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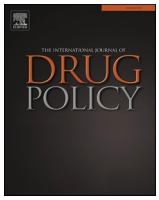

Research Paper

'Zombie drugs': Dehumanising news frames and public stigma towards people who use drugs

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ABSTRACT

Background: News media is an important determinant of public understanding of drug policy topics. Recent media reporting around the use of synthetic drugs such as xylazine makes frequent use of non-human metaphors, including reference to the effects of 'zombie drugs'. We investigated whether presentation of news stories which included such dehumanising frames were associated with i) increased stigmatising attitudes towards people who use drugs; and ii) lower support for relevant harm reduction programmes.

Methods: We undertook a cross-sectional online experimental study with a randomised factorial design, using a nationally representative sample (UK). Participants (N = 1417) were randomly presented with one of six simulated news stories based on recent reports of the identification of xylazine in the drug market. Stories differed with respect to text (neutral or referred to either a 'zombie drug', or a drug that 'turns people into zombies'); and accompanying imagery (neutral or depicting immobile people under the influence of drugs). Stigmatising attitudes and support for harm reduction were assessed using instruments including an adapted version of the Attribution Questionnaire-Substance Use Disorders (AQ-SUD) and analysed using MANOVA.

Results: Data were obtained for 1235 participants (52 % female; mean age 47 ± 16). Attitudes towards people who use drugs were more stigmatising amongst participants presented with either of the dehumanising text conditions (both $p < 0.001$). There was no main effect of imagery and no interaction between text and imagery on stigma scores. Support for harm reduction programmes did not differ between conditions.

Conclusion: Our study is the first to show that dehumanising 'zombie' framing frequently used in news reporting is associated with higher public stigma towards people who use drugs. News media is an important source of public education on drugs, so to avoid reinforcing stigma the use of dehumanising language and framing, such as 'zombie' metaphors, should be avoided. Organisations working to reduce stigma towards people who use drugs should encourage news outputs and journalists to avoid this type of representation.

Introduction

The global burden of drug related morbidity and mortality remains high (UNODC, 2024; World Health Organization, 2024). In the United Kingdom (UK), deaths associated with opioid and cocaine use continue to rise, whilst drug treatment and harm reduction intervention responses are sub-optimal, particularly in light of forecasted changes in illicit drug markets (Black, 2020; Caulkins, Tallaksen, Taylor, Kilmer, & Reuter, 2024; Holland, Copeland, et al., 2024). Despite prioritisation in national drug strategies (H.M.Government, 2021; Scottish Government, 2022), and the United Nations Common Position on Drugs (UNODC, 2018), stigma towards people who use drugs (PWUD) is pervasive, and acts as a barrier to policy objectives (Guise, Harris, McCusker, McNeil, & Werb, 2023; Holland, et al., 2022), whilst there is a limited evidence base to guide stigma reduction interventions (Bielenberg, Swisher, Lembke, & Haug, 2021; de Andrade Tostes, Dias, da Silva Reis, da Silveira, & Ronzani, 2020; Holland, Freeman, et al., 2024; Livingston, Milne, Fang, & Amari, 2012; Sibley, Colston, & Go, 2024). Stigma towards PWUD contributes to a large individual burden including social isolation, prejudice, discrimination, and inequity in care (Lloyd, 2013). Internalisation of stigma can lead to poor mental health, harmful coping strategies, and label avoidance which act as barriers to timely treatment

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seeking and positive outcomes (Biancarelli, et al., 2019; Fontesse, et al., 2020; Lancaster, Seear, & Ritter, 2017; Long & Jepsen, 2023; Neale, Nettleton, & Pickering, 2010).

Stigma occurs through negative labelling, stereotyping, separation, status loss, and discrimination in the context of a power differential (Link & Phelan, 2001). Labelling is affixed on the basis of certain characteristics or behaviours that the majority group consider to be undesirable or morally deviant, leading to individuals and groups being socially excluded and discriminated against (Thornicroft, et al., 2022). The attribution theory of stigma suggests that the causal attributions that people make about the (internal vs external) causes, controllability, and dangerousness of others' behaviour or condition lead to inferences about personal responsibility, which then predict emotional responses such as pity, anger and fear, and a preference for discriminatory or helping responses (Corrigan, Markowitz, Watson, Rowan, & Kubiak, 2003). The theory has been applied in previous studies of stigma towards groups of PWUD (Goodyear, Haass-Koffler, & Chavanne, 2018; Sattler, Escande, Racine, & Goritz, 2017; Sattler, Zolala, Baneshi, Ghasemi, & Amirzadeh Googhari, 2021; Witte, Wright, & Stinson, 2019).

Personal familiarity with stigmatised groups also predicts attitudes (Corrigan & Nieweglowski, 2019). However, familiarity with PWUD who experience problems is low in the general population, and in accordance with media cultivation and social learning theories, perceptions are significantly shaped by media exposure, such as through news or television documentaries (Bandura, Bryant, & Zillmann, 2002; Gerbner, Gross, Morgan, Signorielli, & Shanahan, 2008; Wild, et al., 2021; Wild, et al., 2019). As causal attributions are affected by how target group characteristics and precipitating events are framed, news media can play an important role in determining stigma (Corrigan & Nieweglowski, 2019; Sumnall, Atkinson, Montgomery, Maynard, & Nicholls, 2023). Intergroup differentiation through stigma is used to establish status and preferential positions when competing for limited resources (e.g. funding for services), and this may be important in the context of wider political, public and media discourses in the social constructions of groups that are deserving or undeserving of support (Marsden, 2024; Schneider & Ingram, 1993; Valentine & Harris, 2014).

Stigmatising labels and attributional beliefs about the causes of behaviour can also lead to dehumanisation (Brown, 2020; Haslam, 2006; Haslam & Loughnan, 2014). Dehumanisation can be subtle, whereby members of an out-group are denied some but not all traits of humanity relative to an in-group, or more blatant when out-group members are denied the attributes of humanness altogether. These intergroup differences are exaggerated through metaphors and analogies comparing out-group members with threatening, thoughtless, and emotionless non-human entities, or animals and objects that evoke disgust (Tipler & Ruscher, 2014). When individuals and groups are dehumanised in this way, intergroup empathy, concern, and helping is reduced, aggression is disinhibited, and moral disengagement processes engender stronger support for punitive practices (Boysen, Isaacs, Tretter, & Markowski, 2020; Cuddy, Rock, & Norton, 2007). Dehumanisation has been used politically to forgo responsibility for systemic determinants of drug related harm and to justify discrimination and inequity (Habib, Giorgi, & Curtis, 2023). As with stigma, individuals and groups can believe that others perceive them in a dehumanising way, and through observation or interaction, this can be internalised with negative effects of reduced self-worth and help-seeking (Bastian & Crimston, 2014; Kteily, Hodson, & Bruneau, 2016).

Historically, there have been a wide range of stigmatising news media representations of PWUD, often overlapping with public perceptions of the racial and socioeconomic characteristics associated with the use of specific substances (Bilişli, et al., 2024; Booth, 2003; Furst, Johnson, Dunlap, & Curtis, 1999; Giorgi, Habib, Bellew, Sherman, & Curtis, 2023; Habib, et al., 2023; Marsh, Copes, & Linnemann, 2017; Stringer & Maggard, 2016). Dehumanising framing is also evident, emphasising the threat and violence of intoxicated individuals, or PWUD more generally, and this has been used to justify discriminatory policy responses (Habib, et al., 2023; Swalve & DeFoster, 2016). Use of this framing has changed over time, and is not consistently applied to all types of drugs and the people who use them (Giorgi et al., 2023). This currently includes drugs popularly and stereotypically associated with societal 'problems' or drug dependence, such as crack cocaine, some types of opioids (e.g. heroin, fentanyls), and novel psychoactive substances (e.g. synthetic cannabinoid receptor agonists) (Adley, Atkinson, & Sumnall, 2022; Alexandrescu, 2018). People subject to these types of framings include those experiencing street homelessness, who use some types of drugs in public, or have multiple needs or stigmatised identity markers.

In contemporary Western entertainment culture, 'zombies' are dead people brought back to life without the ability to speak or move easily, cannibalistically preying on the living, and characterised by rotten flesh and strange behaviour (Krautkrämer, 2023). Recent news media reporting of the identification of xylazine, a non-opioid sedative, in the illicit drug supply, has frequently categorised it as a 'zombie drug', due to psychopharmacological effects of sedation, and association with progressive necrotic skin ulceration in consumers (Bowles, Copulsky, & Reed, 2024). A UK Government press release announcing plans to control the drug under the Misuse of Drugs Act 1971 referred to it in such terms (*Britain takes decisive action to ban 'zombie drug' xylazine*; Home Office (2024)). One recent study providing the first analysis of xylazine in the UK illicit drug market (Copeland, et al., 2024) was accompanied by extensive international media reports either describing it as a 'zombie drug' (e.g. *'Zombie' drug xylazine found in cannabis THC vapes in UK*; Roberts (2024)) or producing 'zombie-like' effects in humans (e.g. *Flesh-eating 'zombie drug' sweeping US is linked to 11 UK deaths*; Knapton (2024)), despite this language not being used in either the study text or accompanying press release. International news reporting on synthetic cannabinoids and novel psychostimulants have similarly drawn upon non-human analogies and behaviours associated with such comparisons (e.g. cannibalism) (Alexandrescu, 2018, 2020; Atkinson & Sumnall, 2021; Swalve & DeFoster, 2016). Text and narration in this type of reporting is often accompanied by imagery that reinforces these dehumanising metaphors and potentially evokes disgust (e.g. soft tissue damage, tooth decay, public intoxication) (Ayres & Jewkes, 2012; Ayres & Taylor, 2020).

This framing may be partly understood from a journalistic perspective as an attempt to create newsworthy and sensational content to attract audience attention in a highly competitive commercial media environment, and/or to provide a familiar and efficient, albeit simplistic, reference point for explaining novel or unusual drug topics (Atkinson & Sumnall, 2021; Kelly, Saitz, & Wakeman, 2016). There may also be the intention to scare readers about the effects of drugs and deter use. However, the use of dehumanising metaphors in reporting may also be an editorial decision to signal suggested audience responses to PWUD that align with the political and moral position of the publication (Marsh, et al., 2017; Tipler & Ruscher, 2014). Other studies have highlighted how subtle metaphorical framings can have significant impacts on the perceived appropriateness of different policy responses. For example, describing crime as a 'beast' as opposed to a 'virus' is associated with a preference for punitive responses, as opposed to mitigating the determinants of criminal activity (Thibodeau & Boroditsky, 2011). In the case of zombie framing, emphasising non-human characteristics and behaviours may evoke feelings of threat, fear, and disgust (Haslam, 2006; Haslam & Loughnan, 2014; Monroe & Plant, 2019; Montgomery, Atkinson, Jones, & Sumnall, 2023; Sumnall, Atkinson, Gage, Hamilton, & Montgomery, 2021). Consequently, as the response to zombies in popular culture is "*extreme social distancing or the death of the infected*" (Bowles, et al., 2024, p. 104338), this may exacerbate public stigma, adding to unmet care needs and social harms (Friedman, et al., 2022).

Previous reviews and content analyses of dehumanising representations of PWUD in both news and entertainment media have all concluded that this type of framing exacerbates public stigma toward PWUD (e.g. Alexandrescu (2020); Atkinson and Sumnall (2021); Ayres

and Bond (2012); Ayres and Taylor (2020); Bowles, et al. (2024); Brown (2020); Erceg-Hurn (2008); Giorgi, et al. (2023); Habib, et al. (2023); Linnemann and Wall (2013); Netherland and Hansen (2016)). A small but emerging body of work, including empirical studies, has also shown how media representations of PWUD are an important determinant of public stigma and/or public policy preferences (Atkinson, McAuley, Trayner, & Sumnall, 2019; Atkinson & Sumnall, 2018,2021; Belackova, Stastna, & Miovsky, 2011; Ghosh, et al., 2022; McGinty, Stone, Kennedy-Hendricks, & Barry, 2019; Sumnall, Atkinson, Montgomery, et al., 2023). In contrast, there have been no empirical studies examining the effects of dehumanising news media representations of PWUD on public stigma or public support for public health policies and interventions.

In this study we investigated whether presentation of a simulated news story (headlines, text, and imagery) that included dehumanising references to 'zombie drugs' and 'zombies' was associated with i) stigmatising attitudes; and ii) support for relevant harm reduction programmes. Our primary hypotheses were that compared to neutral reporting, there would be greater stigmatising attitudes and less support for harm reduction after exposure to news stories that i) used headlines and text that referred to a) 'zombie drugs' or b) drug effects that 'turned people into zombies'; and ii) used photographic imagery reinforcing 'zombie' associations (heavily sedated people in public places). We included two 'zombie' text conditions: one which attributed zombie characteristics to the person using drugs, and one which attributed them to the drugs being taken. We hypothesised that there would be greater effects on stigma and support in response to stories that presented blatant dehumanisation of people with non-human characteristics (i.e. 'turned people into zombies') compared to 'zombie drugs' references, which attributed these properties to the drugs rather than those using them. Considering the use of imagery in news media, we also hypothesised that there would be an interaction effect between text and images.

In a similar study of news reporting of drug related deaths, we found a relationship between several individual-level characteristics, stigma, and support for public health policies (Sumnall et al., 2023). We undertook an additional analysis that was not pre-registered to partly test whether these findings replicate, but also to assess whether these outcomes were affected by the experimental stimuli used. Based on our previous findings and the familiarity hypothesis (Corrigan, Edwards, Green, Diwan, & Penn, 2001), we predicted that greater familiarity with PWUD would be associated with lower stigma and greater harm reduction policy support. Previous research has also suggested higher stigma towards a range of statuses and conditions among people holding more conservative views (e.g. Agley, Xiao, Eldridge, Meyerson, and Golzarri-Arroyo (2022); Broady, Brener, Cama, Hopwood, and Treloar (2020); DeLuca, Vaccaro, Seda, and Yanos (2018); Schomerus and Angermeyer (2021)). This has been suggested to be a result of the greater valuation of attributes such as personal agency and responsibility for behavioural outcomes, and negative stereotypes towards people with unpredictable behaviours, leading to greater desire for social distance (Löve, Bertilsson, Martinsson, Wängnerud, & Hensing, 2019). We therefore predicted that individual political conservatism and political party preference would be associated with greater stigma and lower harm reduction support. We included both questions as conservatism is multicomponented (Feldman & Johnston, 2014), and different elements are associated with different components of stigma (Löve et al., 2019). This was also justified as public polling suggests that UK voters do not necessarily support policies that are entirely consistent with conservative-liberal voting preferences (YouGov, 2019, 2024).

Methods

Design

The study utilised a factorial design (three text x two imagery conditions), and participants completed an anonymous online survey.

Participants

Adult members of the UK public ($n = 1417$) were recruited from a nationally representative research panel (provided by Prolific, UK; https://prolific.co/) in July 2024. Forty eight participants failed to complete the survey (clicked the survey link but did not proceed, or 'timed out' by failing to submit answers within 45 min of commencement). One hundred and eighty two submissions were removed for failing attention checks (see *Procedure* section below), leaving a final sample size of 1235 (87.2 %). An *a priori* power calculation for interaction effects using MANOVA (G*Power 3.1; Faul, Erdfelder, Lang, and Buchner (2007)) indicated that to detect a medium effect size ($f = 0.25$; power 0.95), a minimum sample size of 200 was required. For follow up factorial ANOVAs ($f = 0.25$; power 0.95), a minimum sample size of 251 was required.

Eligible individuals were people currently living in the UK and aged over 18 years. These two criteria were assessed through demographic profiling attributes provided by participants to the panel administrators. The sample was representative of the UK adult population on the basis of sex, age, and ethnicity.

Materials

Stimuli

A total of six news story conditions were prepared, and participants were randomised to receive one of these. Stories were adapted from news reports published in the UK in April 2024 in response to a study about the spread of xylazine throughout the UK illicit drugs supply (Copeland, et al., 2024). Stories were presented as an online news report published by the British Broadcasting Company (BBC) and included publisher branding, a headline, main image and caption, lede, and main text. The BBC is the UK's most frequently accessed and trusted news platform (Newman, Fletcher, Robertson, Eddy, & Nielsen, 2022). A fake drug name, *Pedril*, was generated using an online name generator to reduce bias from pre-exposure to news reporting on xylazine (or synthetic cannabinoids, which are similarly framed as 'zombie drugs' in the UK media).

Stories differed on two factors:

1. Text: i) *Neutral Text* – Pedril and its effects were described using neutral and scientific terms; ii) *Zombie Text* - Pedril was described as a 'zombie' drug; iii) *Zombie Plus Text* – Pedril was described as a drug that 'turns people into zombies'.
2. Imagery: i) *Neutral Image* - a photographic image depicting laboratory analysis of a drug sample; ii) *Zombie Image* - a photographic image of immobile people (non-identifiable) under the influence of drugs, typically used in UK reporting of street-based drug use that uses 'zombie' headlines and non-human metaphors and framing (Alexandrescu, 2020).

The six stimuli conditions were therefore: 1. *Zombie Text* x *Zombie Image*; 2. *Zombie Text* x *Neutral Image*; 3. *Zombie Plus Text* x *Zombie Image*; 4. *Zombie Plus Text* x *Neutral Image*; 5. *Neutral Text* x *Zombie Image*; 6. *Neutral Text* x *Neutral Image*.

An example news story (*Zombie Plus Text; Zombie Image*) is reproduced in Fig. 1 (publisher's branding removed; see Supplementary material S1 for all stories), and the text that was changed between conditions is identified:

Flesh-eating drug that turns users into 'zombies' [1] arrives in the UK

[Main image [2] and caption *Pedril can produce extreme 'zombie' effects* [1] *in drug users*]

Cause for alarm, warn academics, as 'zombie drug' Pedril penetrates the UK's drug markets.

People using illegal street drugs risk taking a very dangerous substance called Pedril, UK experts warn after discovering some confiscated products

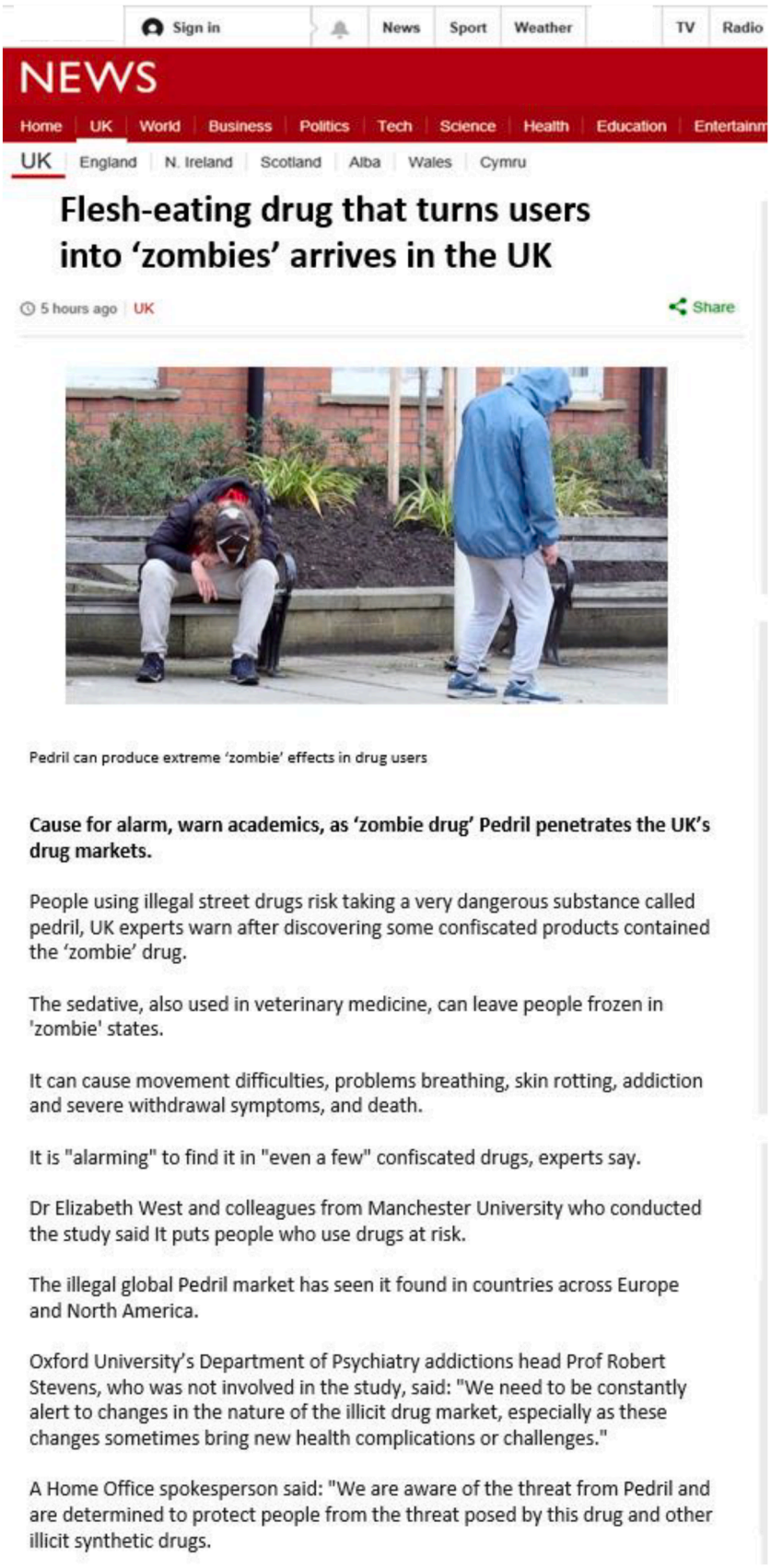

Fig. 1. An example of the stimuli used – *Zombie Plus Text x Zombie Image* (branding removed).

contained the 'zombie' drug.[1]

The sedative, also used in veterinary medicine, can leave people frozen in 'zombie' states. [1]

It can cause movement difficulties, problems breathing, skin rotting [1], addiction and severe withdrawal symptoms, and death.

It is "alarming" to find it in "even a few" confiscated drugs, experts say.

Dr Elizabeth West and colleagues from Manchester University who conducted the study said it puts people who use drugs at risk.

The illegal global Pedril market has seen it found in countries across Europe and North America.

Oxford University's Department of Psychiatry addictions head Prof Robert Stevens, who was not involved in the study, said: "We need to be constantly alert to changes in the nature of the illicit drug market, especially as these changes sometimes bring new health complications or challenges."

A Home Office spokesperson said: "We are aware of the threat from Pedril and are determined to protect people from the threat posed by this drug and other illicit synthetic drugs."

For all stories, Flesch Reading Ease score was 41, indicating easy reading comprehension. Stories were piloted with the lead author's departmental colleagues to confirm comprehension and distinction between conditions.

Outcomes

We created a bespoke 13-item measure to assess the degree to which participants held stigmatising attitudes towards people 'under the influence of Pedril'. We chose this wording as we considered this to be a more emotionally neutral phrase compared to alternatives such as 'used Pedril' or 'intoxicated by Pedril'. Our items were adapted from the 18-item Attribution Questionnaire-Substance Use Disorders (AQ-SUD; Johnson-Kwochka, Aalsma, Monahan, and Salyers (2021); itself an adaptation of the Attribution Questionnaire (AQ-9) (Corrigan, et al., 2003). In accordance with attribution theory, items assessed responsibility (e.g. *How responsible are people under the influence of Pedril for what happens to them?);* negative emotions (e.g. *How angry would you feel at people under the influence of Pedril*?); lack of empathy (e.g. *I would feel pity for people under the influence of Pedril*); and social disengagement (e.g. *Would you want someone under the influence of Pedril as your neighbour?)*. Individual items were scored on a nine-point Likert scale (1 *not at all* to 9 *very much*), and a total score was calculated (range 13–117). Higher total scores represented higher overall stigmatising attitudes (Cronbach's $\alpha = 0.87$).

We assessed support for drug harm reduction interventions using a culturally adapted version of the measure used by Wild and colleagues for the Canadian general public (Wild et al., 2021). After presenting a general description of harm reduction approaches, we asked respondents to indicate if they had been exposed to media coverage featuring examples of drug harm reduction (1 *Yes*; 0 *No*). After providing relevant descriptions of activities, we then assessed support (1 *Strongly oppose* to 5 *Strongly support*) for i) general harm reduction programmes (Wild, et al., 2021); ii) government financial support for harm reduction; iii) provision of drug checking services (Barratt & Measham, 2022); and iv) prescribed 'safer supply' (Slaunwhite, et al., 2024). Scores for these four items were totalled, with higher scores representing greater support for harm reduction ($\alpha = 0.86$).

Additional measures

Demographic questions referred to education, employment, and estimated household income bands. Age, gender, and ethnicity data were added to the dataset by the panel provider. Participants were asked about which party they would vote for in a general election (UK political parties were recoded into *left; right*; and *centre* parties for analysis). To assess political conservatism, we measured level of agreement (1 *Strongly disagree* to 5 *Strongly agree*) with four social policies: i) *The Government should increase its assistance for the poor*; ii) *The Government should lower taxes*; iii) *The Government should be actively involved in solving problems that develop in society*; and iv) *The Government has taken over too many things that should be handled by individuals, families, and private businesses* (Haley & Sidanius, 2006). After appropriate reverse coding of items, higher scores represented greater political conservatism ($\alpha = 0.85$).

Level of familiarity with people who have substance use problems was assessed using a Level of Familiarity (LOF) scale adapted from Corrigan and colleagues (2001). The scale includes 11 dichotomous items ranging from no familiarity (e.g., *I have never observed a person that I was aware had a substance use problem*; (LOF score = 1)) to maximum familiarity (e.g., *I have a substance use problem*; (LOF score = 11)). Respondents indicated whether statements were true or false for them, and an overall score was assigned based on respondents' highest level of familiarity. Higher scores represent higher level of familiarity ($\alpha = 0.75$). Respondents who endorsed 'none of the above' were recoded as missing.

Finally, personal experience of drug death loss was assessed using two items included in a recent estimate of personal overdose loss among US adults (Kennedy-Hendricks, et al., 2024). These questions firstly asked *Do you personally know anyone who has died from a drug overdose?* (*Yes; No; Don't Know*). Respondents who answered *Yes* were then asked *Who do you know that has died from a drug overdose?* (*a family member, a close friend, or an acquaintance*).

Procedure

A pre-launch pilot ($n = 10$) indicated that the median survey completion time was 6.5 min. We planned for participants who subsequently completed the survey in under 3.25 min (one half of the median time, indicating possible lack of attention) to be excluded from the final analysis ($n = 0$). After reading the study information and providing consent, participants first completed demographic questions. They were then randomised using the Qualtrics automated algorithm (at an equal ratio) to receive one of the six story conditions described above. After presentation of the story, they were asked to complete attention checks which comprised two questions about the story (name of drug mentioned, reported effects of the drug), and then the primary outcome measures. Participants then completed the remaining questions.

The research was approved by Liverpool John Moores University Research Ethics Committee (Reference: 24/PSY/040).

Analysis

Our primary analysis was factorial MANOVA with total stigma score and support for harm reduction as the dependent variables, using the multivariate general linear model function in SPSS 29 (IBM Corp, 2023). This analysis plan was pre-registered (https://doi.org/10.17605/OSF.IO/C5K6P).

Hierarchical linear regression analyses, which were not pre-registered, were undertaken with i) stigma score and ii) support for harm reduction as the dependent variables to investigate individual-level predictors. Variables were entered in four steps: step 1) main story factors; step 2) participant demographics (age, sex, education, household income); step 3) political orientation, political conservatism; and step 4) harm reduction support (stigma analysis only), level of familiarity, and having experience of loss through a drug overdose death.

Results

Sample demographic and other descriptive data are presented by randomised condition in Table 1. For discussion purposes, we also present analyses of subcomponents of the stigma and harm reduction outcome measures in Supplementary material S2 and S3.

There was a significant main effect of the MANOVA for the manipulated variable of text (Wilks' $\Lambda = 0.98$; $F_{4,2440} = 6.25$, $p < 0.001$), but

Table 1
Sample characteristics.

	Zombie Text x Zombie Image (n = 199)	Zombie Text x Neutral Image (n = 209)	Zombie Plus Text x Zombie Image (n = 200)	Zombie Plus Text x Neutral Image (n = 210)	Neutral Text x Zombie Image (n = 209)	Neutral Text x Neutral Image (n = 208)	All participants (N = 1235)
Age	44.8 ± 15.1	47.6 ± 15.8	47.4 ± 16.1	49.4 ± 15.4	46.4 ± 16.3	46.5 ± 15.6	47.1 ± 15.7
Female (%)	51.5	54.6	56.9	55.8	50.8	51.3	51.5
Degree or above (%)	59.8	59.3	52.8	57.7	62.7	55.0	57.8
White/White British (%)	78.41[a]	87.0	86.7	89.8	86.5	87.8	86.1
Median income band (£000s)	25–49	25–49	25–49	25–49	25–49	25–49	25–49
Voting preference (%)							
Left wing	63.9	61.1	58.1	58.0	58.9	60.4	61.6
Centre	12.3	11.4	11.6	13.1	13.9	11.2	12.2
Right wing	23.9	27.5	30.2	29.0	27.2	28.4	26.2
Political conservatism	9.9 ± 2.4	9.9 ± 2.6	10.2 ± 2.8	9.5 ± 2.7	9.9 ± 2.3	9.8 ± 2.6	9.8 ± 2.6
Seen harm reduction in media (%)	55.9	56.5	51.8	60.9	56.0	58.2	56.5
Knowing someone who died from a drug related death	11.2	20.9	20.3	17.3	22.1	18.2	18.3
Family member	27.3	20.5	23.3	18.9	19.0	17.6	20.7
Close Friend	13.6	15.9	20.9	32.4	16.7	29.4	21.6
Acquaintance	72.7	68.2	62.8	67.6	69.0	67.6	67.6
Level of familiarity with PWUD	5.7 ± 2.2	5.7 ± 2.4	5.6 ± 2.4	5.9 ± 2.3	5.8 ± 2.4	5.9 ± 2.3	5.8 ± 2.4
Stimuli stigma score	**70.7 ± 15.6**[b]	**69.2 ± 18.6**[b]	**68.0 ± 17.5**[b]	**69.0 ± 18.5**[b]	**65.7 ± 17.4**	**62.6 ± 18.0**	**67.6 ± 17.8**
Harm reduction support score	**15.0 ± 3.7**	**15.0 ± 3.6**	**15.3 ± 3.5**	**15.1 ± 3.6**	**15.5 ± 3.5**	**15.5 ± 3.5**	**15.2 ± 3.5**

[a] Lower than expected White/White British $X^2_5 = 13.1$, $p < 0.022$;
[b] Significant difference between groups, $F_{5,1229} = 5.41$ $p < 0.001$.

not image (Wilks' $\Lambda = 1.00$; $F_{2,1220} = 1.11$, $p = 0.332$). There was no interaction effect for text x image (Wilks' $\Lambda = 1.00$; $F_{4,2440} = 0.729$, $p = 0.572$).

Examining between-subject effects, stigma score was higher ($F_{2,1232} = 11.52$, $p < 0.001$) among participants who had seen the *Zombie* (69.9 ± 17.2) or *Zombie Plus* (68.5 ± 18.0) texts compared to the *Neutral* text (64.2 ± 17.7; $p < 0.001$, and $p = 0.001$ respectively). Stigma scores for the *Zombie* and *Zombie Plus* text conditions did not meaningfully differ from each other ($p = 0.464$). There were no meaningful differences in harm reduction support ($F_{2,1227} = 1.78$, $p = 0.168$) between conditions.

The regression analysis predicting stigma towards depicted subjects, and model parameters are presented in Table 2. The final model was statistically significant ($R^2 = 0.397$; $F_{13,869} = 44.13$; $p < 0.001$). In step 1 (inclusion of story conditions only), presentation of *Zombie* or *Zombie Plus* text, significantly predicted higher stigma scores. In step 2, these two factors continued to predict higher stigma scores, as did younger participant age and not holding a degree or higher award. In step 3, the same two factors and not holding a degree or higher award continued to predict higher stigma scores, as did reporting higher political conservatism, or voting for a right wing vs left wing party. In the final step that included all predictors, the same predictors were associated with higher stigma score, as was lower support for harm reduction, and lower level of familiarity. All other predictors were statistically non-significant.

The regression analysis predicting harm reduction support, and model parameters are presented in Table 3. The final model was statistically significant ($R^2 = 0.242$; $F_{12,870} = 23.16$; $p < 0.001$). In step 1 (inclusion of story conditions only), no variables predicted harm reduction support. In step 2, younger age and holding a degree or higher award predicted higher support. In step 3, age no longer predicted support, but education still did, and support for right wing vs left wing parties predicted lower support. In the final step which included all predictors, education and left wing political party support continued to predict support, as did higher level of familiarity.

Discussion

We investigated the effects of presenting simulated news stories that included dehumanising references to 'zombies' and 'zombie drugs' on public stigma towards PWUD and support for harm reduction policies. Our hypotheses were only partly supported. We found that compared to neutral reporting, both zombie framings were associated with higher public stigma, but there was no difference in harm reduction support. We also found that the images used, and the interaction of text and image, were not associated with differences in stigma or harm reduction support in this context.

Critical reviews and analyses of the use of dehumanising metaphors such as 'zombies' in media reporting of substance use topics have argued that they increase public and professional stigma, acting as barriers to help seeking and leading to poorer experiences of care (Bowles, et al., 2024; Habib, et al., 2023). Our study is the first to demonstrate that this type of framing can increase public stigma towards PWUD. The study sample was the general public, and we did not examine professional and self-stigma, so we cannot draw any conclusions about how this influences care provision. However, as public support is an important component of drug policy development (Barry & McGinty, 2014; Kennedy-Hendricks, et al., 2017; McSween, 2002; Ritter, 2021), stigma towards PWUD may manifest in policy preferences or de-prioritisation of services for particular target groups.

The effects of stigma and dehumanisation can be self-perpetuating. Perceptions or experiences of social distance and exclusion impair self-efficacy, reduce pro-social behaviours, and increase aggression, leading to further isolation (Bastian & Crimston, 2014). Ostracisation is further associated with decreased self-rating of humanness, and increased shame and guilt, indicating internalisation of stigma and dehumanisation (Bastian, et al., 2013). Dehumanisation of out-groups may also be exacerbated when in-group members believe that members of the out-group fail to recognise or understand how they are perceived (Bastian & Crimston, 2014). Thus, a failure of out-group members to acknowledge that public intoxication, unusual behaviour, and physical appearance is seen as 'inhuman' to others, including through media representations, may further exacerbate dehumanising beliefs. Infrahumanisation (the belief that in-group members are more human than members of out-groups), one measure of dehumanisation, can arise even in the absence of direct intergroup conflict (e.g. an encounter with an intoxicated individual in public), and has been shown to be higher towards symbolic threats (such as the 'zombie' in our study) than realistic threats, especially when the out-group is perceived as posing danger to an in-group's customs, values and identity (Rodríguez-Pérez & Betancor, 2023). This has also been shown in response to photographs depicting members of the out-group occupying

Table 2
Summary of hierarchical regression for variables predicting stigma towards depicted subjects.

Variable	B	SE	b
Step 1			
Intercept	62.48	1.24	
Story Factor (ref = Neutral)			
Text (Zombie)	7.59	1.51	**0.419*****
Text (Zombie Plus)	4.35	1.47	**0.240****
Image (Zombie)	1.22	1.20	0.068
Step 2			
Intercept	58.511	3.43	
Story Factor (ref = Neutral)			
Text (Zombie)	7.540	1.49	**0.416*****
Text (Zombie Plus)	4.154	1.45	**0.229****
Image (Zombie)	1.323	1.19	0.073
Participant sex (male vs female)	–2.11	1.19	–0.17
Age	0.096	0.04	**0.08***
Education (no degree vs degree)	–5.225	1.23	**–0.288*****
Household income	0.826	0.51	0.054
Step 3			
Intercept	44.63	3.87	
Story Factor (ref = Neutral)			
Text (Zombie)	6.86	1.38	**0.379*****
Text (Zombie Plus)	3.516	1.35	**0.194***
Image (Zombie)	0.717	1.10	0.040
Participant sex (male vs female)	–1.590	1.11	–0.09
Age	0.007	0.04	0.006
Education (no degree vs degree)	–3.585	1.15	**–0.200****
Household income	0.722	0.48	0.047
Political Orientation			
Centre vs left	2.752	1.77	0.152
Right vs left	8.742	1.54	**0.482*****
Political conservatism	1.593	0.24	**0.233*****
Step 4			
Intercept	99.02	4.67	
Story Factor (ref = Neutral)			
Text (Zombie)	5.712	1.20	**0.315*****
Text (Zombie Plus)	3.888	1.17	**0.215*****
Image (Zombie)	0.880	0.958	0.049
Participant sex (male vs female)	–1.619	0.958	–0.090
Age	–0.040	0.03	–0.034
Education (no degree vs degree)	–2.300	1.00	**–0.127***
Household income	0.548	0.415	0.036
Political Orientation			
Centre vs left	2.500	1.53	0.138
Right vs left	3.403	1.37	**0.188***
Political conservatism	.716	0.22	**0.105*****
Support for harm reduction	–2.48	0.15	**–0.487*****
Level of familiarity	–0.671	0.22	**–0.086****

R^2 step 1 = 0.029; Δ R^2 step 2 = 0.031; ΔR^2step 3 = 0.135; ΔR^2step 4 = 0.202, all $p < 0.001$. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Table 3
Summary of hierarchical regression for variables predicting support for harm reduction.

Variable	B	SE	b
Step 1			
Intercept	15.614	0.25	
Story Factor (ref = Neutral)			
Text (Zombie)	–0.563	0.30	–0.158
Text (Zombie Plus)	–0.073	0.30	–0.020
Image (Zombie)	0.011	0.21	0.003
Step 2			
Intercept	16.786	0.68	
Story Factor (ref = Neutral)			
Text (Zombie)	–0.549	0.29	–0.154
Text (Zombie Plus)	–0.008	0.29	–0.002
Image (Zombie)	–0.103	0.24	–0.03
Participant sex (male vs female)	0.110	0.24	0.031
Age	–0.030	0.01	**–0.132*****
Education (no degree vs degree)	0.950	0.25	**0.267*****
Household income	–0.080	0.10	–0.027
Step 3			
Intercept	19.868	0.75	
Story Factor (ref = Neutral)			
Text (Zombie)	–0.387	0.27	–0.108
Text (Zombie Plus)	0.134	0.26	0.038
Image (Zombie)	0.035	0.21	0.010
Participant sex (male vs female)	–0.013	0.21	–0.004
Age	–0.010	0.01	–0.043
Education (no degree vs degree)	0.566	0.22	**0.159***
Household income	–0.055	0.09	–0.018
Political Orientation			
Centre vs left	–0.060	0.34	–0.017
Right vs left	–2.006	0.30	**–0.562*****
Political conservatism			
Step 4			
Intercept	18.362	0.82	
Story Factor (ref = Neutral)			
Text (Zombie)	–0.337	0.27	–0.094
Text (Zombie Plus)	0.121	0.26	0.034
Image (Zombie)	0.011	0.21	0.003
Participant sex (male vs female)	0.013	0.21	0.003
Age	–0.004	0.01	0.015
Education (no degree vs degree)	0.600	0.22	**0.168****
Household income	–0.046	0.09	–0.015
Political Orientation			
Centre vs left	–0.027	0.34	–0.008
Right vs left	–1.890	0.30	**–0.529*****
Political conservatism	–0.367	0.05	**–0.273*****
Level of familiarity	0.200	0.05	**0.130*****

R^2 step 1 = 0.005; Δ R^2 step 2 = 0.036,; Δ R^2step 3 = 0.186; ΔR^2step 4 = 0.016, all $p < 0.001$. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

physical environments that are familiar to the in-group (Delgado Rodríguez, Rodríguez-Pérez, Vaes, Rodríguez, & Leyens, 2012). Thus, it was surprising that we found no evidence for our hypothesised main or interaction effects of presentation of 'zombie' imagery depicting immobile people who have used drugs. One explanation for this may be methodological, as the image used in our study depicted immobile individuals in a public space, rather than other disgust-evoking signifying elements of the 'drug zombie', such as skin infections and tissue damage, or the 'undead', cannibalistic, and life threatening zombie commonly seen in popular culture (Linnemann & Wall, 2013). However, we used this image as similar variants are frequently used in dehumanising UK reporting on drugs with headlines and text that reference 'zombies'. Our findings may suggest that such images depicting immobile people in public spaces only evoke association with 'zombies' when linked to text specifically using this term. Finally, examination of sub-components of our stigma outcome measure (Supplementary material S2) showed significantly higher ratings of social disengagement in the zombie image condition. This suggests that imagery may have impacts on some components or outcomes of stigma but not others. This may have implications for the development of campaigns designed to encourage members of the public to take action in street-based overdose events (Sumnall, Atkinson, Anderson, McAuley, & Trayner, 2023)

We found no effects of condition on total harm reduction support score. Although it was not part of our pre-registered analysis, we also found no effects on support for the individual harm reduction items used in our scale (harm reduction in general; 'safer supply'; drug checking services; see supplementary material S3). These were selected as they were relevant to the presented news stimuli. This is a similar finding to our previous experimental study of reporting of drug related deaths, which found increased ratings of stigma associated with a range of characteristics of decedents in a news report of a drug related death, but without consistent accompanying differences in harm reduction policy support (Sumnall et al., 2023). In discussing those findings, we suggested that one reason for this may have been methodological as policy descriptions were not embedded in the presented news article. Description of harm reduction approaches were provided in the current study, but participants may not have specifically recognised these as proposed intervention responses to the topic presented in the stimuli, i.e. the identification of a harmful new drug on the market, and the

importance of market intelligence. It will be important to include an assessment of prior knowledge of harm reduction in similar studies in future. Total support scores ranged from 15.0 to 15.5 across conditions (Table 1), representing a mean of approximately 3.75 per item. On the 1–5 Likert scale used, this suggested endorsement of a 'support' choice response in all groups, and so there may have been a ceiling effect. Several previous studies have shown a clear relationship between ratings of stigma and support for different types of harm reduction intervention (Baker, Smith, Gulley, & Tomann, 2020; Grisamore & DeMatteo, 2024; Kennedy-Hendricks, et al., 2017; Kulesza, Teachman, Werntz, Gasser, & Lindgren, 2015; McGinty, et al., 2018; Reynolds, Lindsay, Knaak, & Szeto, 2022; Thornton, MacQuarrie, & Brunelle, 2025). Differences may be therefore be methodological and findings dependent upon the assessments of stigma used (Holland et al., 2024), or this may be a function of individual study respondent characteristics, and so less sensitive to experimental manipulation (Baker, et al., 2020; Grisamore & DeMatteo, 2024; Kennedy-Hendricks, et al., 2017; Kulesza, et al., 2015; McGinty, et al., 2018; Reynolds, et al., 2022; Thornton et al., 2025)

The aim of our study was primarily to investigate the effects of dehumanising media representations of drug use, but our findings have practical implications. There have been repeated calls to adopt person-first language and neutral imagery in the reporting of substance use related topics in the media, as some phrases and framings can lead to an increase in stigma (Botticelli & Koh, 2016; McGinty, Kennedy-Hendricks, & Barry, 2019; McGinty, Stone, et al., 2019; Tsai, et al., 2019). One recent small experimental study with participants from stigmatised groups (including people characterised as being in recovery from a substance use disorder) found that the use of person-first language in news articles increased the perception that one's group was humanised in the news article, and increased trust in news (Murray, Varma, & Stroud, 2024). Media guidelines and other resources have been published internationally to support these objectives (e.g. SFAD/Adfam *Reporting of Substance Media Toolkit* (UK); Appalachia Free Press *Reporting on Addiction* (USA); Common Cause Australia *Drug Stigma Message Guide* (AUS); CCSA/CAPSA *Stigma Primer for Journalists* (CAN)). Our findings can contribute to the development of this type of work, showing that the use of 'zombie' or other types of dehumanising symbolism and framing should be avoided. However, there is currently little evidence to date to suggest widespread adoption of media resources, or if these have led to changes in practice. The wider body of media reporting on substance use is also routinely negative in tone (e.g. focus on perpetrators of violent drug-related crime, drug related deaths), even if it is not directly stigmatising or dehumanising, suggesting there are likely to be significant challenges in changing reporting norms (Alexandrescu, 2020; Atkinson & Sumnall, 2018, 2021; Bowles, et al., 2024; Habib, et al., 2023). Furthermore, and of relevance to this study, there have been no trials of interventions designed to reduce stigma specifically associated with novel drugs such as synthetic opioids or xylazine, which may be associated with higher levels of stigma compared to other drugs due to their novelty and the way they have been reported in media (Beletsky, et al., 2020; Cheetham, Picco, Barnett, Lubman, & Nielsen, 2022).

The findings of our analyses were consistent with other studies that have examined individual-level predictors of drug-related stigma and support for harm reduction (see discussion above) (Cruz, Patra, Fischer, Rehm, & Kalousek, 2007; Kulesza, et al., 2015; Rasinski, Timberlake, & Lock, 2000; Wild, et al., 2021). This relationship is not specific to substance use and has been observed with a range of stigmatised behaviours and characteristics (DeLuca, et al., 2018; DeLuca & Yanos, 2016). Briefly, we found that higher levels of stigma and lower support for harm reduction were reported by those participants with less than degree-level education, who had a voting preference for right wing parties, who were more politically conservative, and who had lower familiarity with people who use drugs. Higher levels of stigma also predicted lower levels of support for harm reduction. Our measure of political conservatism partly indicates less support for state intervention and so this may explain the relationship with harm reduction policy. However, there is no necessary reason to assume harm reduction would always be delivered by state actors (although it frequently is in the UK), and the commitment to personal autonomy and individualised support implicit in harm reduction does not contradict aspects of libertarian conservatism (Nicholls, 2024). From the perspective of attribution theory, the relationship between political ideology and stigma score may be related to greater attribution of personal agency and responsibility for behavioural outcomes of substance use in people who are more conservative (Löve, et al., 2019). This would be an interesting topic for future research (Christie, et al., 2019)

In the UK, most mainstream news media titles have editorial positions that are politically aligned, with the most popular titles being economically and culturally conservative (Atkinson, et al., 2019; Ponsford, 2024). In general, outside of election periods when other factors may become important, audiences tend to prefer titles that accord with their own political preferences (Redfield & Wilton Strategies, 2024). There have been no formal studies that have examined stigmatising reporting on drug topics in relation to political stance of news titles, but we note that other researchers have observed that the use of 'zombie' framing in relation to reporting on xylazine, for example, is consistent across a range of US media titles (Bowles, et al., 2024). In preparing materials to help design the current study, we collated references to 'zombie drugs' in UK news media and noted that these were not dependent upon the political orientation of the title. So, whilst our findings suggest that resources might be focused on more conservative titles to account for differences between audiences, anti-stigma campaigners should target all titles when planning campaigns and challenging dehumanising representations in the media.

The study had several strengths, including an experimental design, appropriate statistical power, a pre-registered analysis plan, and a sample that was representative of the UK general population. Our stimuli were also based on examples of recent news reporting and included an image that had been used in reporting referencing 'zombies'. However, individuals with university degrees were over-represented in our sample as were individuals with left-wing political preferences compared to population estimates (62 % in our study vs 49 % in the 2024 UK General Election). These imbalances were consistent across groups and are common in online survey panels (Levay, Freese, & Druckman, 2016). Stigma is a complex concept, and it is not possible to measure the breadth of phenomena and attitudes associated with it with one measurement instrument (Holland, Freeman, et al., 2024; Spata, Gupta, Lear, Lunze, & Luoma, 2024). In this study we used 13 items from the 18-item AQ-SUD based on the attribution theory of stigma (the theoretical foundation of our study), which were deemed to be most pertinent for the focus of the experiment and sensitive to dehumanising media coverage. Due to constraints on survey length and concerns about participant burden, we did not include assessments of blatant dehumanisation or infrahumanisation. Higher levels of both these outcomes have been found when comparing PWUD in general, people who use cannabis, people who are homeless, people who have serious mental health problems, or people who are obese, to the general public (Sumnall, et al., 2021). We therefore do not know if higher ratings of stigma in response to stimuli were mediated by dehumanising attitudes. This data would provide useful insights into the mechanisms of stigma and suggest potential responses (i.e. 'rehumanisation' of PWUD). However, the absence of this data does not weaken the substantive interpretation of our findings, that dehumanising news stories increase stigma. To simplify the research design, the image used in the stimuli only depicted white male subjects. Ethnicity and gender are important characteristics associated with stigma towards people who use some types of drug (e.g. Bandara, McGinty, and Barry (2020); Sumnall, Atkinson, Montgomery, et al. (2023)). The image was appropriate for this study, reflecting most cases of drug use in the UK (Office for Health Improvement and Disparities, 2023; ONS, 2023), and the focus of most reporting. Finally, as also noted in our previous study of depictions of

drug related deaths (Sumnall et al., 2023), we only presented a single written stimulus, which may not reflect repeated exposure to particular framings. The written modality may also not reflect changes in media consumption in younger audience segments who have an increasing preference for short duration video-based news (Ofcom, 2024). We assessed study outcomes immediately after the presentation of experimental stimuli; hence we do not know the longevity of the effect. We also acknowledge that attitudes that participants express towards potentially unfamiliar subjects within experimental studies may not be the same as those expressed in other contexts (Hughes & Huby, 2012).

Conclusion

In highly competitive news reporting environments, the use of non-human metaphors may provide a simple attention-grabbing means to attract audiences and convey information about novel drugs and the impact on the people who use them. However, this type of framing leads to an increase in stigmatising attitudes. Considering the high global burden of drug-related morbidity and mortality, the emergence of harmful new drugs on the market, and the importance of providing high quality and accessible care for those who need it, dehumanising representations in the media should be challenged.

CRediT authorship contribution statement

H.R. Sumnall: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **A. Holland:** Writing – review & editing, Methodology, Conceptualization. **AM Atkinson:** Writing – review & editing. **C. Montgomery:** Writing – review & editing. **J. Nicholls:** Writing – review & editing, Conceptualization. **O.M. Maynard:** Writing – review & editing, Methodology, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.drugpo.2025.104714.

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