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Is 'suicide' themed search engine optimisation likely to be harmful?

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ABSTRACT

Objective: To increase website prominence, search engine optimisation (SEO) techniques use high-value keywords to attract users. As the search term 'suicide' is being used to attract browsers, it is important to understand whether this confusing practice is harmful or beneficial.

Method: To provide a method of documenting browser confusion, online searches used signal detection theory and subtractive methodologies to consider the impact of search terms: 'painless methods', 'suicide', 'alcohol', and 'gambling'. The distributions of 'harmful' and 'harmless' content in 800 search results provided by Google in June 2023 were examined. The degree of overlap occurring between 'harmful' and 'harmless' content was indicated by d' , while the willingness to report harmful results was indicated by β .

Results: The most harmful search (largest d') resulted from the search term 'Painless Methods', but Google was less willing to report this content (highest β). Including the search term 'Suicide' elicited more helpful sites and reduced d' . However, more harmful content was shown when the terms 'Alcohol' or 'Gambling' were added.

Discussion: Using the word 'Suicide' on websites is actually beneficial, and can flag the site for health services, but deliberately using it to attract the vulnerable to *harmful* websites seems inappropriate.

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Introduction

As online competition can be fierce, in their attempts to attract customers (Castillo & Davison, 2010; Ortiz-Cordova & Jansen, 2012; Rusmevichientong & Williamson, 2006), web-designers may engage in Search Engine Optimisation (SEO) (Ahmad et al., 2024; Egri & Bayrak, 2014; Singh & Maini, 2013). Search engine optimisation involves a range of strategies to improve the page rankings of websites in search engine results (Al-Mukhtar et al., 2021). In other words, in their attempts to improve page rankings, some websites may engage in deliberate attempts to confuse search engines and browsers (Phillips et al., 2024). During search engine optimisation, it seems to be accepted practice to use the keywords of one's competitors (Erdmann et al., 2022; Rusmevichientong & Williamson, 2006; Yalçın & Köse, 2010). This means that *a search for therapeutic material may also produce results that are quite harmful and damaging* (Alao et al., 2006; Tajali, 2021). However, some keywords should possibly be considered 'reserved' (Watters & Ziegler, 2016). To inform web designers and regulators, the present paper addresses specific problems associated with suicidal content that may be 'controlled' in some jurisdictions (Pirkis et al., 2006).

Suicide as a public health concern

Approximately 700,000 deaths occur every year worldwide due to suicide (World Health Organization, 2021), and there are also specific vulnerable demographic groups within the population (Harris et al., 2009; Mok et al., 2021). Unfortunately, a troubled and desperate individual may be triggered to attempt suicide if provided with details of another's suicide. This behavioural contagion is known as the Werther effect (Haw

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et al., 2013; Phillips, 1974), whereas a beneficial effect of the media promoting alternatives to suicide is known as the Papageno effect (Niederkrötenhaler et al., 2010). While suicide is a public health concern and suicide prevention is important (Pirkis et al., 2024), there are reports that searches using the terms 'gambling' and 'suicide' were redirecting to online casinos and could potentially trigger the vulnerable (Phillips et al., 2024).

Suicide and digital sovereignty

As there are concerns that media coverage of suicides may elicit copycat suicide attempts (Haw et al., 2013; Phillips, 1974), specific jurisdictions have laws controlling suicide-related materials online (Pirkis et al., 2009). Given such laws seek to extend digital sovereignty (Pohle & Thiel, 2020) and curb harmful content, one might think it inappropriate and unethical for certain businesses to use the term 'suicide' to attract customers (Ortiz & Khin Khin, 2018). Within this context, the present paper considers current online conduct by website designers (see Arendt et al., 2019; Ortiz & Khin Khin, 2018). Apparently, it has been accepted practice during search engine optimisation to use the keywords of competitors and basically confuse search engines and users. However, this practice potentially places vulnerable people who are seeking assistance at further risk. The present study examines how internet browsers respond to online searches involving search terms such as 'suicide', 'gambling', 'alcohol', and 'painless methods'.

Given that specific jurisdictions may be seeking to 'control' the availability of suicide-related content (Australian Government, 2021; European Union, 2022; New Zealand Legislation, 2015; UK Parliament, 2023), it could be important to determine how a search engine such as Google performs such rankings. Singaravelu et al. (2015) analysed 314 websites through searching keywords pertaining to self-harm, suicide and depression. They found self-harm and suicide-related search terms were more positive and preventative, whereas the search term 'ways to kill yourself' provided more negative and harmful results. Recupero et al. (2008) similarly conducted a study searching suicide-related terms across popular search engines, such as 'suicide methods' and 'how to kill yourself'. Search results were categorised as pro-suicide, anti-suicide, suicide-neutral, not a suicide site or error. Analysing 373 web pages, they reported that 115 were suicide-neutral, 109 were anti-suicide and 41 were pro-suicide. The remaining were either not suicide-related or could not be accessed, such as being blocked.

Other studies have noted the irrelevant information provided when conducting website searches for information and support regarding suicidality. For example, Thornton et al. (2017) searched for 26 terms pertaining to dying, with the keyword 'help' added alongside each. From the 520 websites obtained, 26% were irrelevant and subsequently excluded because they made no mention of suicide or help-seeking information. Of the 329 websites deemed relevant, 68% were suicide preventative, 22% had mixed attitudes, 8% were neutral and only 1% were deemed pro-suicide. As the rates reported by these studies vary, a systematic method of interpreting such findings is warranted.

When conducting searches using the search term 'suicide', Phillips et al. (2024) reported browser redirections to inappropriate websites (e.g. online casinos). Figure 1 illustrates such confusing practices – a search using the terms 'alcohol' and 'suicide' provides a hit implying assistance for the suicidal that instead

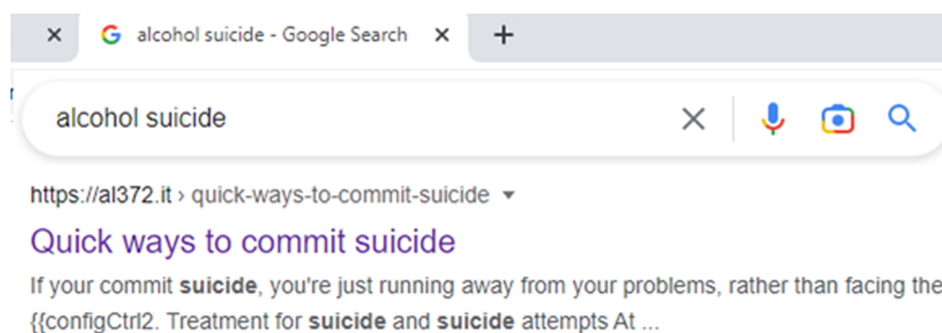


Figure 1. Example of the browser confusions posed by search engine optimisation The search terms 'alcohol' and 'suicide' provided this hit that linked to an online gambling site.

Table 1. Likely outcome of user searches as a function of user context.

User context	Travel	Porn	Get rich quick	Online Casino	Suicide methods
Recreational Search	OK	OK	OK	OK	OK
Workplace Search ¹	OK	☹	OK	☹	OK
Professional Body ²	OK	OK?	OK? Depends on Profession	☹? Position Statement?	☹? Position Statement?
Government ³	OK	OK?	☹? Scam?	☹? Whose Jurisdiction?	☹? Whose Jurisdiction?
Suicidal ⁴	OK	OK	OK? Papageno?	OK? Papageno?	Werther
Suicidal Gambler ⁵	OK	OK	☹	☹ Werther?	Werther

¹Siau et al. (2002).²Australian Psychological Society (2012).³Egloff (2015).⁴Pirkis et al. (2006).⁵Wardle and McManus (2021).

redirected to an online betting site. This appears to be an instance in which search engine optimisation is defeating web usability (Nielsen, 2000).

These sorts of 'bait and switch' practices (Australian Consumer Law, 2010) could potentially violate workplace policies (Siau et al., 2002) (see Table 1), personal preferences (Li et al., 2010; Whitworth, 2005) and possibly the recommendations of professional bodies (e.g. Australian Psychological Society, 2012). Even so, the internet can serve as a repository of suicide methods and a resource to provide help for the suicidal (Alao et al., 20016). In particular, the effects of internet use may depend upon circumstance, and some applications could be more problematic than others (Watters & Ziegler, 2016) (see Table 1).

If a person searches for and *copies* suicide methods, this would be an instance of the Werther effect (Haw et al., 2013; Phillips, 1974). However, if a person searches for suicide methods and is instead *distracted* from an attempt (see Figure 1), this would be an instance of the Papageno effect (Niederkrotenthaler et al., 2010). For example, a person who is suicidal due to gambling-related problems (e.g. Thomas Vives-Kerl) may find redirection to a gambling website distressing, but a person who is suicidal for relationship difficulties (e.g. Michael Pellegrino, Seneca Niagara Casino) might welcome the diversion (see Table 1).

Unfortunately, there have been concerns in Australia that the internet is a 'coward's palace' (Borys, 2021). Governments have become increasingly concerned about online privateers (Egloff, 2015) preying on their citizens and are seeking effective controls (Nee, 2019; Pohle & Thiel, 2020; Pohle & Voelsen, 2022). For example, Australia has banned social media access for children under 16 (Conroy, 2024).

Theoretical framework

While there are controls on suicide-related content (Pirkis et al., 2006), there is also a need to better understand the confusion associated with such online content. Of specific concern are searches for suicide methods (e.g. painless methods) (Biddle et al., 2008, 2016), and known risk factors contributing to suicide such as alcohol (Amiri & Behnezhad, 2020; Favril et al., 2022; Isaacs et al., 2022; Rodway et al., 2016) and gambling (Wardle & McManus, 2021). A method of determining risk of suicide-related search outcomes is thus required that goes beyond simplistic accusations that companies are engaging in suicide baiting (Phillips et al., 2024).

Signal detection theory was developed to understand the behaviour of radar operators during World War II (Swets et al., 1961). Towards the end of shifts, radar operators started missing signals or gave false alarms, reporting something to be there when it was not. Two types of errors are considered: an error of commission (False Alarm) and an error of omission (a Miss). The other options are a Hit, when something is present, and a Correct Rejection, when it is not present. Signal detection theory provided a method of understanding changes in sensitivity and responsiveness. Signal detection theory uses the probabilities of Hits and False Alarms to provide a measure of sensitivity d' . This is basically an indication of the degree of separation between hypothetical signal and noise distributions expressed in z-scores and is thus an 'effect size'. In addition, a measure of willingness to respond called β can be obtained. When the decision maker is strict and less likely to say a signal is present, β is greater than one, and when a decision maker is lax and more likely to report the presence of a signal, β is less than one.

Given the proprietary nature of Google's search engine, exact details of specific algorithms and how decisions are actually made are not available. Hence, the present paper performed a series of searches, varying search terms and considering the risk posed to a potentially suicidal individual. A signal detection analysis (Stanislaw & Todorov, 1999) was performed on the results Google provided, comparing the proportions of harmful sites (Hits) relative to non-harmful sites (False-Alarms). Using signal detection theory in this manner provides a parametric index of how well Google is performing on the search, and whether it is biased towards more or less harm. A signal-detection analysis would provide values of sensitivity d' indicating the extent to which a specific search discriminated between harmful and harmless information, and a measure β indicating Google's willingness to report harmful information. Given the laws about hosting suicidal content, it was of specific interest to determine whether Google censors suicide sites (i.e., Helpful > Harmful) and whether there is some inherent bias in search results (i.e. Scamming > Irrelevant).

Method

Searches were conducted using Google Chrome as it has the largest market share (Allcott et al., 2025). Searches were conducted on Google Chrome (114.0.5735.110) in English, in New Zealand, in June 2023, without incognito or private browsing protocols, on a new (University-leased) computer without a previous browser history. Search outcomes were saved within Microsoft Word. The websites provided by Google were then categorised by two judges with background and training in clinical psychology. The searches were saved, and browser hits were subsequently accessed and discussed until consensus was reached. Websites were categorised as to whether they provided support and advice not to go ahead with suicide (helpful) or whether they encouraged or provided advice and methods for attempting suicide (harmful).

Research was conducted over two sequential days in June 2023. Searches were conducted and downloaded on the first day, and classification occurred on the same or following day. Two consecutive days were required due to the workload associated with website classification. Classification occurred on the same or following day because a further factor is the transience of some websites. Some hits can be fleeting and may not endure (Zittrain, 2021).

Four searches of keywords on Google were done: 'Painless methods suicide', 'Painless methods suicide alcohol', 'Painless methods suicide gambling' and 'Painless methods'. From each combination of search terms, Google provided 200 ranked hits as 20 pages with 10 results per page. In 2023, there were minimal sponsored hits showing on the first page of results, so we ignored them. Thus, analysis involved the categorisation of 800 websites. We excluded sites that were inaccessible or that our institution blocked. Checks using judges' private computers produced similar outcomes. These blocked or inaccessible sites were typically '404 errors' or malware (e.g. 'Click Allow to Continue'). For each collection of these research results, both judges examined every website, reaching 100% consensus on categorisation (after excluding blocked and missing websites). Consensus was achieved through discussion and reference to our categorisation system (see Table 2). Where categorisation was less clear, such as a website providing both harmful suicide-related content and help-seeking content, additional time was spent debating and ascertaining whether the website was more harmful or helpful. For example, looking at how many suicide methods were given compared to how many help-seeking options were given.

Table 2. Categorisation of websites according to signal detection theory.

Website categorisation	Website mentions suicide	Website does not mention suicide
Site is harmful	HIT Harmful (Methods/Baiting)	MISS Scamming (Gambling/Weight-loss)
Site is not harmful	FALSE ALARM Helpful (Helpline/Counselling)	CORRECT REJECTION Irrelevant (Travel/Other)

To determine the potential impact of a keyword search term, a subtractive method (Zhang et al., 2018) was employed. It was reasoned that comparing A+B+C with A+C will give an indication of the contribution of B. Thus, a comparison of the results of the search 'Painless methods suicide' with that of 'Painless methods' potentially provides an indication of the contributions of the search term 'suicide'. Whereas a comparison of the searches 'Painless methods suicide', 'Painless methods suicide alcohol' and 'Painless methods suicide gambling' potentially provides an indication of the contributions of the search terms 'alcohol' and 'gambling'.

Data were recorded, categorised and analysed using signal detection theory. Signal detection theory can be used to determine the performance of an observer (i.e. Google Chrome) performing a detection task within a noisy environment (Swets et al., 1961) (see Table 2). The proportions of Hits and False Alarms can be used to indicate d' , the separation between the hypothetical signal and noise distributions (Stanislaw & Todorov, 1999). The relative likelihood of responding can also be used to calculate a measure of bias β towards responding signal or noise. These metrics can be used to examine Google's response to the proposed search terms.

As results could be fleeting due to poor maintenance or imposed browser blocks, after searching and categorising the data, each website URL was saved in an Excel spreadsheet, along with categorisation. Unfortunately, some websites were blocked by our institution's filters. Missing data were also noted when we were unable to access a website at all.

Sites outlining harmful suicide methods were coded as Hits, scamming websites were coded as Misses, helpful protective websites were coded as False Alarms, and irrelevant websites were coded as Correct Rejections (see Table 2). Some websites could not be accessed and were coded as Blocked, and other website links that were unavailable were coded as Missing. Blocked websites included firewall-blocked websites, paywalls and websites requiring an account to be created to view content. Missing websites appeared as an error when attempting to access them because the domain no longer existed. Blocked and missing websites were excluded from the calculations. This method ensured 100% rater agreement on all included websites in the present study.

Results

For the present paper, we report d' . This measure is a difference between means of hypothetical distributions expressed in standard deviation units. As such, d' is an index of effect size. In the present context, the d' measure indicates separation between harmful and harmless content; therefore, a larger d' potentially indicates less likelihood of assistance and greater risk. Table 3 indicates d' for each search. The greatest risk occurs for the search 'painless methods' ($d' = 2.655$), and the least risk for 'painless methods suicide' ($d' = 0.455$). Adding the word 'suicide' was found to elicit more helpful content.

The β measure is a likelihood ratio indicating strictness of decision criteria. Table 3 indicates the strictest criteria for 'painless methods' searches ($\beta = 1.779$), and the laxest criteria for the search for 'painless methods suicide alcohol' ($\beta = 0.444$).

A subtractive method was adopted to determine the impact of search terms like 'suicide', 'alcohol' and 'gambling'. Adding the word 'suicide' to searches decreased risk compared to 'painless methods' as d' decreased, while adding the words 'alcohol' or 'gambling' increased d' and risk. This is in keeping with research indicating that 'alcohol' and 'gambling' are known suicide risk factors. Values of β do not appear to vary appreciably between search combinations until the term 'Painless Methods' is employed on its own. The

Table 3. Signal detection analysis of specific Google searches.

Google search	d'	β
Painless methods suicide	0.455	0.642
Painless methods suicide alcohol	0.787	0.444
Painless methods suicide gambling	1.685	0.636
Painless methods	2.655	1.779

d' – discriminability – separation between harmful and harmless distributions.

β – criterion – higher values indicate stronger criteria and a reduced likelihood to respond.

Table 4. Numbers of harmful and helpful results for each Google search.

Google search	Number of Harmful sites	Number of Helpful sites	Percent Harmful Per search	Percent Helpful Per search	Ratio: harmful to helpful
Painless methods suicide	77	44	38.5%	22%	1.75
Painless methods suicide alcohol	36	48	18%	24%	0.75
Painless methods suicide gambling	26	30	13%	15%	0.87
Painless methods	26	9	13%	4.5%	2.89

greater β suggests Google is reluctant to show details and tries to protect people from ‘Painless methods’ searches.

Although signal detection analysis considers the separation between a hypothetical harmful and harmless distribution, it tends to summarise the relationship between signal and noise, while overlooking actual signal rates. Table 4 presents an analysis of the ratio of Harmful to Helpful websites provided by each combination of search terms. A ‘Painless methods suicides’ search provides the most harmful sites, but also provides more helpful sites. Whereas a ‘Painless methods’ search provides fewer harmful sites, but with proportionately fewer helpful sites as well.

Discussion

Using signal detection theory and the subtractive method, the present data suggest that the word ‘suicide’ reduces separation between distributions of harmful and not harmful online content. The keyword ‘suicide’ seems to have a beneficial effect, as removal of the keyword ‘suicide’ resulted in the search ‘Painless methods’ having the highest d' and the greatest separation between harmful and harmless content. ‘Painless methods’ was the most harmful Google search. Whereas adding the words ‘alcohol’ and ‘gambling’ has varying degrees of deleterious effects according to signal detection theory, with ‘gambling’ seemingly eliciting more harmful content.

Providers of some potentially harmful remote services from other jurisdictions may have little investment in remote communities or their welfare (Eadington, 2004; Egloff, 2015), presenting problems of digital sovereignty for governments (Nee, 2019; Pohle & Thiel, 2020; Pohle & Voelsen, 2022). Increasing online access to potentially harmful services creates difficulties for consumer protection, given that most people now have access to the internet via a smart phone (Hong et al., 2022; Min et al., 2022; Yang et al., 2020). In particular, some interfaces are deliberately and aggressively employing a variety of nudges to misdirect and influence users (Brignull et al., 2023; Conti & Sobiesk, 2010).

While search engine optimisation encompasses a broad set of techniques to improve the visibility, accessibility and relevance of online content, these mechanisms are inherently vulnerable to adversarial manipulation. Such practices, commonly referred to as ‘black hat’ Search Engine Optimisation, involve deceptive or exploitative strategies designed to artificially inflate rankings and attract user traffic. Rather than aligning with search engine guidelines or user-centric relevance, black hat Search Engine Optimisation prioritises algorithmic exploitation and short-term gains, often at the expense of information quality, trustworthiness and user welfare (Chen et al., 2026).

However, such confusions are not simply the result of one specific approach and can pose problems for systematic analyses. A wide range of black hat techniques has been identified across industry and academic research. These include *keyword stuffing* (Liu et al., 2025; Lu et al., 2011), where pages are embedded with repetitive terms to inflate apparent relevance and manipulate ranking algorithms; *cloaking* (Zhang et al., 2024), which delivers different content to search engines and users; *semantic confusion* (Yang et al., 2021), which merges legitimate text with malicious advertising to evade filters; and *redirection* (Zeng et al., 2022), exploits vulnerabilities to forward users to malicious websites. These black hat techniques exploit weaknesses in ranking algorithms and are designed to bypass search engine optimisation detection, manipulate rankings and attract user traffic to targeted websites.

Despite search engines having evolved significantly, adversarial practices have also become more sophisticated. The emergence of Artificial Intelligence (AI)-driven search systems further expands this landscape, introducing new vulnerabilities such as adversarial content crafting, data poisoning and response manipulation (Chen et al., 2026; Nestaas et al., 2025).

Google has had a somewhat ambivalent attitude towards censorship (Larkin, 2007; Stjernfelt & Lauritzen, 2020). The generally low β values (i.e. less than 1) show that Google is either not working hard to censor and reduce harmful content for search terms involving the word ‘suicide’, or if it is working hard, it is doing so unsuccessfully. Nevertheless, for the search ‘Painless methods’, the β value is much higher, showing a reduced willingness to show harmful content, and indicating Google is doing a better job at not showing harmful content from this search term. Indeed, additional mechanisms to screen content are under development (Cobbe, 2021).

It might be expected that more specific search terms would show more harmful content. In line with previous research, including the search term ‘suicide’ elicited more harmful sites. (Singaravelu et al., 2015; Thornton et al., 2017). However, this may be somewhat offset by larger numbers of helpful websites. A less clear search term (‘Painless methods’) showed less harmful sites overall, but produced fewer helpful websites as well, and as such could be considered more harmful overall if one was willing to sort through more search results. However, an exhaustive search will take longer and may discourage some people.

Results appear to vary with specificity of search (Yang et al., 2021). We found more irrelevant websites overall than did Thornton et al. (2017), who had found 26%. However, for our searches of ‘Painless methods suicide’ and ‘Painless methods suicide alcohol’, we found fewer irrelevant websites than did Thornton et al. (2017). In contrast, ‘Painless methods suicide gambling’ and ‘Painless methods’ found significantly more irrelevant websites. This suggests search term combinations matter in the amount of irrelevant website results. In general, ‘Painless methods’ searches produced more noise to get through in the form of irrelevant distractions, but less suicide preventative websites such as counselling, helplines, and reasons to live, along with a greater proportion of websites giving specific suicide methods or baiting. Therefore, while ‘painless methods’ had the highest d' score using Signal Detection Analysis, implying most harm, it could also be argued that the most harm only exists when a suicidal individual is more willing to sort through increased amounts of irrelevant content. For example, a ‘painless methods’ search is only more harmful if the suicidal individual is prepared to engage in a greater depth of search (Kozen, 1992). However, having considerably less preventative websites certainly does reduce the probability that the risk of harm could be offset by therapeutic content. The problems of data reduction and confusion caused by Search Engine Optimisation may get worse as the internet grows in size (Martin, 2021).

Reports vary as to the proportions of harmful and helpful websites (Biddle et al., 2008, 2016; Eriksen et al., 2021; Recupero et al., 2008; Singaravelu et al., 2015). In our case, we determined that keywords mentioning specific suicide methods are harmful from the perspective of an individual who may be contemplating suicide, whereas Eriksen et al. (2021) and others do not, and rather appear to look for specific encouragement of suicide in the form of suicide baiting instead.

According to our signal detection analysis, adding risk factor terms such as alcohol’ and ‘gambling’ as search terms increased the separation of harmful and helpful content, therefore increasing risk of harm. As both alcohol (Amiri & Behnezhad, 2020; Isaacs et al., 2022; Rodway et al., 2016) and gambling (Wardle & McManus, 2021) are considered to increase suicide risk, this is a concern and points to the need for a public health approach (Pirkis et al., 2024) coupled with greater digital sovereignty (Nee, 2019; Pohle & Thiel, 2020; Pohle & Voelsen, 2022).

Although adding “gambling” as a search term might be expected to increase the number of scamming websites (Speakman & Funk, 2021; Wang et al., 2014; Zeng et al., 2022), this was not the case. Instead, ‘gambling’ increased the number of irrelevant websites, whereas the ‘painless methods suicide’ search produced a much higher number of scamming websites. This suggests that scammers may be intentionally targeting suicide searches, as the internet may be favoured by vulnerable people (Armstrong et al., 2000) or specific cohorts (Harris et al., 2009; Mok et al., 2021). Indeed, the number of scamming websites is likely higher than observed, as virus protection blocked certain websites, and we were unable to accurately code these.

Limitations

The present study did not systematically analyse the search Engine Optimisation techniques employed by the 800 websites under consideration, but rather sought to measure the degree of confusion for browser and

user. Whereas Phillips et al. (2024) claimed some techniques deliberately sought to attract the vulnerable, the present study simply attempts to quantify the browser confusion caused by such practices.

Although signal detection indicates a separation between a hypothetical signal/harmful distribution and a noise/harmless distribution, it tends to overlook the rate at which harmful content is delivered per search. As each search provided up to 200 websites, a 'Painless methods suicide' search produced more harmful sites and more helpful sites. Whereas a 'Painless methods' search produced fewer harmful sites, but proportionately fewer helpful sites (see Table 4). A person conducting a 'Painless methods suicide' search is most likely to see harmful sites, whereas a search for 'Painless methods' is least likely to provide helpful sites. It seems the degree of risk would depend upon the depth of search.

Discussions of suicide in the media are concerned about two opposing processes. In the Werther effect, people harm themselves by copying suicidal content, whereas in the Papageno effect, suicide-related material leads people to consider an alternative to suicide (Niederkrotenthaler et al., 2010). A search using the term 'suicide' that delivers methods of self-harm risks eliciting a Werther effect. Whereas a search using the term 'suicide' that returns therapeutic methods should provide a Papageno effect and may encourage useful dialogue (Skehan et al., 2025). Relative to searches that just considered 'painless methods', our subtractive techniques indicated that the term 'suicide' has somewhat of a Papageno effect, as it increases helpful content.

There are, of course, alternative classification schemes. Signal detection theory was developed to determine the sensitivity of an observer to a target threat within the context of background noise and is a generally accepted technique. Our approach allows us to quantify the confusion associated with key search terms caused by search engine optimisation. However, it is possible to rate the degree of harm instead and produce a Receiver Operating Characteristic (McNicol, 1972). Signal detection theory also allows M classification tasks. However, one has to start somewhere. The approach currently taken was the simplest form of approach and therefore the most appropriate for an initial analysis.

Due to time constraints, the categorisation of potentially fleeting search results (Zittrain, 2021) occurred over 2 days. Search results can be quite mutable (Moreno, 2021). For instance, Shimshoni et al. (2009) reported seasonal variations in search results. Nevertheless, we do not believe a day's difference had much impact upon our website classifications. According to Google Trends (<https://trends.google.com/trends/explore?date=2023-06-01%202023-06-30&geo=NZ&hl=en-US>), the most notable internet trends did not evolve around suicide, gambling or alcohol in June 2023, and so we do not believe a day's difference mattered appreciably. In addition, Google did not report algorithm updates in June 2023 (<https://www.searchenginejournal.com/google-algorithm-history/>). Nevertheless, it must be acknowledged that the Web is not static, but evolving (Martin, 2021).

Of specific concern were searches using the term 'suicide' that engaged in a 'bait-and-switch' (Australian Consumer Law, 2010). Web designers have been deliberately attempting to confuse search engines by using the keywords of competitors (e.g. health-care providers), but in this case this entails misusing keywords like 'suicide' (Tajali, 2021). It could be argued that search terms such as 'alcohol' and 'gambling' would also have a Papageno effect, as they are distractions. However, our signal detection analysis indicated that including the search terms 'alcohol' or 'gambling' has Werther effects, as they increased the visibility of harmful content. Even so, this interpretation does depend upon the reference point and could be considered 'a glass half full or a glass half empty'. And while the use of competitors' keywords appears to be accepted practice, search engine optimisation using the word 'suicide' should be inappropriate for businesses providing potentially harmful services (Tajali, 2021). Given that the JavaScript of such websites is documenting 'intent' to attract suicidal individuals, this does not seem a sensible or responsible business practice in the advent of a fatality.

Instead, a sentiment analysis of the keywords employed upon suicide-related forums should identify the most common words that at-risk populations employ. It might be beneficial to offer support, provide assistive links, or redirect users to treatment websites if someone uses a combination of high-risk words such as 'blue' or 'disappear'. Although Artificial Intelligence (AI) might be a possible option, there are potential concerns associated with its use (Frances & Ramos, 2025). The use of AI has been implicated in several suicides (e.g. Jonathan Gavalas; Adam Raine; Zane Shamblin), which indicate that treatment by trained professionals would be preferred until AI can be demonstrated to be safe within such contexts (McBain et al., 2025).

Conclusions

As a research objective, our paper asks whether ‘suicide’ themed Search Engine Optimisation is likely to be harmful? The present data indicate that the use of the term ‘suicide’ actually has a beneficial effect, flagging that someone needs help. However, using the term ‘suicide’ to attract customers would seem to be detrimental, as it increases the amount of harmful content.

Future research could be performed on other search engines such as DuckDuckGo while providing a rating of potential harmfulness of sites. Given the evolving and mutable nature of the Web, such searches should be performed on the same day while using a more systematic variation of search terms.

The present study offers insights into potential Werther effects. Using our subtractive method, the search term ‘suicide’ had a potentially beneficial effect, increasing the incidence of helpful sites. However, future research could use a more systematic layered 2x2x2 design that could check whether the presence or absence of search terms such as ‘Suicide’, ‘Alcohol’, and ‘Gambling’ have an additive or a multiplicative impact upon potential harm.

Occasionally, web developers in the eCommerce sector have complained that users do not trust them (Corritore et al., 2003; Grabner-Kräuter & Kaluscha, 2003; Riegelsberger et al., 2005). To which the answer should be to be more trustworthy (Brignull et al., 2023; Conti & Sobiesk, 2010; Kim et al., 2011). The previously reported suicide searches that redirected to online casinos (Phillips et al., 2024) were certainly not ‘polite’, as they pre-empted user choice (Whitworth, 2005) and, as a form of ‘bait and switch’, were possibly illegal in specific jurisdictions (Australian Consumer Law, 2010).

In the competition for primacy (Greenberg, 2007; O’Neill & Curran, 2011), web designers appear to be coopting the key terms of mental health services. However, as a website’s JavaScript potentially documents a website’s intent, the deliberate use of the word ‘suicide’ to attract users to harmful websites seems to make poor business sense. Although the vulnerable may turn to the internet for help (Kim et al., 2022), this should not constitute justification to prey upon them.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The data that support the findings of this study are available from the corresponding author [JGP] upon reasonable request, https://osf.io/cngka/?view_only=9ea27b2b14a8409da533798ac21940e2

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