

RESEARCH ARTICLE

Support for a browser plug-in blocking online alcohol imagery among Australian participants: A qualitative interview study

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Abstract

Issues Addressed: Alcohol depictions are extremely common online, and there is a reported relationship between alcohol exposure and alcohol use. A browser plug-in specifically designed to block online alcohol depictions may be helpful to prevent the uptake of alcohol or increased alcohol use.

Methods: Twenty-five semi-structured interviews were conducted, examining participants' beliefs about the effects of online alcohol exposure and their support for developing the browser plug-in.

Results: Using reflexive thematic analysis, we found participants highlighted a clear impact of viewing alcohol online and offline alcohol use. Participants believed a browser plug-in that blocked alcohol was acceptable and would be especially useful for minors (to prevent alcohol initiation) and those who are aiming to reduce their alcohol use.

Conclusions: Participants emphasised that viewing online alcohol exposure had an impact on drinking behaviours, such as increased craving and temptation. The browser plug-in was considered an easy intervention tool for both parents and people who are experiencing alcohol-related problems or trying to reduce their drinking.

So What? Participants' continuous support of an alcohol-blocking browser plug-in suggests that future health promotion strategies should consider the development of a prototype plug-in.

KEYWORDS

alcohol, children, drinking behaviour, media, prevention

1 | INTRODUCTION

With the ubiquitous use of smart devices and social media sites, people are spending more time online than ever before. Recent estimates indicate that in 2021, Australians spent more than 6 h using the Internet per day, with almost 2 h being spent using social media sites.^{1,2}

In 2022, more than 80% of Australians were active social media users, compared with only 58% in 2015.³ Although internet access affords a range of important opportunities, such as connecting with people worldwide and efficient access to information and entertainment, it has also raised new challenges. For instance, it has increased marketing reach and exposure to harmful content, such as alcohol.⁴

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Exposure to alcohol imagery is almost impossible to avoid online, occurring as advertisements on webpages, in social media posts, and in online videos and music.⁵ Digital marketing is one common source of online alcohol exposure, for instance, an average of 765 alcohol advertisements were identified on Meta platforms (e.g., Facebook, Instagram, Messenger) per week in Australia.⁶ Even individuals who cannot legally purchase alcohol are exposed to digital marketing; Robards et al.⁷ demonstrated that almost 70% of Australian adolescents (in their study) aged 16–17 viewed targeted alcohol advertisements online. In the United States, Jernigan et al.⁸ reported that youth (aged 13–20) recalled exposure to alcohol marketing on almost all media forms in the past 30 days, and especially on the Internet. This included alcohol advertisements, images of celebrities using alcohol, and images of celebrities wearing alcohol-related logos and brands. However, limited research has examined participants' beliefs about online alcohol exposure, alcohol marketing, and potential consequences. In their citizen scientist study, Robards et al.⁷ found that over 80% of participants felt that targeted advertising from unhealthy industries (e.g., alcohol, gambling, sugary drinks) should be reduced and better regulated.

Of particular concern is the relationship between exposure to alcohol imagery and alcohol consumption, with multiple recent reviews confirming this relationship.^{5,9,10} For instance, Noel et al.'s⁵ systematic review found that engaging with digital alcohol marketing (e.g., liking or clicking an alcohol advertisement) was positively related to alcohol use. Additionally, Curtis et al.'s⁹ meta-analysis found a significant relationship between alcohol-related social media engagement (e.g., liking, viewing, or commenting on alcohol-related social media content) and both self-reported consumption and alcohol-related problems among young adults. Furthermore, Sargent and Babor¹⁰ suggested that the relationship between alcohol marketing and drinking onset and binge drinking among young people was 'causal'. Several theories have been referenced to understand this link between exposure and alcohol use (e.g., Social cognitive theory, Social norms theory¹¹; see reference 12, for a review). Although the link is complex, most theories tend to suggest that exposure to alcohol leads to positive expectancies or alcohol being viewed as more normative, which in turn predicts initiation or increased alcohol use.¹²

Given the impact of alcohol exposure in digital media, one strategy aimed at reducing alcohol use could be to limit the amount of alcohol imagery people are exposed to online. The majority of solutions, however, tend to focus on limiting advertising, often through policy change. A recent report by the Lancet commission called for policy to regulate and reduce alcohol advertising aimed at children.¹³ Similarly, the World Health Organization¹⁴ highlighted that policy interventions should target the volume and content of alcohol marketing and regulate sponsorships promoting alcohol and new marketing methods (e.g., social media), especially aimed towards young people.

Although these strategies are important, alcohol exposure is not exclusive to only marketing efforts. For example, in a recent analysis of Twitter posts, about 2% of user-generated tweets were alcohol-related, and almost 40% of these posts referenced intoxication.¹⁵ Similar to advertising, user-generated references to alcohol online are

overwhelmingly positive and even references to consequences are often positive.^{16,17} Additionally, on social media, these depictions may be more influential given that people are exposed to friends' alcohol use (which may have a greater influence on their normative perceptions of alcohol) or by influencers they follow and respect^{12,18} (see reference 19, for a review of norms). As a result, any policy changes that would reduce advertising, would not reduce the vast amount of user-generated or non-marketing-related alcohol imagery people see online.

One key solution is to develop and deploy a browser plug-in aimed at blocking alcohol imagery. Currently, users can install an ad blocker, or change settings on their browser to avoid alcohol ads (e.g., Google Chrome allows users to limit advertisements about sensitive topics; Google Help²⁰). However, a browser plug-in has the potential to expand beyond the scope of current ad blockers or restrictive browser settings by blocking any depiction of alcohol, such as user-generated alcohol-related images (i.e., images from social media posts from friends featuring alcohol) and influencer marketing. Pornography blockers are one example of these applications, by installing a browser plug-in capable of blocking pornographic imagery on devices.²¹ Such content blockers may be technically feasible as algorithms used to identify alcohol in images are relatively accurate.^{22,23} For example, Norman et al.²⁴ determined that automated estimation tools show promising early results at detecting alcohol from Instagram images; while their algorithm overestimated the number of false positives, overall accuracy remained high. Prior to development and investment, it is important to determine (1) if people believe that online alcohol exposure is a problem, and (2) if a browser plug-in blocking alcohol imagery online would be considered acceptable, and garner support from the end users.

In this study, we first aimed to examine participants' beliefs about online alcohol exposure and subsequent alcohol use, as well as the extent of their support for a browser plug-in capable of blocking digital alcohol exposure. Second, we aimed to determine what features of such a browser plug-in would be considered acceptable. Given that a browser plug-in may be particularly important for (1) people aiming to reduce their drinking, and (2) young people who have not initiated alcohol use, we recruited participants who were aiming to reduce their drinking, along with parents of primary school-aged children (aged between 6 and 12 years old).

2 | METHODOLOGY

2.1 | Participants

Semi-structured interviews were conducted between November 2022 and January 2023 with 25 participants (20 adults who wanted to reduce their drinking and five parents) from across Australia. Overall, they were predominantly female (64%) aged between 18 and 64 (18–24 = 4%; 25–34 = 36%, 35–44 = 44%; 45–54 = 8%; 55–64 = 8%). For the 20 participants who were aiming to reduce their drinking, their average AUDIT-C score was 6.1 (SD = 2.4²⁵). Scores of

3 and higher (for females) and 4 and higher (for males) likely signifies hazardous drinking, and all participants who were aiming to reduce their drinking scored above this threshold.²⁶ We did not measure alcohol use of the five participants recruited as parents.

Although our initial intention was to analyse the data from parents and drinkers separately, similar themes were generated from both groups, and we combined them for simplicity. Participants were recruited using social media advertising on Facebook and Instagram and were eligible to participate in an interview if: they were between 18 and 65 years old, used chrome as their main browser, spoke English, were residing in Australia, and were the parent or carer of at least one child in primary school or aiming to reduce their drinking. We selected those who use chrome given that it is the most commonly used browser and development of a tool would likely start with chrome.

2.2 | Procedure

Interested participants who fit our inclusion criteria were invited to participate in an interview over Zoom, which was conducted by the first author. Once verbal informed consent was obtained, participants were asked about: (1) their and/or their family's internet and social media use, (2) their and/or their family's alcohol use, (3) their views and experiences interacting with alcohol exposure online, and (4) their views on a browser plug-in that would block online depictions of alcohol. We described the browser plug-in as something similar to an ad blocker, a downloadable plug-in that would load onto browsers and passively sit on taskbars, blocking all alcohol imagery, including user-generated posts and advertisements. We asked their thoughts on the general efficacy, usefulness, and utility of an alcohol-blocking browser plug-in, and explored their feedback and ideas on specific features, the design, and the appropriate target audience. For example, we asked participants about their preferences for how the image was blocked (e.g., blurred, using emojis), how much of the image should be blocked (e.g., only the beverage vs the full image), and any conditions under which they would/would not use the browser plug-in (e.g., on certain websites, certain times of day, if it slightly slowed devices). Interviews lasted between 30 and 60 min, were audio-recorded and transcribed verbatim. Transcripts were then uploaded to NVivo (QSR International) for coding and analysis. Participants were reimbursed with \$20 digital gift cards thanking them for their contribution. This study was approved by La Trobe University's Human Research Ethics Committee (HEC22224).

2.3 | Data analysis

Transcripts were analysed using reflexive thematic analysis, led by the first author (a PhD student working on alcohol use research). Reflexive thematic analysis emphasises the researcher's subjectivity generating codes and themes, where 'codes' refer to the building blocks that form themes.^{27,28} As a result, the first author's prior experiences and

beliefs, and her social positioning, influenced her generation of codes and themes. First, the first author listened to and read and re-read each transcript, writing some initial notes. Next, data was coded inductively, and reflected participants' explicit wordings and meanings.^{27,28} The initial coding process was repeated twice, editing and combining codes, and creating a short description to reflect each of the codes' meanings. Then, the first author began forming initial themes by merging similar codes together. After multiple collaborative meetings where the research team (comprising of sociologists and psychology-trained alcohol and drug researchers) provided feedback, themes were revised and finalised.

3 | FINDINGS

Our analysis generated four inter-related themes relevant to participants' experiences with alcohol exposure and their support of the browser plug-in. The first theme—*Environments of exposure*—explored tensions between what participants noted as 'real world' exposure versus 'online/digital' exposure. The second—*Blocking the temptation of alcohol exposure* and third themes—*Protecting the digital generation*—focused specifically on the browser plug-in's usefulness, such as blocking the temptation to think about or drink alcohol, and to protect minors. The final theme—*Different target audiences require different versions—Personalising and tailoring features* examined the acceptability and perceived usability of specific features, and the importance of adapting the browser plug-in.

3.1 | Environments of exposure

Participants highlighted that alcohol exposure was hard to avoid, both in the 'real' and 'digital' world, claiming that alcohol consumption was a part of the Australian 'DNA' or culture. For example, in the 'real' world, participants were exposed to alcohol advertising in supermarket catalogues, on the radio, on billboards, and at sporting venues (e.g., football, cricket).

...So I watch a lot of cricket as well, and I'm immediately thinking when – I think VB support or sponsors the Australian cricket team, for example. So that immediately comes to mind... And just I guess when you're watching the game, it's always on the billboard or it's always on the game sort of thing...

—Adult_Drinker_5.

Conversely, online alcohol exposure was described as an individualised experience, dependent on the person's age or generation, personal interests, and the typical platforms or websites they used. Alcohol was identified as prevalent on almost all platforms, including social media (e.g., Facebook, Instagram), websites, YouTube, or on streaming services. Participants described being most frequently exposed to alcohol either through alcohol advertisements or friends'

social media posts featuring alcohol (e.g., images or videos of people sharing an alcoholic drink) on Facebook or Instagram (the two most popular platforms). However, participants described that the primary purpose of these platforms was not alcohol related, but that they were used to connect and to relate to others, by posting and sharing images. For instance, when we questioned one participant if they had ever shared something online about their alcohol use, they highlighted:

Not as the primary reason for the sharing [the photos], it would be the secondary. So it would be like an occasion, celebrating something – with drinking in the background. It would never be like, “Ooh just had this delicious bottle of red.” Or, “You’ve got to try this whiskey.” Or anything like that, no.

—Adult_Drinker_9.

Additionally, participants described being exposed to alcohol-related content regardless of whether they were actively searching for it. For example, they described feeling that it was inappropriate, annoying, or frustrating when advertisements ‘disrupted’ their normal online activities or tried to market products to them. This occurred both in the ‘real’ world (e.g., alcohol sponsorships at sporting events or alcohol advertisements) and the ‘digital’ world (e.g., pop-up advertisement banners on the side of regular websites or posts on social media timelines).

Maybe a little irritated, yeah. Maybe irritated at the fact that it’s an ad, and secondly, that it’s an ad for alcohol in particular. That they’re trying to push that particular product on me.

—Adult_Drinker_1.

Consequently, while participants supported the browser plug-in as a temporary feature, widespread alcohol exposure both in the ‘real’ and ‘digital’ world encouraged several participants to advocate for wider societal change. They suggested legislating alcohol advertising at the governmental level, or regulation consistency between the ‘real’ and ‘digital’ world (e.g., choosing to ‘opt out’ of viewing alcohol advertisements online altogether). For instance, one participant who supported the development of an alcohol-blocking browser plug-in, also emphasised the need for increased legislation:

I think it’s a brilliant idea. But I’m sad that it’s [the plug-in] necessary. I really think that this should be legislated at the government level, and restricted that way. I think it’s ridiculous. But, yes, I – good idea in lieu of that.

—Parent_1.

3.2 | Blocking the temptation of alcohol exposure

Participants indicated that online alcohol exposure was ‘suggestive,’ serving as a primer or reminder to drink. This brought alcohol to the

forefront of their mind, even if they were not considering drinking beforehand. This was particularly tempting if they felt they were at a ‘low point’, such as feeling stressed or sad, or if the person was drinking heavily. One participant drew attention to the impact of viewing alcohol online by sharing the impact on subsequent alcohol use:

[It tries] to get us to drink more. But it depends what mood you’re in; when you’re seeing alcohol, and if you’re having a depressing sort of day, it’s like, “Oh, this looks appetising, I think I need to go and get a drink.” So, it’s like it’s testing you when you’re at your low point, I guess. They just make it sound so delicious or something.

—Adult_Drinker_18.

Another participant described alcohol exposure as ‘triggering’ reoccurring thoughts about alcohol, and eventually leading to increased craving.

If you see it, you think about it, and then you’re like – especially if you’ve had it before and you’ve liked it, it just triggers the thought in your brain and then you start craving it.

—Adult_Drinker_10.

Similarly, many participants indicated that intentional branding or advertising strategies aimed to entice or tempt them to purchase alcohol. For example, alcohol advertisements highlighted trendy features, emphasising unique colours, flavours, or tastes, or made the beverage look ‘delicious’ or ‘tasty,’ such as emphasising the water droplets on the side of beer bottles. This helped to create a brand ‘identity’ or ‘image,’ increasing participants’ awareness of new products and brands to try. For instance, one participant shared how they purchased vodka seltzer via a Smirnoff advertisement on Facebook:

Interviewee: There was something I saw recently about vodka seltzer... I saw that on Facebook recently and I thought, that’s interesting. In actual fact, I actually purchased that box after seeing it, because it came in four different flavours...

Interviewer: Was that an advertisement?

Interviewee: Yeah, so it was a Smirnoff advertisement that I saw on Facebook. I didn’t even know what a seltzer was, but – because I always stick to the same sort of drinks...Seltzer wasn’t something that I drink regularly, but I just wanted to give something different a try...

—Adult_Drinker_3.

As participants described the content they were exposed to, it became clear that online alcohol content disproportionately fabricated idealistic portrayals of alcohol use, without sharing any

damaging or harmful consequences. For instance, participants discussed how friends' social media posts depicted alcohol as "essential" in celebratory events, and as relaxing, appealing, or glamorous.

As I was indicating before it's usually showing good times, you know? People with their friends, having a great old time – eating, drinking, feeling relaxed, feeling in a good mood. Cheering, celebrating – that kind of atmosphere is portrayed.

—Adult_Drinker_17.

In comparison to positive portrayals, some participants were opposed to censoring negative alcohol content using the browser plug-in, such as hangovers, arguments/fighting, or vomiting. This was depicted as the 'truth' about drinking and was especially important aimed towards minors. For example, viewing images of drunk driving served as a warning or lesson, and would work in opposition to the alcohol industry attempts to facilitate positive drinking portrayals.

I think the problem is that a lot of ads make it look really cool, fun and then people think, "We should do that. We should try that. We should get that." It gives you a fake appearance of what that alcohol is going to be or what vibe it's going to give you because you see an ad that looks really good. But it's not a real representation of that drink and what it can actually do to you.

—Adult_Drinker_19.

Most participants agreed that blocking online alcohol content, including positive portrayals of alcohol, alcohol advertising, and social media posts featuring alcohol, using the browser plug-in, was a realistic next step for regulation. By doing so, they believed this would help block the temptation to think about, purchase, and drink alcohol.

3.3 | Protecting the digital generation

Participants seemed particularly concerned about protecting the next generation of 'digital children' who would be spending more and more time online. For instance, a few parents indicated that they were worried about their pre-teens and teenagers being disconnected and socially withdrawn from the 'real' world because of the 'digital' world.

...There's a lot of mucking around going on. So, yeah. It's really hard. And in Covid, being in lockdown and home-schooling and everything, all the kids want to do now is be online. They don't want to do anything else. So, yeah, it's hard.

—Parent_3.

It was not just the parents in our sample who stressed the importance of protecting minors; adult drinkers in our sample drew on their identities and roles as uncles, aunts, grandparents, teachers, and

community members to express their concerns about minors' online exposure. The greatest concern was that adults were unsure of what children were doing online or what they were being exposed to. They drew comparisons to their own upbringing, re-iterating that because of the internet and social media, minors were more exposed, and at an earlier age, to inappropriate content than they were. This not only included alcohol, but extended to violence, sexual content, and drugs.

...You don't know what they're looking at, but they're just so exposed to everything, that nothing's really like innocent anymore. People used to be innocent up until their late teens, but now, it's happening as they're a lot younger. They've seen their parents drinking, they're watching people drink online, and they would influence them to try and get alcohol, drink their parents alcohol or get someone to buy them underage alcohol and stuff like that. I definitely think that children seeing these things in social media, it is something that pushes them to want to go try – or drink, get that product...

—Adult_Drinker_3.

Participants highlighted that minors needed to be protected from online alcohol exposure because they were impressionable and vulnerable. There was a concern that minors were susceptible to peer pressures and easily influenced as a collective, especially if they wanted to be viewed as 'cool' or to be 'part of the group.' In particular, there was concern that online alcohol exposure taught minors that drinking was socially acceptable, fun or exciting, tempting and initiating earlier alcohol use.

I guess so, because when you see the ads or photos online, the teenagers do not have much control. Or even if they do, they're curious. Say for example when you are about 18, you never drink before, and you just want to get – tempting to try. And then those events are kind of encouraging you to do so.

—Adult_Drinker_16.

It was important to parents to control their children's environment while they still could, and all participants (including parents and adult drinkers) endorsed support for a parental-controlled alcohol-blocking browser plug-in. Parents wanted the opportunity to restrict children's alcohol exposure until they were ready to have an age-appropriate discussion, or until their child was older and could make their own informed decisions. For instance, one parent was concerned that online alcohol exposure was teaching her child about alcohol before she had the chance to do so:

...I have noticed a couple of times my [child] has said to me things about, "What does such and such taste like?" I think it might have been vodka or something... As I mentioned, [their] dad, he's really only a beer drinker, and it did get me thinking how [do they] even know about this, let's say it was vodka. I'm like, how

[do they] even really know about that? We don't go into bottle shops looking around or anything. So, yeah, I think that must have come from online somewhere and obviously has caught [their] attention.

—Parent_4.

Most participants agreed that minors (i.e., under 18) should not be exposed to online alcohol content. The inescapable nature of alcohol exposure meant it was important to be able to tailor the browser plug-in to block a diverse range of alcohol depictions on different platforms. This included alcohol advertisements, viewing social media posts from friends featuring alcohol, and crucially, any positive or glamourised alcohol depictions.

Consistently, there was widespread agreement that drinking 'scenes' (i.e., the character or influencer holds/shows a drink) on YouTube, TikTok or streaming services should be blocked for minors, as they spent most of their time on these apps.

See, if the kids also using Facebook and all that, Facebook is something which I would definitely – and I think – I don't use TikTok and all that stuff but TikTok would be one of the things where kids are a lot on – on those platforms... And definitely watching YouTube and stuff, they should also have that plug-in saying that, you know, kids shouldn't be watching it.

—Adult_Drinker_20.

Most participants recommended blocking alcohol exposure from between 8 and 18 years old, indicating that minors in this age range were the most impressionable. A few participants indicated that blocking alcohol exposure could even be beneficial beyond the legal drinking age and into young adulthood (until their brains were fully developed) or for children aged younger than eight.

...But I guess you may as well say from any, like my [toddler's age], why let them see it at all? They take in way more than what you give them credit for I think. Like, there'll be things I think that [they] hasn't heard or doesn't – then next minute [they'll] start singing a song or something and I'll be like, "How do you know that song?" So, it really wouldn't hurt for a child of any age really, up until I don't know, I guess 18 if that's the legal drinking age.

—Parent_4.

Interviewee: Especially young people whose emotions and maybe sense of self control is a bit limited that might be, this might be really helpful for them because I know at that age that I wasn't as disciplined as I am now... So having this help would be good for them because they don't want to go off social media altogether, but just

having maybe these images blocked out of – it's kind of out of sight, out of mind...

—Adult_Drinker_14.

Interviewer: ... When you say young people, can you give me an age range of what you mean?

Interviewee: Well, it seems like a lot of 16 to 24 year olds who I believe are officially classified as youth, that age group do drink excessively because they're just starting out on their drinking journey, I suppose...

—Adult_Drinker_14.

3.4 | Different target audiences require different versions—Personalising and tailoring features

Overall, respondents were supportive of the alcohol browser plug-in, and believed it would be useful to varying degrees dependent on the target audience. For instance, participants indicated that the more 'control' the person had over themselves or their drinking, the more options they should have to 'control' the browser plug-in.

Yeah again I like – I think choice is always great. Because I think what works for me might not work for my neighbour who's at a different stage in the limitation process. So yeah I would definitely say that providing the user to tailor their experience with this plug-in is the best option always.

—Adult_Drinker_9.

Some of the adult drinkers self-identified as 'casual', 'occasional', or 'social' drinkers. As these participants felt they did not have alcohol problems, they believed they were less impressionable or influenced by alcohol exposure, reporting less of a need to use the browser plug-in. Instead, among most of these participants, the browser plug-in's usefulness was dependent on the specific context, setting, or time period, for example, at night time. Consequently, participants wanted the ability to adapt the browser plug-in, having more options available to them than for other audiences. For example, the browser plug-in was best suited as a 'buffer', such as being able to click and view the image if it was blocked.

I guess so, because say if I want to still keep updated with my friends and what they're doing, I kind of still want to do that. But it kind of gives me a buffer, right, and it automatically pops up? So if I want to see particular images, it would be great. Say for example if there's some work events that involve alcohol, and on Facebook I will still want to know about. But I may not want the kids to know.

—Adult_Drinker_16.

These participants suggested that it was more valuable to them to be able to turn the tool on/off when they needed it,

such as: when they were drinking or when they were more tired, during night-time, on a Friday or Saturday night, during Dry July or the holiday season (when there was increased alcohol marketing). Others indicated wanting the option to decide what type of alcohol exposure they wanted to block, such as only one type (advertising, social media posts, pop-up ads) or a combination. For instance, it was more important to this audience to block alcohol advertising than memes or posts on social media.

Let me think, at a certain time of the day, I feel like I'm more susceptible to ads when I'm tired, so I want it on when I'm browsing from 10 pm onwards for something. And then the other was certain websites, I guess on websites, they probably have more images of alcohol than others, so there'd be red flags.

—Adult_Drinker_1.

Many of our participants 'othered' their drinking patterns by setting themselves apart from more 'vulnerable' audiences, such as younger people or people who are trying to stay sober. Most interviewees specifically emphasised that a browser plug-in was more useful for people who were experiencing problems from alcohol or trying to reduce consumption, as there was a greater concern for tempting alcohol consumption. For this audience, participants indicated there should be more boundaries or extra steps, such as questioning if they were 'sure' they wanted to view the image. For instance, instead of being able to turn the plug-in on and off, people suggested setting a timer or set number of days.

...I think it gives them the option of – you know, at the end of the day, it's up to the person, right, in terms of their self-control...maybe instead of just clicking it, very simply, maybe they could be – you need to do a few extra steps that you need to go back into the browser and have to disable or block some – or block the images, for example, just to give them a few more – I don't know, prompts or considerations before they do consider removing the blocked image...

—Adult_Drinker_5.

Additionally, participants agreed that minors should not have control over the browser plug-in, stressing the importance of parental control, such as being password protected and only the parent having the option to override. The 'control' over the browser plug-in was different among this target audience, as it was the parents who should have that responsibility. For instance, children should not be prompted to click and view the image, and the entire image should be covered and blocked.

...If it's being used by a parent, then maybe there should be parental controls. So, maybe it's controlled by a password or a log-in. I'm just thinking, similar to

Net Nanny, when you're trying to block inappropriate content for kids...

—Parent_3.

The overall preference, regardless of target audience, was to be able to tailor *how* the image would be blocked, giving the individual the choice to select what they want to substitute the alcohol image with, and *how much* of the image. There was support for the range of different options offered, such as replacing the images with accountable messages (e.g., the reasons I am not drinking), personalised images, such as an avatar or an emoji, blurring the image or 'blacking' it out (i.e., having a black square cover the image).

...Maybe you can get people to select, what do you want to substitute it with? Do you want it substituted with a reinforcing message or something otherwise benign or targeted reinforcement... I don't know, but it depends on people's reasons...

—Adult_Drinker_11.

For example, some participants preferred to blur the whole image, as opposed to only blurring the beverage itself. As it was common for sensitive content to be blurred online, participants indicated that they would not necessarily know it was an alcohol-related post. Quite a few respondents agreed that this was the best option for people who were experiencing problems from alcohol or trying to reduce their drinking, as it would draw less attention to the post. For these participants, they were concerned that choosing a personalised image would only spark curiosity or remind them of alcohol.

Probably blur the image, because if it's just blurred, it shouldn't really trigger anything unless yeah, but if it was covered from something, you're going to still think about that other image...

—Adult_Drinker_10.

In contrast, others argued that creating a personable link, such as a chosen emoji, positive or accountability measure was more beneficial than blurring the image. Participants described that an intentional replacement would help remind people who were alcohol-dependent or trying to cut down on alcohol of their targets and goals. Similarly, replacing the alcohol image with another image, such as a picture of the family dog, was considered more suitable for the minor audience, as they would be focused on that image instead of the alcohol.

Interviewee: Probably to allow the user to choose their image, just – it's more personalised.

—Adult_Drinker_12.

Interviewer: Yeah. And how do you think that might help people?

Interviewee: They can choose an image that they like or they're comfortable with. So I don't know, it could feel more personal to them.

—Adult_Drinker_12.

Overall, this example highlights how the goals, features, and usefulness of the browser plug-in differed based on the target audience. It was important to give participants the choice to shape the browser plug-in dependent on their individual needs. For instance, a few participants identified religious or cultural motivations for reducing exposure to alcohol, wanting alcohol to be fully blocked.

The other thing that I think it would be useful for... I'm just thinking, religions or cultures that don't drink alcohol. Yeah, I think that would be really good for them. Because they're just not interested, so - yeah, if I was in that situation, I'd love just to be able to turn it off. It's just a whole lot of advertising and everything that I don't need to see.

—Parent_3.

Additionally, consistent of all target audiences, participants in our sample questioned the capabilities of the plug-in. They indicated it may be 'buggy' or difficult to use and talked about the impacts on the seamless use of social media pages or videos. It was extremely important to all participants that installing the program would be easy and effortless, requiring no extra cables, cords, or be technically challenging in any way. Consistently, most participants were resistant to sluggish or slowed-down devices. If the browser plug-in significantly impacted the performance of their devices, people indicated they would be annoyed and frustrated, regardless of target audience. This further extended to viruses, or if the program used up too much battery, data, memory, or storage.

...I just can't handle anything being slow, I need something to be normal. So, by having a device added to your internet it shouldn't make anything slow; if it makes things slow no one's going to use it. Everyone's had years of hiccups with [broadband name] and not having service, and anything, and I don't think anyone would want to opt in to having worse off service, or anything slow.

—Adult_Drinker_18.

4 | DISCUSSION

In this study, we investigated whether Australian adults believed that online alcohol exposure influenced alcohol consumption, and if they considered an alcohol-blocking browser plug-in an acceptable tool for blocking alcohol depictions. We examined specific features of a potential browser plug-in to determine what was perceived as acceptable. First, we found that participants believed that alcohol exposure was linked to increased alcohol use, as advertisements and user-generated posts 'reminded' them about alcohol, alerting them to

drink. Second, we found interviewees were very supportive of the browser plug-in, which was considered an acceptable next step in addition to legislation.

Consistently with previous research, participants in our study highlighted excessive exposure to alcohol marketing and alcohol content online.^{6,15} We expanded on this by sharing that participants were exposed to alcohol without even searching for it, occurring both in the 'real' and digital world. Constant streams of alcohol exposure reinforced cultural norms around alcohol (e.g., viewed as an ordinary part of life) and drinking (e.g., normalised and socially accepted in Australia). Furthermore, consistent with systematic reviews^{5,9,10} participants reported a link between alcohol imagery (including user-generated content and marketing) and alcohol use. According to the participants, user-generated content promoted social alcohol use and celebratory drinking, and advertisements glamorised alcoholic beverages to entice alcohol use. We expanded on previous reviews by identifying more than just increased alcohol consumption as an outcome of user-generated content and alcohol marketing; as participants reported increased craving, temptation, intent to purchase alcohol, and contributed to framing cultural and social norms around alcohol. Owing to our qualitative research design, we were also able to demonstrate how participants were surprisingly critical of alcohol exposure (e.g., criticising the disproportionate amounts of positive alcohol representations) and were increasingly concerned about the impact on minors (e.g., enticing and encouraging alcohol initiation).

Resonating with previous Australian research (supporting increased regulation of alcohol advertising⁷), a browser plug-in was considered an acceptable way to block online alcohol depictions, especially for minors and people trying to reduce their drinking. However, the browser plug-in was only considered acceptable if participants could tailor and personalise it depending on the target audience or the user. For instance, for self-identified occasional, social, or casual drinkers, the browser plug-in was useful for blocking positive alcohol depictions promoting celebratory drinking, with a specific focus among this audience for alcohol advertisements. In contrast, participants noted that all references to alcohol (including advertisements and user-generated content) should be blocked for minors and people who were experiencing alcohol-related problems. Besides the ability to tailor the browser plug-in, participants commonly highlighted that it was important the program run smoothly and seamlessly—for example, without slowing devices down, creating hassles or interruptions, and an easy experience downloading and installing the program. This was so important that many agreed that if the program was not simple and effortless to use it would deter them from using it at all. This presents a technical challenge for computational resources and the development of a plug-in would need to be thoroughly tested using a range of computers with varying capabilities. Additionally, various optimizations to improve performance needs to be explored to ensure the user browser speed is not adversely affected. Therefore, a key next step is to demonstrate feasibility, similar to those browser plug-ins that block pornography. Indeed, it is important to note that while Norman et al.²⁴ found that alcohol could be detected in Instagram images, the images were processed on powerful GPUs. A challenge moving forward is to demonstrate similar accuracy with a model that is small

enough to be fast enough to block alcohol images on much smaller CPUs (e.g., mobile phones).

4.1 | Strengths and limitations

Despite the convenience sampling method, our study was strengthened by including a relatively diverse sample, featuring Australians of different ages and genders. However, this study could be limited by the time and date of recruitment (during the holiday season and in the summer) with some participants noting that this season was associated with increased alcohol marketing and consumption in Australia. Additionally, only five parents were included in our sample despite being a targeted participant group. However, as previously acknowledged, similar themes were generated from both adult drinkers and parents, with adult drinkers drawing on their identities as parents/uncles/aunts/teachers/grandparents/community members. Another potential limitation is that we did not provide a prototype browser plug-in to show the users, so that they would have more of a concrete understanding of the limitations and capabilities of a browser plug-in. Given that our research determines participant interest and support, future research can expand by developing the proposed prototype to determine the technical feasibility and acceptability of such a plug-in. Future research should also interview people who were dependent on alcohol or clinicians of people seeking treatment to clarify from their perspective if the browser plug-in would be beneficial, or what specific features would be useful.

5 | CONCLUSIONS

To conclude, our sample of Australian adult drinkers and parents supported the development of an alcohol-blocking browser plug-in, alongside stricter governmental regulation and restriction for alcohol-related marketing and exposure. The browser plug-in was considered an easy intervention tool for parents and people who are experiencing alcohol-related problems or trying to reduce their drinking. Interestingly, the browser plug-in was also classified as acceptable in specific situations (e.g., dependent on time/content/setting) among self-identified casual, social, and occasional drinkers.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no conflict of interest.

DATA AVAILABILITY STATEMENT

Due to the sensitivity of the data, and participants not providing consent, supporting data are not available to be publicly shared.

ETHICS STATEMENT

This study was approved by La Trobe University's Human Research Ethics Committee (HEC22224).

INFORMED CONSENT STATEMENT

Verbal informed consent was obtained from all participants for being included in the study.

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