

## FEATURE

## CHRISTMAS 2017: LANGUAGE AND LITERACY

# In bed with Siri and Google Assistant: a comparison of sexual health advice

Nick Wilson and colleagues find out how well technology answers questions on sex

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To Google or not to Google, that is the question emerging for quality sexual health advice. We can all search the internet without shame or fear of embarrassment, whatever the question. A 2017 UK survey of 3221 people aged 16 years or older found that 41% of internet users go online for health related questions, with half of these (22%) having done so in the previous week.<sup>1</sup> But do smartphones and their digital assistants offer quality sexual health advice? To find out we jumped into bed (albeit independently), pulled out our smartphones, and asked Siri and Google Assistant. We then compared their answers with a laptop based Google search.

## “Hey Siri ...”

We selected 50 questions to test the software. These were based on the subject titles from the UK National Health Service site Healthy Choices in the sexual health category<sup>2</sup> and recent sex related news or designed to test functionality—for example, locating services or finding images and videos on how to have sex (table 1↓). Each author made a maximum of three attempts per question when speaking into the smartphones; one had a pure New Zealand accent, one a New Zealand/Scottish accent, and one a New Zealand/Ulster English accent.

## “OK Google ...”

We found that a laptop based Google search performed much better than the two digital assistants, providing 72% (36/50) of the best (or equal best) responses for the sexual health questions (table 1↓). Google Assistant performed better than Siri (50% of best (or equal best responses) versus 32%;  $P=0.036$ ). Google searches also had the lowest outright failure rate, providing no useful response for 8% (4/50) of the questions compared with 12% (6) for Google Assistant and 36% (18) for Siri ( $P=0.0007$

for Google versus Siri;  $P=0.005$  for Google Assistant versus Siri).

We assessed the search results' content for relevant expertise, excluding eight functionality test questions relating to nearest location, price and translation, and found 48% (20/42) of the questions were answered with what we determined were expert sources. These included the NHS ( $n=8$ ), Family Planning (New Zealand) ( $n=4$ ), and other sites endorsed by medical experts such as the US Centers for Disease Prevention and Control (CDC), Planned Parenthood, hospitals, specialist clinics, and universities. Six (14%) searches provided websites with “some expertise” such as Wikipedia articles and commercially oriented sites (eg, condom manufacturers), and six identified online magazine articles.

Google and Google Assistant seemed better than Siri at finding pictures of how to have sex, along with instructional videos for using condoms, such as a YouTube video using a wooden penis model that has had over six million views. Google and Google Assistant were also better at finding an image of sex inside an MRI scanner<sup>3</sup> (as detailed in the Ig Nobel prize acceptance speech of a participant<sup>5</sup>). This research confirmed the “boomerang shape”<sup>6</sup> of the penis during coitus, albeit for just a side-to-side variant of the missionary position. Even so, sometimes the videos found by a Google search were less than encouraging. For example, one question returned a video clip entitled: “The 5 stupidest ways people have died having sex.”

## Lost in translation

Somewhat surprisingly, Siri failed to find any videos of people having sex on the internet. Even for pictures (“Show me pictures of how people have sex”), Siri lacked specificity by including pictures of sex with aliens, what looked like men wrestling, and photos of people kissing. Siri was more likely to be diffident,

with responses to some questions about sex being: “I don’t have an opinion on that” and also had trouble with New Zealand accents at times, repeatedly confusing “sex” with “six.” An accent problem is also likely to have caused Siri to misinterpret a question on “vasectomy” as something to do with “suck to me.” Siri’s response to, “Tell me about menopause” was to suggest the show *Menopause the Musical* in Wikipedia (this show is apparently running in Las Vegas at over 3600 performances) and interpreted “STI” (sexually transmitted infections) as a stock market code.

Google Assistant had fewer such problems but responded to a question on STIs by providing a website link to the popular seaside resort of “St Ives” in Cornwall. Siri was best at locating some nearby services, such as the nearest place to buy condoms or obtain emergency contraception, but less ideally suggested a local acupuncture clinic when asked for the nearest “sexual health clinic”. Furthermore, when asked about “trans health,” Siri suggested Health-Trans, an ambulance service in Philadelphia, USA, located 14 283 km away.

For other functionality, all three approaches provided guidance on how to correctly pronounce: “cunnilingus” but Google Assistant was the best for translations and French accents as when asked, “How do you say ‘where can I get condoms’ in French,” correctly saying out loud: “Où puis-je avoir des préservatifs.”

Magazine and newspaper articles provided answers of variable quality. For “Is it okay to put a jade egg in my vagina?”—a practice detailed on Gwyneth Paltrow’s Goop website<sup>7</sup> with egg prices from \$55 (£41; €46) each—all three approaches found media articles quoting sound medical advice with gynaecologists pleading: “Please don’t put a jade egg in your vagina.” But the responses around Goop advice on getting a V steam (vaginal steaming) were more mixed, with one result reporting a journalist trying it and recommending it to readers despite noting that gynaecologists advise against it. The latest papal advice on condoms being acceptable for preventing infection with Zika infection or HIV/AIDS was also found in media reports by the three different approaches.

## Where to from here?

All approaches could do better at finding expert information. Our experiences suggest that people can find quality sexual health advice when searching online, but this is less likely if they use a digital assistant, especially Siri, instead of Google laptop searches. Our findings are consistent with a study in 2015–16, which found Siri and other smartphone assistants trivialised some important general health inquiries or failed to provide appropriate information.<sup>8</sup>

Our results are probably better than “real world” experience, given that we spoke clearly and used reasonably precise wording, often from the NHS website on sexual health, rather than slang words or colloquialisms. Anyone with an accent will be familiar with adopting their “telephone voice” to help make them understood in a range of scenarios<sup>9</sup>; an approach which is usually more effective than the related phenomenon known as shouting. Anecdotal evidence suggests people are similarly adapting their speech to virtual assistants, rather than the other way round.<sup>10</sup>

Device use may also vary by context. Whispering into headsets can provide privacy but increases the likelihood of miscomprehension by the digital assistant. One advantage of the digital assistant is giving the speaker hands-free information, although this is not recommended while driving<sup>11</sup>; evidence is

still lacking on the cognitive demands or other risks of using a digital assistant for advice while having sex.

Our findings show the importance of improving digital literacy in the general population. UK data suggest that only 48% of 1516 people aged 16 years or older using search engines could correctly recognise an advertisement in search results, despite these being distinguished by a box with the word “Ad”.<sup>1</sup> In particular, more needs to be done to encourage internet users to treat information in online lifestyle magazines with caution. Goop, and its promotion of jade eggs for “vaginal weightlifting,” has been criticised for the quality of its health information,<sup>12</sup> recently winning the 2017 “rusty razor” award for the most audacious pseudoscience.<sup>13</sup>

For adolescents, appropriate smartphone and internet searches could be evaluated as a component of school based sex education or as part of a broader health education or digital literacy courses.<sup>14</sup> Parents too embarrassed to respond to their children’s questions about sex, can reasonably say “just Google it,” but we would not suggest asking Siri until it becomes more comfortable with talking about sex (or at least has an opinion). Software designers and health authorities are already beginning to work together to improve search functionality, and this needs to continue.<sup>15 16</sup> Clearly, the ideal is to ensure that all sexual health advice searches, including those using slang, colloquialisms, or New Zealand accents, are always directed to high quality sites with up-to-date, evidence based recommendations.

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## Table

**Table 1 | Specific questions and results for sexual health advice provided by Siri, Google Assistant, and Google searches**

Specific question / topic	Siri	Google Assistant	Typed Google search on a laptop (using quote marks when ≥2 words)	Agreed ranked performance
Tell me about ...*				
Contraception	Offers to speak the first few sentences of the Wikipedia article on Birth control and provides the “see full article” link	For two of us: Speaks out a sentence from the Wikipedia article (also provides the link). For one of us: Found an expert New Zealand site for health information (Health Navigator) on contraception.	Found an expert and local (New Zealand) site (familyplanning.org)	Google > GA > Siri
STIs (“sexually transmitted infections”)	Offers to speak the first few sentences of the Wikipedia article on “sexually transmitted infection” and provides the “see full article” link	For two of us: Speaks out a definition from the Mayo Clinic and then gives a list to select from. For one of us found a HPV immunisation website <a href="http://www.bestshot.co.nz">www.bestshot.co.nz</a>	Found an expert and local (NZ) site	Google > Siri > GA
Good sex	Failed for all—eg, interpreted “good sex” as “good six” or said: “I don’t know what you mean by good sex.” Offered a web search, which also failed	For two of us: Same as the Google search. For one of us: Found a <i>Marieclaire</i> magazine article: “10 sex tips”	Found a magazine article (bodyandsoul.com):	Google = GA > Siri=Fail
Sex and young people	Failed for all (as above)	For two of us: Found a magazine article ( <i>Today’s Parent</i> ). For one of us: Found a reasonable quality website with a long and detailed article about why young people do or do not choose to have sex	Found an expert site (NHS):	Google > GA > Siri=Fail
Vagina health	For one of us: Offered a web search and found a <i>Cosmopolitan</i> magazine article: “22 vagina facts that you need to know” For one of us: Offered a web search and found how to have a healthy vagina (with pictures) on <a href="http://www.wikihow.com">wikihow.com</a> (of limited quality) For one of us: The expert NHS site on “Vagina health”.	For two of us: Found a <i>Diply</i> magazine article. For the other found a <i>Women’s Health</i> magazine article	Found an <i>Everyday Health</i> magazine article (doctor reviewed)	Siri > Google > GA
Penis health	Failed to comprehend or retrieve relevant sites	Found a <i>Men’s Health</i> magazine article	Found a <i>Men’s Health</i> article	Google = GA > Siri=Fail
Talking about sex	Failed to retrieve relevant sites	Same as the Google search.	Found an American Sexual Health Association page	Google = GA > Siri=Fail
Fertility	Offers to speak the first few sentences of the Wikipedia article on fertility and gives the full article link	For two of us: automatically speaks sentence from the Wikipedia article on fertility (and provides link). For one of us: Found a private fertility clinic link for in NZ	Found a not very relevant site about fertility monitors	Siri = GA > Google
Trans health	For two of us: Same as the Google search. For one of us: Showed a map pinpointing Health-Trans in Philadelphia, USA (an ambulance service 14 283 km away)	For two of us: Found a relevant website run by the American Medical Students Association. For one of us: found a magazine article	Found a magazine article ( <a href="http://www.trans-health.com/">http://www.trans-health.com/</a> )	GA > Siri = Google
Gay health	For two of us: Found “Gay City Health Project” Medical Centre in Seattle, 11,319 km away. For one of us: Same as the Google search	Each of us got a different result: an expert “gay and bisexual men’s health” site (CDC); a gay men’s sexual health research group at a NZ University; and an irrelevant scientific journal article	Found an expert site (NHS)	Google > GA > Siri
Menopause	For two of us: Website showing a definition only. For one of us suggested the Wikipedia site for “Menopause the Musical”	Speaks out a definition sourced from the Mayo Clinic and then gives a list to select from (“Sources: Mayo Clinic and others”)	Found a magazine article ( <i>Healthline</i> )	GA > Google > Siri
Ten selected questions from titles on the NHS Choices website				
Where can I get contraception?	For two of us found Wikipedia page on birth control. For one of us: An expert site (NHS)	Speaks out about the local service with the link being about “Contraception for young women”:	Found a professional and local service (for a phone consultation)	Google = GA > Siri
Which method of contraception suits me?	Same as the Google search	Same as the Google search	Found an expert site (NHS):	All fairly similar

Table 1 (continued)

Specific question / topic	Siri	Google Assistant	Typed Google search on a laptop (using quote marks when ≥2 words)	Agreed ranked performance
What to do if you're on the pill and you're sick or have diarrhoea?	Same as the Google search.	Speaks 4 sentences from the same expert site as the Google search (NHS).	Found an expert site (NHS):	All fairly similar
Could I have an STI?	For two of us: Failed to understand "STI" For one of us: Found a UK site that was medically reviewed (albeit with some commercial aspects): <a href="http://www.webmd.boots.com">http://www.webmd.boots.com</a>	Speaks 2 sentences citing the Mayo Clinic and then gives a list of the most common types ("Sources: Mayo Clinic and others").	Found an expert site (familyplanning.org) but in the wrong town (ie, Blenheim), although it had with links to STI testing and other information	Google > GA > Siri
Am I at risk of HIV?	Spoken response: "I don't have an opinion on that"	Speaks a long sentence giving risk from an encounter of unprotected anal sex from a magazine article ( <i>Poz</i> )	Found an expert site (University of California)	Google > GA > Siri=Fail
Can oral sex give you cancer?	Didn't know but offered a web search that came up with the same expert site as the Google search.	For two of us: Speaks 3 sentences citing WebMD and giving a site by an author with an MPH qualification: For one of us: A relevant <i>Time</i> article about Michael Douglas	Found an expert site (NHS Live Well):	Google = Siri > GA
What if my partner won't use condoms?	Same as the Google search.	Same as the Google search.	Found an expert site (NHS):	All fairly similar
Could I be pregnant?	For two of us: Spoken response: "I'm afraid I don't know the answer to that". For one of us: found a relevant magazine site:	For two of us: Speaks 4 sentences citing WebMD and giving a site. For one of us: Found an expert service provider site in Canada:	Found magazine articles	GA > Google > Siri
Is my vagina normal?	Couldn't find anything but offered a web search and then also found nothing	Speaks 2 sentences and then provides the same expert site as the Google search.	Found an expert site (Planned Parenthood) <a href="https://www.plannedparenthood.org/learn/teens/puberty/my-vulva-and-vagina-normal">https://www.plannedparenthood.org/learn/teens/puberty/my-vulva-and-vagina-normal</a>	GA = Google > Siri=Fail
Is it normal to have a curved penis?	Same as the Google search.	Speaks 2 sentences and then provides the same site as the Google search.	Found an expert site (NHS)	All fairly similar
<b>Sex in the news and trending fashions</b>				
Is it okay to put a jade egg in my vagina?	For two of us: Found a media article quoting gynaecologists "please don't put a jade egg in your vagina" <a href="http://www.health.com/sexual-health/jade-egg-goop">www.health.com/sexual-health/jade-egg-goop</a> For one of us: Found a magazine article ( <a href="http://gurl.com">gurl.com</a> ) with reasonable advice:	Same as the Google search	Found a media article quoting gynaecologist advising not to: <a href="http://gizmodo.com/no-you-should-not-put-jade-eggs-in-your-vagina-because-1791390211/amp">http://gizmodo.com/no-you-should-not-put-jade-eggs-in-your-vagina-because-1791390211/amp</a>	All fairly similar
Is it okay to get a V-steam (vaginal steaming)?	Found a <i>Women's Health</i> article quoting gynaecologists advising against this	Same as the Google search	For two of us: Found a <i>Huffington Post</i> article of a journalist trying it and recommending it despite noting gynaecologist advice against it. (Given this journalist's recommendation we down-graded the quality of this source). For the other: same as Siri	Siri > GA = Google
Can Zika be spread by sex?	For two of us: Couldn't understand either Zika or sex. For the other: Found an expert website on Zika (NHS)	Found an expert website (CDC) –oriented towards health professionals	Found an expert website (CDC) for lay audience	Google > GA > Siri
Is it true that the Pope approves of condoms to prevent Zika?	For two of us: Found a British 2010 <i>Telegraph</i> article relating to the Pope approving condoms for preventing AIDS. For one of us: found a news article (CNN) titled "Pope suggests contraceptives could be used to slow spread of Zika"	Same as the Google search.	Found a relevant 2016 news media article on this topic. <a href="#">↓</a>	Google = GA > Siri
Is it okay to get my genitals pierced?	For one of us: Found a media article "advice on penis piercing". For one of us: Found an expert site (NHS) but on the wrong topic "Can I get my penis enlarged". For one of us: Found nothing.	Found a WebMD site:	For two of us: Same as for GA. For one of us: A commercial pro-piercing for males website in the US	GA > Google > Siri

Table 1 (continued)

Specific question / topic	Siri	Google Assistant	Typed Google search on a laptop (using quote marks when ≥2 words)	Agreed ranked performance
Is it okay to get my pubic hair removed?	For one of us: Found a Q&A site in the US for replies by dermatologists offering private laser treatment. For one of us: Found a link to a waxing provider. For one of us: Same as the media article found by GA.	For one of us: Found a UK <i>Telegraph</i> article with gynaecologist's advice about risks. For one of us: Found an advertisement site for laser hair removal. For one of us: Same as the Google search	For two of us: Found an expert US medical site (Boston Children's Hospital), centre for young women's health. For the other: A magazine article ( <i>Live Strong</i> )	Google > GA > Siri
Functionality tests—pictures, diagrams, and videos				
Show me pictures of how people have sex	Found pictures on Bing.com (since Siri uses Bing for pictures) showing a wide range of pictures albeit including sex with aliens, what looks like men wrestling, and photos of people kissing	Found a YouTube video of the sound of people having sex in a hotel room (of no educational value)	Goes to Google images and shows a wide range of pictures of highly variable educational value	Google > Siri > GA=Fail
Show me a video of people having sex	Failed to find any relevant websites	The same video as when asked for a picture	Found a video of "The 5 stupidest ways people have died having sex!" (which may provide information about injury prevention)	All failed
Show me a video on how to put on condoms	Failed to find any relevant websites	For two of us: Found a deliberately silly YouTube video of no educational value. For one of us: Found an advertisement site from a condom manufacturer (with no instructional videos)	Found an expert (Southern Nevada Health District, US) video on YouTube (4 minutes, 6 million views)	Google > GA > Siri=Fail
Show me a video on how to use a female condom	Failed to find any relevant websites	Same as the Google search	Found a high quality instructional video but the source is unclear	Google = GA > Siri=Fail
Show me a diagram of the squeeze method for premature ejaculation	For two of us: Failed to correctly understand the question. For one of us: Failed to find any relevant websites	For two of us: Found an advertisement for a herbal formula. For one of us: Same as the Google search	Reasonable quality magazine article with diagrams ( <a href="http://risingmaster.com">risingmaster.com</a> )	Google > GA > Siri=Fail
Show me a diagram of what a vasectomy does	For one of us: Failed to correctly understand initially but on the third attempt found an expert site (NHS) on vasectomies (but no diagrams). For one of us: Failed to correctly understand the question. For one of us: Same as the Google search	For two of us: Found a link to an advertisement for a local vasectomy provider. For one of us: The Wikipedia entry which has a good diagram	High quality animation with diagrams by a commercial urology centre in the US	Google > Siri > GA
Show me a diagram of female sterilisation	For two of us: Found an expert site (NHS) on female sterilisation (but no diagrams). For one of us: Found an expert US medical site (Boston Children's Hospital), centre for young women's health including a diagram	Same as for the Google search	Shows high quality diagrams on Google images	Google = GA > Siri
Show me a picture of the contraceptive implant	Shows educational pictures on Bing	Same as the Google search	Shows educational pictures on Google Images	All fairly similar
Show me a picture of genital warts	Shows educational pictures on Bing	Shows just 4 pictures at <a href="http://medicinenet.com">medicinenet.com</a>	Shows educational pictures on Google Images	Google = Siri > GA
Show me a picture of genital warts being removed	Shows pictures on Bing but of limited educational value (including a non-recommended apple cider vinegar application)	For two of us: A You Tube video with some information but still no removal pictures. For one of us: An advertisement for a doctor (with before and after pictures)	A non-relevant YouTube video on skin tags	All failed
Show me an x-ray scan of people having sex	Failed to find any relevant websites	Found an advertisement for scanning equipment	Found a YouTube video of the clip from the famous <i>BMJ</i> study <sup>3</sup>	Google > GA=Fail, Siri=Fail
Functionality tests—location, language, other				
Where is the nearest place to buy condoms?	For two of us: selected a pharmacy in the local suburb but missed closer venues (supermarkets and pharmacy). For one of us: Found the nearest place—a pharmacy 1.6 km away	Found an advertisement site from a condom manufacturer	Goes to a condom manufacturer site with no information on where to buy	Siri > GA=Fail, Google=Fail

Table 1 (continued)

Specific question / topic	Siri	Google Assistant	Typed Google search on a laptop (using quote marks when ≥2 words)	Agreed ranked performance
Where is the nearest place I can get the morning after pill?	For one of us: Selected a pharmacy in local suburb but missed a closer pharmacy and a medical practice. For one of us: Found the nearest place—a pharmacy 1.6 km away.	For one of us: Selected an urgent pharmacy 7.6 km away, though this has the advantage of longer opening hours than most pharmacies. For one of us: Found US & UK online websites, no local NZ sites. For one of us: Found expert information on the emergency contraceptive pill but not where to get it	For one of us: Expert and local (NZ) site: For two of us: Found a pharmacy but missed many closer pharmacies and medical centres	Siri > Google > GA
Where is the nearest family doctor?	For two of us: Failed as tried searching for "family practice physicians" (a term not routinely used in NZ). For one of us: Selected a family planning clinic 9.1 km away, did not return several closer local practices	For two of us: Same as the Google search. For one of us: Provided websites for Auckland after hours medical centres (600+ km away from the searcher's location in Wellington)	Found the closest general practice	Google > GA > Siri=Fail
Where is the nearest free sexual health clinic?	For one of us: Found an acupuncture clinic and a general practice (which are not free). For one of us: Selected a local family planning clinic 9.1 km away (which is only free for <22 year olds). For one of us: found an after hours medical clinic 4.3 km away (also not free)	For one of us found nearest free clinic. For the others: Selected the local family planning clinic (only free for <22 year olds)	Found the nearest free clinic	Google > GA > Siri=Fail
How much is a pregnancy test?	Of limited value as only provided Australian or US sites	For two of us identified a local supermarket. For one of us: Provided a US information site	Provided US information sites	GA > Google = Siri
How do you pronounce cunnilingus?	Same as the Google search	Same as the Google search	Found a YouTube clip "Emma Saying ..." with 3 repeats of the spoken word	All fairly similar
How do you say "I don't want sex" in Spanish?	Failed with one response being: "I can't translate from NZ English yet"	Speaks out the correct response: "No quiero sexo," and the text is also shown	Found a Spanish translation site and wrote: "no quiero tener sexo contigo"	GA > Google > Siri=Fail
How do you say "where can I get condoms" in French?	For two of us: failed to find any site. For one of us: Went to a French/English dictionary for the word "condom"	Speaks out the correct response of "Où puis-je avoir des préservatifs" and the text is also shown	Found dictionary giving the French word for condom: "préservatif"	GA > Google > Siri
Is prostitution legal in the country I am in?	Found a Wikipedia article with the correct information	Failed to find the information	Failed to find the information	Siri > Google=Fail, GA=Fail
Are condoms with ribs more fun?	Failed to understand the question or could not find an answer	Same as the Google search	Found a blog site linked to a condom manufacturer so the reliability of the information may be uncertain	GA = Google > Siri=Fail
Does wearing some clothes make sex hotter?	For two of us: Found a somewhat related magazine site on how condoms can make sex better ( <a href="http://mensfitness.com">mensfitness.com</a> ) (but it says nothing about the clothing issue). For one of us: Same as the Google search	Same as the Google search	Found a relevant <i>Cosmopolitan</i> magazine article	Goggle and GA > Siri
What did Shakespeare say about alcohol and sex?	Found a link to article in <i>TheBMJ</i> on "Shakespeare and alcohol" <sup>4</sup> – but which actually did not cover this particular quote	Same as the Google search.	Found the correct information: "It provokes the desire, but it takes away the performance" ( <i>Macbeth</i> Act 2. Scene 3)	GA = Google > Siri=Fail

\*Taken from headings on NHS Healthy Choices website ("sexual health").