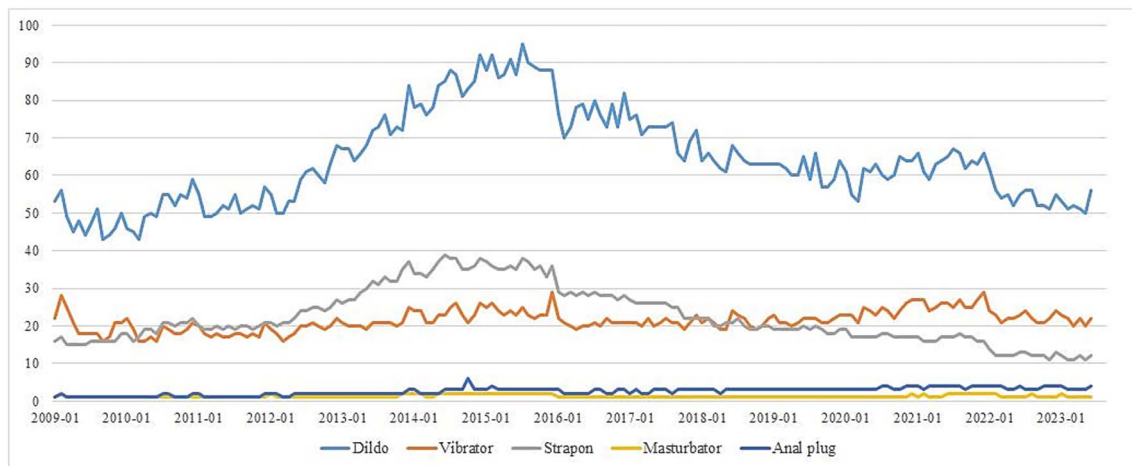


Figure 1. Google Trends relative search volume for sex toys from 2009 to 2023. Polynomial time-trend curves for each toy. When the search term is most popular, the RSV is scored as 100, and when it is half that, it is scored as 50. A result of 0 signifies that the phrase has insufficient search data. The curves were created by taking the monthly average RSV. Popularities were ranked as follows: dildo, vibrator, strap-on, anal plug, and masturbator. Between 2009 and 2016, dildo had positive trends with its high search rate. After 2016, it had a negative trend with its decreasing popularity. Strap-on was the only one to have a downward trend. Vibrator and masturbator had positive trends in the regression analysis and the upward trends have continued uninterrupted since 2009.

Materials and method

Since 2004, data on the global search traffic for a given Google query, including time period and category trends, has been provided by GT (Google, California, USA). GT can generate a “line graph” that displays how interest in a certain region has changed over time. The relative search volume (RSV), which ranges from 0 to 100, is used to index search values for certain terms. The numbers represent search interest relative to the highest point on the chart for a given region and time. RSV 100 displays the largest search trends, while RSV 50 represents half of the searches. A result of 0 signifies that the phrase has insufficient search data. When the search term is most popular in that region, the RSV is scored as 100, and when it is half that, it is scored as 50.

We listed the sex toys, known by similar names all over the world, on GT. The top 5 sex toys used globally were chosen as search phrases. These were “dildo,” “vibrator,” “strap-on,” “anal plug,” and “masturbator.” From January 1, 2009 to June 30, 2023, the data was included as “worldwide” under the “global” enquiry category. Data were represented by five trend lines, one for each search term. The global trend change of search terms over time is shown in Figure 1 and Table 1. Figure 1 was created by taking the monthly average RSV. Regression analysis was performed to more clearly show statistically significant changes between 2009 and 2023. Table 1 shows the results of the regression analysis. A positive beta value indicates an uptrend, while a negative value indicates a downtrend. The beta value also indicates the strength of the trend. R^2 shows the correlation.

Another analysis we made is regional-national popularity between 2009 and 2023. This is also shown in Table 2 and Figure 2. Table 2 shows the five countries where the search terms were most searched-popular between 2009 and 2023. The numbers next to the countries show the strength of popularity. This analysis does not show popularity over time, but total popularity by region between 2009 and 2023. Figure 2 shows the regional popularity of each search term individually and collectively on the world map. A darker color indicates a higher trend.

Table 1. Linear regression analysis for each toy from January 1, 2009 to June 30, 2023. This analysis shows the change in trends of the searched term over time. $P < .05$ indicates a statistically significant trend from 2009 to 2023. A positive beta value indicates an uptrend, while a negative value indicates a downtrend. The beta value also indicates the strength of the trend. R^2 shows the correlation.

	R^2	Beta	P value
Dildo	0.013	0.114	.135
Vibrator	0.280	0.529	.030
Strap-on	0.108	−0.329	.029
Anal plug	0.010	0.101	.184
Masturbator	0.678	0.824	.045

SPSS v.24.0 (SPSS Inc., Chicago, IL, USA) and Microsoft Excel v.16.0 (Redmond, WA) were used for all statistical and trend analyses. Using linear regression analysis, each polynomial trend line was evaluated. If the P -value was <0.05 , the result was deemed significant. This research used only online data; there were no human volunteers involved. There were no requirements for informed consent or IRB approval.

Results

The global trend change of search terms over time is shown in Figure 1 and Table 1. In the linear regression analysis, the trends by strength were ranked as follows: dildo, vibrator, strap-on, anal plug, and masturbator. In 2018, vibrator surpassed strap-on and came in second (Figure 1). Between 2009 and 2016, dildo had positive trends with its high search rate. After 2016, it had a negative trend with its decreasing popularity. Strap-on was the only one to have a downward trend ($P = .029$). Vibrator and masturbator had positive trends in the regression analysis ($P = .030$, $P = .045$). The upward trends have continued uninterrupted since 2009 (Table 1).

Another analysis we made is regional-national popularity between 2009 and 2023. Denmark, Romania, Greece, Brazil, and the Czech Republic were the leading countries for

Table 2. Top 5 highest trending countries for each toy. The table shows the five countries where the search terms were most searched-popular between 2009 and 2023. The numbers next to the countries show the strength of popularity.

Dildo	Vibrator	Strap-on	Anal plug	Masturbator
Denmark (99)	Romania (99)	Greece (99)	Brazil (99)	Czech Republic (99)
Norway (99)	South Africa (93)	Lebanon (63)	France (90)	Poland (96)
Sweden (94)	Holland (90)	Cyprus (61)	Switzerland (59)	Slovakia (93)
South Africa (91)	Australia (88)	Tunisia (51)	Germany (49)	Germany (92)
Holland (88)	Slovakia (87)	Algeria (50)	Belgium (45)	Austria (72)

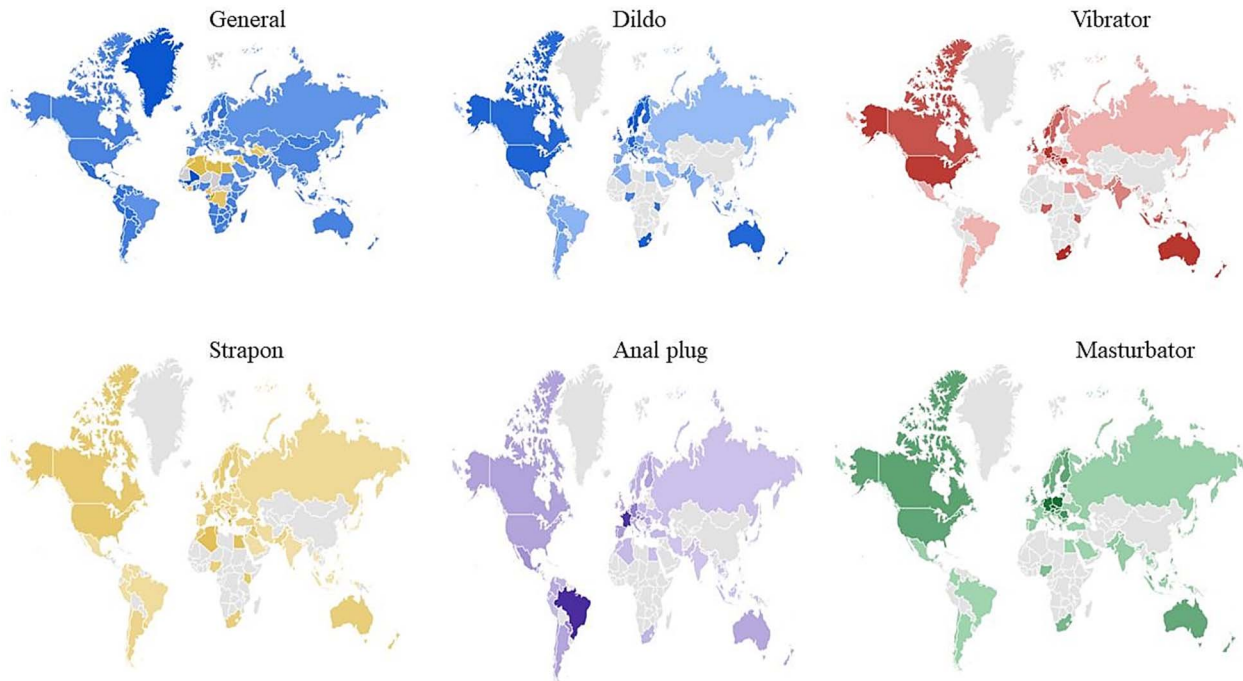


Figure 2. Figure 2 shows the regional popularity of each search term individually and collectively on the world map. Darker color indicates a higher trend. Higher trend regions mean where the search term was used most between 2009 and 2023.

dildo, vibrator, strap-on, anal plug, and masturbator searches, respectively (Table 2). This data shows the countries where search terms were used most frequently between 2009 and 2023. In global trends, the dildo had strong trends in Northern Europe, vibrator in Eastern Europe, strap-on in the Aegean region, anal plug in South America, and masturbator in Central Europe (Figure 2). This data shows the regions where search terms were used most frequently between 2009 and 2023.

Discussion

This is the first research of this sort looking into the interests of internet users about sex toys by country over time using GT. Our research revealed that as technology and clinical usage have advanced, so too has interest in web trends related to sex toys. This increase is associated with the development of the sex toy industry globally in line with demands and easy accessibility. The technological revolution has increased the variety of products, and this has caused them to become more popular.

When the historical development of sex toys is considered, the oldest sex toy known dates from ~28 000 BC.^{9,10} Petra Kieselbach found the paleolithic stone penis at the Hohle Fels

Cave in southern Germany.¹⁰⁻¹² It was possibly used as a dildo, idol statue, or other tool. Ancient Egyptian art from 3000 BC portrays women wearing phallic devices and paying respect to the gods.¹³ The dildo was initially mentioned in Ancient Greece when vendors marketed a device called an *olisbos*.¹⁴ Aside from the traces left by the ancient Greek and Egyptian civilizations, there are also many references to sex toys in the *Kama Sutra*, the world's oldest literature on sex and pleasures compiled by Vatsyayana.¹⁵ It also discusses early forms of erectile dysfunction therapy, such as dildos and penile extensions of wood or reed wrapped around the waist.^{15,16} These were the forerunners of today's belts.¹⁵ Dildos, which have a rich cultural heritage, demonstrated a negative global trend in regression analysis after 2016. Forrester³ assessed patients who presented to emergency departments in the United States between 2000 and 2019 with injuries associated with vibrator and dildo use. In their study, the majority of patients were men, and the injury rate was found to be higher in patients using dildos than in those using vibrators.³ According to studies, the fact that dildos cause injuries to many more patients compared to vibrators, the inability to adapt to technological developments, and the increasing number of sex toys with developing technology are responsible for this negative trend.³ According to Johns et al.,¹⁷ when insertable toys do not vibrate, people find them more enticing.

Considering how vital vibrations are to women's orgasmic experiences, this implies that particular non-phallus-shaped, clitoral-specific vibrators are selected for oscillating feelings. Today, dildos alone are on the rise in Northern Europe. It is also one of the most preferred sex toys along with vibrators in South Africa.

Today, vibrators come in a variety of forms, dimensions, and materials, and they are intended and promoted for use by men, women, and partners during solitary and coupled sexual activities.^{2,18,19} A nationally representative internet-based research about women in the United States revealed that 52.5% had used a vibrator.⁴ Vibrators, both with their vibration features and different designs, have an accelerated upward trend with their adaptation to technological developments and gained a place in therapy, making them stand out in terms of choice.^{5,19} Vibrators, when considered alone, achieved a wider distribution across continents. Teledildonic technology, which allows remote control of the partner's sex toy, and vibrators with integrated video cameras are among the contributions of current technology.²⁰ Clinically, vibrators may be advised for treatment of sexual dysfunctions such as anorgasmia, female sexual arousal disorder, persistent sexual arousal syndrome, erectile dysfunction, and sexual issues caused by cancer therapies.²¹⁻²⁴ Vibratory stimulation also demonstrated effectiveness for pelvic floor dysfunction and vulvar pain.^{1,18} Vibrator usage is also positively related to sexual arousal and general sexual functioning.¹ This clinical importance undoubtedly plays a key role in the increasing trend for vibrator preferences. Reece et al.²⁵ showed that the majority of men in the United States began using vibrators for fun. They stated that males who used vibrators had less issue with sexual function than men who had never utilized vibrators, and they had much greater results in terms of sexual intercourse enjoyment.²⁵ Herbenick et al.⁴ stated that research about vibrator use in women in the United States, involving 2056 women aged 18–60 years, found significant differences among vibrator users in terms of sexual orientation. There were significant differences in education status, with people in the never-used group having more high school and lower education level. Of participants, 71.5% of the users in the study did not report any side effects due to vibrator use.⁴ Among the remaining participant women, genital numbness, pain, irritation, inflammation/swelling, and tears or cuts were observed as side effects.⁴

The external anal sphincter holds anal plugs in the rectum, which are triangular devices. Anal plugs may improve sexual pleasure while also stimulating the prostate.^{5,26} These are advised for males, such as those with anorgasmia, who wish to modify their orgasmic experiences or improve their orgasmic response.^{2,26} When used in urological practice, they could help patients with chronic prostatic pain maintain better prostate health.²⁷ Anal plugs are also on the rise in this study with vibrating types available. In addition to keeping up with technological developments, rising trends for anal plugs were observed in western Europe after Brazil, as they are preferred both during sexual intercourse and in patients with chronic prostatitis pain. Although trending upward, individuals who use anal plugs have a higher risk of contracting sex device-related bacterial infections. In this regard, patients should also be informed that the anal and then vaginal application of a sexual product may introduce harmful pathogens into the vagina.²⁸ It also increases the risk of developing rectal injury secondary to using a device.^{3,29,30} It is important to use

lubricant when inserting anal plugs to avoid pain or traumatic injury.^{29,30} In the study conducted by Dahlberg et al.,³¹ 85 patients who presented with rectal body involvement between 2009 and 2017 were evaluated. They reported that 40% of foreign rectal objects that had to be removed under anesthesia in a large hospital in Stockholm were sex toys, and 6 out of 8 cases requiring laparotomy were due to sex toys.³¹ In 41% of cases, the objects removed were sex toys, including anal plugs and dildos.³¹ The only factor that will be effective in reducing the frequency of injuries and sexually transmitted diseases is education about the use of sex toys. Individuals avoiding due to the hesitation to voice fears and the feeling of shame in societies reduces awareness. To protect against the undesirable effects of sex toys, both couple therapies and information provided by medical professionals after puberty may be valuable for increasing public awareness.

Strap-ons are sex toys, also called “external penile prostheses,” that are attached to the person's waist.²² They are easy to use, affordable, and non-invasive.^{22,32} Strap-ons are also tailored to the size, shape, firmness, and angle of a typical erect penis, as well as a partner's preferences.²⁴ Using an external penile prosthesis, such as a strap-on, for penetrative intercourse may offer several benefits over traditional erectile dysfunction therapies.^{22,33} Gray and Klotz²³ first proposed the potential of an external penile prosthesis to help men with erectile dysfunction regain sexual dysfunction. Warkentin et al.²¹ described how a fully impotent, testosterone-suppressed prostate cancer patient achieved pleasant, multi-orgasmic intercourse with a strap-on. They also reported that strap-ons have lower costs as a treatment option compared to phosphodiesterase-5 (PDE5) inhibitors and penile implants for patients being evaluated for erectile dysfunction.²¹ In the regression analysis between 2009 and 2016, strap-ons showed a positive trend. Searches about strap-ons were shown to be more common in Mediterranean nations, such as Greece, Cyprus, and Lebanon. However, vibrators, with new designs, adaptation to technological developments, and clinical use, have surpassed the use of strap-ons in country trends in 2018. There is little data about the efficacy and diversity of external prosthetic devices and alternative therapies for erectile dysfunction, but these choices may be easier to obtain, simpler to use, and more affordable for the right people.²² More research is needed to evaluate patient and partner outcomes after therapy with these prosthetic devices.²²

Masturbators are sex toys designed from soft, flexible material that look like vulvae, anus, or mouths.³⁴ Rosenberger et al.² showed that sex toy use was more prevalent during masturbation than during couple interactions. Almost all respondents with a history of sex toy use stated that they have engaged in solo masturbation using toys, such as masturbation sleeves (89.8%), dildos (88.2%), and non-vibrating cock rings (83.0%).² Masturbators and dildos are frequent sex toys used by men in solo sexual activities, which could imply that they play an essential role in facilitating men recreating the sensation of oral sex or sexual intercourse in the absence of a sexual partner.² Trends about masturbators are on the rise in Eastern European countries. Considering that sex toys are preferred among partners primarily for entertainment purposes in the studies in the literature, masturbators remain in the background in partnered relationships.

Sex toys are currently a multi-billion dollar industry and can be acquired practically anywhere, online or offline, thanks

to technological advancements and the emergence of sex robots.²⁰ This market is expected to grow to 52 billion dollars by 2026.^{20,35} We were not able to provide GT data as sex robots are not widely used yet. They resemble sex dolls, but are loaded with sensors, performers, and artificial intelligence.²⁰ They can communicate, show emotions, and have preprogrammed personalities.²⁰ However, when the psychological and physiological process of sexual intercourse is considered, the effects that sex robots may have on individuals in this sense are a matter of curiosity. Studies showed that for men, sexual experiences, such as those caused by masturbation or sexual intercourse in brief relationships, have distinct beneficial psychological and physiological impacts.³⁶ In this context, men have a greater desire for sex than women, and women have a stronger need for commitment.³⁶ Some early adopters may be drawn to sex robots by new opportunities for sexual exploration and enjoyment, while issues of social and sexual deprivation may attract others.²⁰ Richards et al. found no significant difference between individuals in regards to the possibility of sex with a robot and the subheadings of relationship satisfaction, sexual satisfaction, fear of intimacy, and sexual desire.³⁷ Furthermore, Szczuka et al.³⁶ revealed that personal traits related to social life, such as isolation, have no effect on sex robot attractiveness judgments. Although sex robots remain in the initial stages of development, it was noted that the concerns regarding social life will lessen as experience grows in the future.³⁶

Sharing sexual equipment is associated with an increased risk of sexually transmitted diseases.³¹ Partners should also be informed that inserting a sexual product anally and later vaginally can allow hazardous germs into the vagina.²⁸ Between 1995 and 2016, 6799 persons over the age of 20 attended emergency departments in the United States for sex toy-related injuries, with stated rates of injury increasing dramatically in the last 6 years of the study.³⁵ The real prevalence of sex toy-related injuries is likely higher since negative stigma and underreporting, due to embarrassment, may drive delays in seeking care.³⁵ Given that more vibrators than dildos are purchased, vibrator injuries may be more frequent than dildo injuries.³ Additionally, since vibrators are an option in the treatment of erectile dysfunction, vibrator injuries may be observed more frequently depending on the frequency of use.³

The present research is subject to some limitations. First, a single web research engine, Google, was used, and the study was conducted only in English. Our sample was limited, and the variety of only a limited number of products was documented. Statistical data is based solely on GT search data. Actual data may differ over countries or time. The individual is interested in the object and searches for it, although it could be for merely visual interest or pornography, rather than desire for personal usage. Some regions may restrict access via Google. Also, the fact that Google is used more frequently in western countries may have affected regional results. Google Trend data is anonymous, and analysis of subpopulation groups is not possible. It was not possible to create a subclassification of the preference trends among gay, heterosexual, and bisexual individuals. Statistics for elderly people may be limited due to the internet's popularity among young people. Sex toys have different functions and can be used for different purposes. They also have common uses, such as dildo vibrator, but this is ignored in the search terms. In spite of these limitations, we believe our findings are an important indicator of current sex toy trends.

Conclusion

People from all around the world use the internet to acquire sex toys and devices with increasing interest in order to improve their sexual pleasure and add alternatives and excitement to sexual intercourse. In this sense, various industries can use web trends as a useful indicator for sales policies. Considering their compatibility with technological development, clinical use, and side effect profiles, the most important trend increase was in favor of vibrators, followed by masturbators. Future studies should evaluate the reasons for the regionally distinct trends we have shown, the balance of negative and positive effects of different types of sexual products, and sales policies with objective scales in line with these results.

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Conflicts of interest

The authors have no conflicts of interest to declare that are relevant to the content of this article.

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