Exploring the perceived importance of neuroscientific research on addictions in legal contexts: A survey of US criminal justice students and German legal professionals

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ABSTRACT:

Neuroscientific research on addictions has prompted a paradigm shift from a moral to a med-ical understanding â€“ with substantial implications for legal professionalsâ€™ interactions with and decision-making surrounding individuals with addiction. This study complements prior work on U.S. defense attorneyâ€™s understandings of addiction by investigating two further perspectives: (a) the potential â€œnext generationâ€ of legal professionals in the U.S. (criminal justice under-graduates) and (b) legal professionals from another system (Germany). Their views on the brain disease model of addiction, dominance and relevance of this model, the responsibility of affected persons, and preferred sources of information were assessed.

Views of 74 U.S. criminal justice undergraduate students and 74 German legal professionals were assessed using Likert Scales and open-ended questions in an online survey.

Neuroscientific research findings on addictions and views that addiction is a brain disease were rated as significantly more relevant by American students to their potential future work than by German legal professionals. However, a majority of both samples agreed that addic-tion is a brain disease and that those affected are responsible for their condition and actions. Sources of information most frequently used by both groups were publications in legal aca-demic journals.

CUST_RESEARCH_LIMITATIONS/IMPLICATIONS_(LIMIT_100_WORDS) :No data available.

In the U.S., information for legal professionals needs to be expanded and integrated into the education of its â€œnext generation,â€ while in Germany it needs to be developed and promoted. Legal academic journals appear to play a primary role in the transfer of research on addiction into legal practice.

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Addiction neuroscience in legal contexts

Keywords

Addiction neuroscience, legal system professionals, criminal justice students, forensic, responsibility, information source

Abstract

Purpose

Neuroscientific research on addictions has prompted a paradigm shift from a moral to a medical understanding – with substantial implications for legal professionals' interactions with and decision-making surrounding individuals with addiction. This study complements prior work on U.S. defense attorney's understandings of addiction by investigating two further perspectives: (a) the potential "next generation" of legal professionals in the U.S. (criminal justice undergraduates) and (b) legal professionals from another system (Germany). Their views on the brain disease model of addiction, dominance and relevance of this model, the responsibility of affected persons, and preferred sources of information were assessed.

Design/methodology/approach

Views of 74 U.S. criminal justice undergraduate students and 74 German legal professionals were assessed using Likert Scales and open-ended questions in an online survey.

Findings

Neuroscientific research findings on addictions and views that addiction is a brain disease were rated as significantly more relevant by American students to their potential future work than by German legal professionals. However, a majority of both samples agreed that addiction is a brain disease and that those affected are responsible for their condition and actions. Sources of information most frequently used by both groups were publications in legal academic journals.

Practical implications

In the U.S., information for legal professionals needs to be expanded and integrated into the education of its "next generation," while in Germany it needs to be developed and promoted. Legal academic journals appear to play a primary role in the transfer of research on addiction into legal practice.

Originality/value

This study complements prior work on U.S. defense attorney's understandings of addiction by investigating two further perspectives.

1. Introduction

Addiction is not just an individual but a societal problem that often bears on the legal system and those who make contact with it as criminal offenders (Chandler, Fletcher and Volkow, 2009; Seear, 2017; Volkow, 2021). For instance, in the U.S., about 65% of the prison population is estimated to have a substance use disorder, and a further 20% are estimated to have committed their crimes under the influence of drugs or alcohol (NIH, 2020). In Germany, 44% of the prison population reportedly has substance-related addiction problems (Drogenbeauftragte (BMG-D), 2019). Additionally, alcohol and drugs are often involved and considered in a wide variety of legal matters, such as driving under the influence of a psychoactive substance (NIDA, 2019) or domestic and other violence (European Monitoring Center for Drugs and Drug Addiction (EMCDDA), 2007).

Given its prevalence and presence in the legal system, addiction is commonly encountered by legal and forensic systems professionals, such as advocates, judges, forensic physicians, and psychologists, in various cases and legal proceedings (Chandler, Fletcher and Volkow, 2009; Seear, 2017; Avery *et al.*, 2020). Their perceptions of addiction and how it can affect individuals, their behavior, and their potential for treatment could affect the social and legal trajectories of offenders with addiction (Seear, 2017). One of the most important factors shaping the attitudes towards addicted individuals seems to be the attribution of control; for example, based on greater stigmatization, attorneys showed more negative attitudes towards their clients – which might result in less overall engagement and a lower tendency to plead for treatment referral – if they rejected of a " full brain disease model of addiction" (BDMA) (Avery *et al.*, 2020). Furthermore, essentialist thinking has been found to significantly predict culpability and sentencing judgements (Berryessa, 2020).

Current conceptions of addiction are largely influenced by novel research approaches since the 1990s, the “decade of the brain” (Satel and Lilienfeld, 2015, p. 50ff; Koob and Volkow, 2010). Notably, the application of the then newly developed neuroscientific methods, such as (functional) Magnetic Resonance Imaging (MRI/fMRI), has revealed changes in the brains of

addicted persons and thus have led to revised claims of addiction as a brain, rather than a moral or social, disease (Leshner, 1997; Volkow, Koob and McLellan, 2016). Especially the considerable paradigm shift from a moral understanding – which focuses on deficits in self-control based on the assumed preservation of the ability to change (addictive) behavior – to a medical, brain-based understanding of addiction with impaired control over behavior has since been supported by numerous scientific researchers and organizations (Volkow, Koob and McLellan, 2016; NIDA, 2020; Kuhar, 2015).

As these findings have been more widely accepted, continued and controversial debates about their impact have affected how individuals with addiction are viewed and treated across social realms, including the legal system (Chandler, Fletcher and Volkow, 2009; Heather *et al.*, 2018; Hall, Carter and Forlini, 2015; Volkow and Koob, 2015; Heim, 2014).

Indeed, medical models of addiction have had substantial implications for various legal issues. Most importantly, neurobiological explanations of addiction may lessen perceptions of impaired control of affected individuals due to drug-related brain changes (Volkow, Koob and McLellan, 2016; Dackis and O'Brien, 2005; Burns and Bechara, 2007; Morse, 2017). If addiction as a brain disease impairs and bears on impulse and behavioral control, a person who suffers from an addiction or substance use disorder might be less responsible – or at least not as responsible as others without this condition – for actions taken under the influence of a possible substance (Burns and Bechara, 2007; Berryessa and Krenzer, 2020; Xu *et al.*, 2022). Similar arguments based on biological risk factors are most typically utilized and argued during sentencing as mitigating to an offender's responsibility for his criminal actions (National Academies of Sciences, Engineering, and Medicine *et al.*, 2018, p. 11; Aono, Yaffe and Kober, 2019; Berryessa, 2020). Thus, "When modern brain science is laid out clearly, it is difficult to justify how our legal system can continue to function without it." (Eagleman, 2012:p160).

However, the dominance, the validity and the implications of brain-based explanations of addiction have been subject to a broad controversial debate in the scientific community. The

perceived dominance of views that addiction is primarily a brain disease has been contested in various ways. For example, the foundation of the Addiction Theory Network (ATN), which followed a letter to the editor of the journal Nature signed by 94 researchers (Heim, 2014), aimed at "opposing the dominant influence of the brain disease model of addiction" (Heather *et al.*, 2018). One of the most relevant issues that has been discussed across literature refers to the assumed loss of control associated with a medical view of addiction (Leshner, 1997). Several authors have not generally assumed reduced agency and responsibility of affected persons, but instead discuss it in a differentiated manner (Bonnie, 2002; Hyman, 2007; Heyman, 2010, 2013; Dingel *et al.*, 2012; Karasaki *et al.*, 2013; Uusitalo, Salmela and Nikkinen, 2013; Carter *et al.*, 2014; Peele, 2016; Ochterbeck, Frense and Forberger, 2023). In the legal system, especially in the light of the voluntary act requirement (Gordon and Fondacaro, 2018), the fact whether or not addicted persons are deemed responsible is crucial and thus needs to be evaluated.

Furthermore, the claim that viewing addiction as a disease will automatically destigmatize is (Leshner, 1997; Volkow, Koob and McLellan, 2016) has been contested (Trujols, 2015; Fraser *et al.*, 2017; Heather, 2017; Barnett *et al.*, 2018; Clark, 2021; Rundle, Cunningham and Hendershot, 2021). Brain-based understandings and essentialist thinking have been shown to sometimes and lead to amplified stigmatization of defendants and their brain-based characteristcs in the legal system (Avery *et al.*, 2020; Berryessa, 2020). Further, addiction terminology has shown to play a substantial role in creating stigma (Botticelli and Koh, 2016; Alcohol and Drug Foundation, 2023), including in the legal system. Seear (2023) found that lawyers and legal decision-makers consider perceptions of agency and responsibility integral in describing addiction in court; in these contexts, stigmatizing language of addiction like "sick," "users," or "addicts" can sometimes be strategically used to amplify the problems of addiction for the court so it may be more likely that treatment is recommended (Seear, 2023). Thus, the stabilization of addiction as a disease through legal processes can

be regarded as primarily influenced by lawyers, despite them not being experts in the addiction field (Seear and Fraser, 2016).

Indeed, although neuroscientific evidence may be increasingly used in legal contexts to assess responsibility and self-control (Satel and Lilienfeld, 2015, p. 100ff; National Academies of Sciences, Engineering, and Medicine *et al.*, 2018, p. 3; Aono, Yaffe and Kober, 2019; Jones *et al.*, 2013), this suggests that if and how legal professionals conceive of addiction, as well as whether they adopt or are familiar with neuroscientific research on addictions and the medical model of addiction, may affect their interactions with and decision-making surrounding individuals with addiction in legal settings (Morse, 2017; Murphy, 2017; Seear, 2017). For example, lawyers are reported to take on a "quasi-expert" role in addiction-related aspects at several stages of their legal proceedings: (a) when determining whether to take a case on, (b) when building a client's case, (c) when advocating for clients in court, and (d) when attempting to settle a dispute (Seear, 2017). In her article, Seear argues how, within this role, lawyers' views and understandings of addiction largely shape their decisions and carry significant consequences for their clients before taking cases, while handling and arguing cases in court, and during the plea bargain and negotiation process (Seear, 2017).

To our knowledge, only one study has investigated the views of legal professionals on the models, causes, and impacts of addiction. Avery et al. ~~survey~~ examined the attitudes of 483 U.S. (American) criminal defense attorneys (and 301 physicians) towards four models of addiction and their attitudes towards clients. The attorneys were recruited via their professional association to participate in a survey distributed by email, and monetary incentives were provided as a lottery for those who answered the online questionnaire. The methodology included an attitude measure, a measure regarding the participants' conception of addiction, and questions assessing demographic details (Avery *et al.*, 2020) The results show~~ing~~ed that a brain disease model of addiction was endorsed by a vast majority of the participating attorneys (Avery *et al.*, 2020). Of those, 52.3% considered addiction a brain disease in which the affected person has practically no choice, and 43.7% believed it was a brain disease but

with only moderate impacts on behavioral choice and control. Less than 4% of the participants endorsed a (failure of) choice and/or moral model of addiction. Those endorsing a brain disease model of addiction were reported to generally have a more positive attitude towards their clients (Avery *et al.*, 2020).

Not only Avery et al. focused on U.S.-based attorneys (Avery *et al.*, 2020). The vast majority of literature cited in their paper reports research and/or opinions from the United States of America, where 'neurolaw' seems to be an established discipline (Kruse, 2020). However, the reception of neuroscientific findings and their connection to and intersection with legal issues in Germany are still in its infancy (Kruse, 2020). Materials comparable to the 'Reference Manual for Scientific Evidence (National Research Council, 2011), or workshops on 'Neuroforensics' (National Academies of Sciences, Engineering, and Medicine *et al.*, 2018) are unavailable in Germany. The perspectives of representatives of the German legal system on brain-based explanations of addiction, the responsibility of persons with addictions, and the perceived utility of neuroscientific research on addictions for the German legal system remain unclear. The exploration of their perceptions is, therefore, a notable gap in research.

Furthermore, the ways in which legal and forensic professionals learn and get their information about addiction may be important. Interaction between the legal and neuroscientific fields has been deemed necessary (Garland, American Association for the Advancement of Science and Charles A. Dana Foundation, 2004, p. 31; Jones *et al.*, 2013), and training for judges and students to address a potential knowledge gap, meaning "… knowing who and what to trust under what circumstances…", is recommended (National Academies of Sciences, Engineering, and Medicine *et al.*, 2018, p. 39).

Based on this, we extended Avery et al.'s study and added two further perspectives: (a) the potential "next generation" of legal professionals in the U.S. and (b) legal professionals from another system, namely Germany. Using an online survey with two samples, we explored perceptions of (a) U.S. undergraduate criminal justice students and (b) German professionals

who practice in legal and forensic settings on the relevance of brain-based explanations of addiction and its influence on responsibility and behavioral control.

We focused on asking prompts that address the following questions: (1) Is addiction seen as a disease/disorder of the brain (medical model of addiction) and how relevant do they believe this model is to science, treatment, affected persons, and the legal system? (2) Do they believe addicted individuals are responsible for their behavior? (3) Is neuroscientific research on addiction viewed as important for legal practice? Additionally, we inquired (4) Where have participants learned information about addiction? We discuss the implications of the results of this survey in relation to criminal justice practice and education.

2. Methods

Ethics approval for the complete study, including the data protection concept, was granted from the University of Bremen/Germany on December 6th, 2018. An additional ethics approval for the student survey at Rutgers University was provided by the Rutgers University Institutional Review Board under Pro2020000700 on October 27th, 2020. Study details, including contact information, contact information for university ethics boards, and the risks and benefits of the study, were provided at the beginning of the survey. After reading these details, participants were asked for their informed consent in order to participate in the study. *[blinded for review]*

2.1 Participants & procedure

The present study used two independently conducted surveys of (a) U.S. undergraduate criminal justice students at a large university in the Eastern U.S. and (b) German legal and forensic professionals. The following two groups of participants were invited to participate in an online survey, set up as LimeSurveys:

(a) *U.S. undergraduate criminal justice students*: Participants were a sample of undergraduate students enrolled in an introductory criminal justice major class at a large university in the Eastern U.S. This course is a requirement for the criminal justice major at that university. The total class (95 students) was contacted via their course website to solicit their

participation in a survey open from October 24th, 2020 to November 1st, 2020. As an incentive, respondents were awarded a one percentage point extra credit for their final grade in the class through which they were enrolled in the study.

(b) *German professionals from the legal and forensic system*: Lawyers, judges, public prosecutors, forensic pathologists, forensic psychiatrists, forensic psychologists, and chairholders at German Universities in law, forensic medicine, and forensic psychiatry were solicited for participation. They were contacted via e-mail either personally or via their professional associations (supplementary table S1). Additionally, on the recommendation of one participant, the survey invitation was also posted on the pinboard of the Section of Legal Psychology of the Association of German Psychologists. Starting May 20th, 2020, one invitation and two reminders were mailed with the request to participate or forward the survey link and the respective information. The survey ended on October 15th, 2020. No incentives for participation were provided.

2.2 Instrument

A previous questionnaire tailored to understanding scientific researchers' views of addiction (Ochterbeck and Forberger, 2022) was adapted for this study. The modifications for the current included the addition of questions regarding (a) the participants' current field of work (Germany) or college major and future career plans (USA); (b) the perceived use and importance of neuroscientific knowledge about addictions for legal and forensic purposes; and (c) how they have learned or been informed about addiction. Additionally, gender, age, ethnicity, current college major and future career plans of the U.S. sample, and the current area of work of the German participants were assessed.

This paper describes the results of the questions in the following areas that were asked to participants: (a) Do you see addiction as a disease/disorder of the brain, and how dominant is this view considered in various groups (society, science, treatment, affected persons, the respondents' legal system)? (b) Are addicted individuals perceived as responsible for their

conditions and actions? (c) Is neuroscientific research on addictions regarded as important for studies and future or daily work? (d) Where do the participants inform themselves about the topic? (original questions in supplementary materials Sx and Sy)

Questions (a) and (b) could be answered by selecting one option on a six-point Likert scale (very strongly disagree, strongly disagree, partially disagree, partially agree, strongly agree, very strongly agree) or 'I don't know', plus adding comments in a free text field. To answer question (c), participants could choose between 'yes' and 'no' and were asked to add a more detailed description in a free text field. For question (d), a list of information sources (details in fig 4 and tab S5) was provided with a four-point Likert scale (never, seldom, sometimes, often) and a free text field to add further options. All original questions from the questionnaire are provided in the supplementary materials S1-S4.

2.3 Analyses

The quantitative items were analyzed descriptively by calculating frequencies and proportions using IBM SPSS 24 software. Questions that could be answered with a six-point Likert scale (a and b) were analyzed separately according to the substances selected by the participants. Alcohol, cannabis, heroin, cocaine, and gambling were default options. Other choices could be added in a free text field. The psychoactive substances mentioned were combined into "other" for the analysis. The free-text comments were coded and categorized with MAXQDA10 software, following an iterative inductive approach (Braun and Clarke, 2006; Mayring, 2015).

3. Results

The surveys on the use of neuroscientific research results on addictions in the legal systems of the United States of America and Germany were answered by (a) 74 U.S. criminal justice students and (b) 74 German professionals from the legal and forensic systems, respectively. Details on the characteristics of the demographics of participants are summarized in Table 1. The equal number of participants was not intentional and was achieved by chance.

<include Table I "Participants' characteristics across both samples > here, please

3.1 Endorsement of brain-based explanations of addiction

The classification of substance use disorders (SUDs) as diseases/dysfunctions of the brain was shared by a little over 60% of the German respondents, except for gambling with only 40%. Larger variations between the substances/behavior were found among the U.S. students: while about 90% agreed with this view for heroin and cocaine and about 80% for alcohol, only 60% did so for cannabis and gambling and about 50% for other psychoactive drugs.

Regarding the dominance of brain-based explanations of addiction in science, treatment, society, the respective legal systems, and affected persons, apparent differences emerged between the two groups of participants (Figure 1, supplementary table S2). U.S. students tended to consider a brain-based view dominant in nearly all of the stakeholders mentioned above, with few exceptions (gambling in the U.S. legal system; society, and science; cannabis in affected persons). In contrast, the participating German legal professionals showed dissimilar views. Only a very small minority considered the classification of SUDs as brain-diseases/disorders the dominant view in any of the target groups inquired.

<include Figure 1 "Acceptance of brain-based explanations of addiction in different stakeholder groups" here, please>

3.2 Perceived responsibility of addicted persons for conditions and actions

Views on the responsibility of those with addiction for their condition and their related actions, as attributed by respondents, are shown in Figure 2 (data in supplementary table S3). Overall, about 80% of all participants across both groups viewed the responsibility of those with addiction for related actions as in some way mitigated by their disease (except for U.S. students regarding heroin and cocaine addiction (about 60%) and 'other psychoactive substances' (about 30%, but only n=3 respondents here)).

The responsibility of those with addiction for their condition was attributed to the affected persons by about 70-80% of the U.S. students and by about 50-60% (except for 'other

psychoactive substances' and gambling with 40 and 80%, respectively) of the German participants.

<include Figure 2 "Perceived responsibility for condition and action as attributed to addicted persons" here, please>

3.3 Importance of neuroscientific research results for participants' daily or expected future work and studies

Marked differences between the two groups of participants also emerged when asking about the importance of neuroscientific research on addiction to their studies and potential future careers (U.S. students) or their day-to-day work in the legal system (German professionals). On average, almost 80% of all U.S. criminal justice students thought this research was important for their studies, with about 70% also reporting that it would be important for their job one day. In comparison, only 40% of German legal professionals indicated that this research was important to their day-to-day work in the legal system (data in supplementary table S4).

Responding to the open question regarding why neuroscientific research on addiction was important to their studies, the U.S. criminal justice students most frequently (n=19) highlighted that it helped them learn more about the causes and impacts of addiction. Sixteen of them elaborated on this, essentially saying that it improved their understanding of how the brain works and "why people do certain things" (respondent U15). Regarding its potential impact on their future jobs, students often stated that such knowledge would help improve their performance in their future careers in the legal system (n=16) in the sense that it would enable them "…to smart out certain people to get a good result in your case." (U15). Another student argued that "…working [in the legal system] could mean having to understand how people's brains work and the psychological and neurological reasoning behind their actions." (U67). Furthermore, the use for a future occupation in the psychology field (i.e., working as a forensic psychologist, psychiatrist, or social worker) was brought up by n=7 respondents.

German legal professionals indicated that they viewed the relevance and use of neuroscientific addiction research, especially for expert evidence and testimony in court (n=7) and for decisions in sentencing proceedings (n=5).

3.4 Sources for advice on neuroscience research findings on addiction

The ways in which participants reported that they had learned about neuroscientific research on addiction also varied between groups. In general, the U.S. criminal justice students more often answered that they 'sometimes' or 'often' consulted one of the sources mentioned in the survey and displayed in Figure 3 (data in supplementary table S5), as compared to the German legal professionals. Across groups, however, publications in legal professional journals (e.g., law reviews) were used 'sometimes' or 'often' by about 60% of the respondents.

About 50% of the German legal professionals had previously utilized reviews/evidence summaries, original research results, publications, and colleagues' advice. All other provided sources of information were 'seldom' or 'never' referred to by more than 60% of these respondents. Two respondents added that they consulted "books and scientific articles" and "expert witnesses in court."

For the U.S. criminal students, however, about 60% indicated that they 'sometimes' or 'often' consulted advice from superiors (e.g., professors), scientific forums or talks, published review papers, original publications of research results, advice from friends, experts recommended from their networks, professional organization websites, and advice from colleagues. The least consulted sources of guidance were persons they already know, such as personal contacts to NGOs and experts in known projects, of which about 30% stated were used 'sometimes' or 'often'. A single participant added "fact sheets, library resources & open access research".

<include Figure 3 "Sources for advice on neuroscience research findings on addiction" here, please>

4. Discussion and conclusions

The conceptualization of addiction as a disease or disorder of the brain may have significant implications for the legal system, including views on sentencing, mitigation, and behavioral control (Heather *et al.*, 2018; Hall, Carter and Forlini, 2015; Volkow and Koob, 2015; Heim, 2014). Thus, exploring the views of legal professionals, as well as students who may become legal professionals one day, on various aspects related to brain-based explanations of addiction may help to illuminate if and how their interactions with and decision-making surrounding individuals with addiction in legal settings may be affected by their views on addiction (Morse, 2017; Murphy, 2017; Seear, 2017).

This study thus provides valuable insights by exploring the views of two different groups in relation to two separate legal systems. In general, U.S. criminal justice students –as potential "future generation" of legal professional – seemed to be more open to neuroscientific research results on addictions. They considered it essential for their future work, and endorsed the classification of addiction as a brain disease to a considerably higher degree than a group of attorneys previously surveyed by Avery et al. (Avery *et al.*, 2020). In contrast, the participating German professionals considered it essential but deplored the German legal system's lack of acceptance and/or recognition. This perception is consistent with Kruse's assessment (Kruse, 2020), and supported by the fact that no documents similar to the U.S. "Reference Manual on Scientific Evidence" (National Research Council, 2011) or "Neuroforensics: Exploring the Legal Implications of Emerging Neurotechnologies" (National Academies of Sciences, Engineering, and Medicine *et al.*, 2018) exist in Germany.

No clear differences between the two studied subgroups, however, seemed to exist in the attribution of responsibilities to addicted persons for their related actions. About 80% of both groups (with a few exceptions in the U.S. group) considered them responsible for their actions. As this is an essential determinant for the assessment of legal culpability and liability,

it is crucial that experts in this field in their role as "quasi-experts" (Seear, 2017) thoroughly reflect on the implications this has at the various stages of a court case, from their decision whether or not to take a case, to building a client's case and determining advocacy strategy in court, to the settlement of a dispute (Seear, 2017). Based on the findings that the attribution of culpability and punishment judgement are influenced by personal attitudes such as essentialist thinking and neuroscientific evidence (Aono, Yaffe and Kober, 2019; Xu *et al.*, 2022; Berryessa, 2020), a reflexive attitude of legal professionals as well as information and education about the respective mechanisms is recommended.

The primary means to learn about – and possibly discuss – (neuro-)scientific research results on addiction and their utility in the respective legal systems are publications in legal professional journals. The reported consultation of reviews and original research reports also might indicate that scientific research plays or should play an important role in legal practice. However, especially the function of legal professional journals as facilitators of (neuroscientific) research transfer to legal professionals might be the most promising way to inform and educate this group. Further research is needed on whether and how these issues are reported and debated to date, and which options are the most appropriate for the future.

Some limitations, however, must be considered when interpreting these results. First, both samples were relatively small and cannot be regarded as representative. All of the U.S. students were attendants of one introductory criminal justice course from one particular university. The response rate in this course was high (77.89%), possibly because of the provision of an incentive. Still, their answers do not necessarily reflect the views of other U.S. students in comparable college majors. Conversely, the response rate of the German professionals was relatively low, with potential participants invited via their professional associations. Yet a considerable number of these organizations did not forward the invitation. One of the reasons organizations gave when asked for feedback on why they had yet to share the survey was the increased workload of their members due to the Covid-19 pandemic.

Further, both samples may have been affected by either social desirability or self-selection bias regarding either preexisting views toward or interest in neuroscientific addiction research. Finally, although some differences in opinion were observed between respondents in the two samples as noted above, further research is needed to determine whether their views on the medical model of addiction, as well as its relevance to their legal systems and traditions, may extend to other samples of students or legal professionals in the U.S. and Germany. In terms of methodology, especially the assessment of attitudes using single items and providing Likert scales allows for an overview, but limits in depth interpretation. A subsequent more nuanced investigation using either a battery of related items and/or a qualitative approach could usefully supplement this study.

Altogether, however, this study shows that the next generation of legal professionals in the U.S. seems to be positively disposed to neuroscientific research on addictions –even perhaps more than the current generation (Avery *et al.*, 2020). This tendency needs attention in research – for instance, on the implications of attitudes and the changes compared to previous generations – and education. Materials for legal professionals are available already (National Research Council, 2011; National Academies of Sciences, Engineering, and Medicine *et al.*, 2018). They must be expanded, regularly updated, and communicated to them, as well as possibly integrated into academic education.

Especially for Germany, further exploration of neuroscientific evidence currently brought forward in courts and its role at various stages of legal proceedings (Seear, 2017) is needed. The initiated development of integrating neuroscientific research results into legal practice (Kruse, 2020) still has a long way to go. Legal professional journals could play an important role here.

References

Alcohol and Drug Foundation (2023) *The Power of Words - Alcohol and Drug Foundation*, *The Power of Words*. Available at: https://adf.org.au/resources/power-words/ (Accessed: 17 January 2024).

Aono, D., Yaffe, G. and Kober, H. (2019) 'Neuroscientific evidence in the courtroom: a review', *Cognitive Research: Principles and Implications*, 4(1), p. 40. Available at: https://doi.org/10.1186/s41235-019-0179-y.

Avery, J.J. *et al.* (2020) 'Physicians' and Attorneys' Beliefs and Attitudes Related to the Brain Disease Model of Addiction', *The American Journal on Addictions*, 29(4), pp. 305–312. Available at: https://doi.org/10.1111/ajad.13023.

Barnett, A. *et al.* (2018) 'Drug and alcohol treatment providers' views about the disease model of addiction and its impact on clinical practice: A systematic review', *Drug and Alcohol Review*, 37(6), pp. 697–720. Available at: https://doi.org/10.1111/dar.12632.

Berryessa, C.M. (2020) 'The effects of essentialist thinking toward biosocial risk factors for criminality and types of offending on lay punishment support', *Behavioral Sciences & the Law*, 38(4), pp. 355–380. Available at: https://doi.org/10.1002/bsl.2476.

Berryessa, C.M. and Krenzer, W.L.D. (2020) 'The Stigma of Addiction and Effects on Community Perceptions of Procedural Justice in Drug Treatment Courts', *Journal of Drug Issues*, 50(3), pp. 303–328. Available at: https://doi.org/10.1177/0022042620918950.

Bonnie, R.J. (2002) 'Responsibility for addiction', *Journal of the American Academy of Psychiatry and the Law Online*, 30(3), pp. 405–413.

Botticelli, M.P. and Koh, H.K. (2016) 'Changing the Language of Addiction', *JAMA*, 316(13), pp. 1361–1362. Available at: https://doi.org/10.1001/jama.2016.11874.

Braun, V. and Clarke, V. (2006) 'Using thematic analysis in psychology', *Qualitative Research in Psychology*, 3(2), pp. 77–101. Available at: https://doi.org/10.1191/1478088706qp063oa.

Burns, K. and Bechara, A. (2007) 'Decision making and free will: a neuroscience perspective', *Behavioral Sciences & the Law*, 25(2), pp. 263–280. Available at: https://doi.org/10.1002/bsl.751.

Carter, A. *et al.* (2014) 'Control and Responsibility in Addicted Individuals: What do Addiction Neuroscientists and Clinicians Think?', *Neuroethics*, 7(2), pp. 205–214. Available at: https://doi.org/10.1007/s12152-013-9196-6.

Chandler, R.K., Fletcher, B.W. and Volkow, N.D. (2009) 'Treating Drug Abuse and Addiction in the Criminal Justice System: Improving Public Health and Safety', *JAMA : the journal of the American Medical Association*, 301(2), pp. 183–190. Available at: https://doi.org/10.1001/jama.2008.976.

Clark, T.W. (2021) 'Determinism and Destigmatization: Mitigating Blame for Addiction', *Neuroethics*, 14(2), pp. 219–230. Available at: https://doi.org/10.1007/s12152-020-09440-w.

Dackis, C.A. and O'Brien, C.P. (2005) 'Neurobiology of addiction: treatment and public policy ramifications', *Nature Neuroscience* [Preprint]. Available at: https://doi.org/10.1038/nn1105-1431.

Dingel, M.J. *et al.* (2012) 'Chronic Addiction, Compulsion, and the Empirical Evidence', *AJOB Neuroscience*, 3(2), pp. 58–59. Available at: https://doi.org/10.1080/21507740.2012.665411.

Drogenbeauftragte (BMG-D) (2019) 'Drogen- und Suchtbericht 2019'.

Eagleman, D. (2012) *Incognito: The Secret Lives of the Brain*. Paperback ed. Edinburgh: Canongate.

European Monitoring Center for Drugs and Drug Addiction (EMCDDA) (2007) *Drugs and crime — a complex relationship*, *Drugs in focus*. Available at: https://www.emcdda.europa.eu/html.cfm/index36331EN.html_en (Accessed: 17 November 2022).

Fraser, S. *et al.* (2017) 'Addiction stigma and the biopolitics of liberal modernity: A qualitative analysis', *International Journal of Drug Policy*, 44, pp. 192–201. Available at: https://doi.org/10.1016/j.drugpo.2017.02.005.

Garland, B., American Association for the Advancement of Science and Charles A. Dana Foundation (eds) (2004) *Neuroscience and the law: brain, mind, and the scales of justice*. New York : Washington, D.C: Dana Press ; AAAS.

Gordon, N.S. and Fondacaro, M.R. (2018) 'Rethinking the voluntary act requirement: Implications from neuroscience and behavioral science research', *Behavioral Sciences & the Law* [Preprint]. Available at: https://doi.org/10.1002/bsl.2352.

Hall, W., Carter, A. and Forlini, C. (2015) 'The brain disease model of addiction: is it supported by the evidence and has it delivered on its promises?', *The Lancet. Psychiatry*, 2(1), pp. 105–110. Available at: https://doi.org/10.1016/S2215-0366(14)00126-6.

Heather, N. (2017) 'Q: Is Addiction a Brain Disease or a Moral Failing? A: Neither', *Neuroethics*, 10(1), pp. 115–124. Available at: https://doi.org/10.1007/s12152-016-9289-0.

Heather, N. *et al.* (2018) 'Challenging the brain disease model of addiction: European launch of the addiction theory network', *Addiction Research & Theory*, 26(4), pp. 249–255. Available at: https://doi.org/10.1080/16066359.2017.1399659.

Heim, D. (2014) 'Addiction: Not just brain malfunction', *Nature*, 507(7490), p. 40. Available at: https://doi.org/10.1038/507040e.

Heyman, G.M. (2010) *Addiction: a disorder of choice*. Cambridge, Mass.; London: Harvard University Press.

Heyman, G.M. (2013) 'Addiction and Choice: Theory and New Data', *Frontiers in Psychiatry*, 4, p. 31. Available at: https://doi.org/10.3389/fpsyt.2013.00031.

Hyman, S.E. (2007) 'The neurobiology of addiction: implications for voluntary control of behavior', *The American journal of bioethics: AJOB*, 7(1), pp. 8–11. Available at: https://doi.org/10.1080/15265160601063969.

Jones, O.D. *et al.* (2013) 'Law and Neuroscience', *Journal of Neuroscience*, 33(45), pp. 17624–17630. Available at: https://doi.org/10.1523/JNEUROSCI.3254-13.2013.

Karasaki, M. *et al.* (2013) 'The place of volition in addiction: Differing approaches and their implications for policy and service provision', *Drug and Alcohol Review*, 32(2), pp. 195–204. Available at: https://doi.org/10.1111/j.1465-3362.2012.00501.x.

Koob, G.F. and Volkow, N.D. (2010) 'Neurocircuitry of addiction', *Neuropsychopharmacology: Official Publication of the American College of Neuropsychopharmacology*, 35(1), pp. 217–238. Available at: https://doi.org/10.1038/npp.2009.110.

Kruse, J. (2020) 'Neurojurisprudenz - Potentiale und Perspektiven', *Neue Juristische Wochenschrift*, Heft 3, pp. 137–142.

Kuhar, M. (2015) *The addicted brain: why we abuse drugs, alcohol, and nicotine.* Upper Saddle River/New Jersey: Pearson Education.

Leshner, A.I. (1997) 'Addiction Is a Brain Disease, and It Matters', *Science*, 278(5335), pp. 45–47. Available at: https://doi.org/10.1126/science.278.5335.45.

Mayring, P. (2015) *Qualitative Inhaltsanalyse: Grundlagen und Techniken*. 12., überarbeitete Auflage. Weinheim Basel: Beltz Verlag.

Morse, S.J. (2017) 'The Science of Addiction and Criminal Law', *Harvard Review of Psychiatry*, 25(6), pp. 261–269. Available at: https://doi.org/10.1097/HRP.0000000000000150.

Murphy, J. (2017) 'Addiction Frameworks and Support for Expanding Treatment for Drug Offenders', *Contemporary Drug Problems*, 44(3), pp. 232–245. Available at: https://doi.org/10.1177/0091450917723770.

National Academies of Sciences, Engineering, and Medicine *et al.* (2018) *Neuroforensics: Exploring the Legal Implications of Emerging Neurotechnologies: Proceedings of a Workshop*. Edited by L. Bain et al. Washington, D.C.: National Academies Press, p. 25150. Available at: https://doi.org/10.17226/25150.

National Research Council (2011) *Reference Manual on Scientific Evidence: Third Edition*. Washington, D.C.: National Academies Press, p. 13163. Available at: https://doi.org/10.17226/13163.

NIDA, (National Institute on Drug Abuse) (2019) *Drugged Driving DrugFacts*, *National Institute on Drug Abuse*. Available at: https://nida.nih.gov/publications/drugfacts/drugged-driving (Accessed: 17 November 2022).

NIDA, (National Instiute on Drug Abuse) (2020) *Drugs, Brains, and Behavior: The Science of Addiction; Drugs and the Brain*, *National Institute on Drug Abuse*. Available at: https://www.drugabuse.gov/publications/drugs-brains-behavior-science-addiction/drugs-brain (Accessed: 28 January 2021).

NIH, N.I. of H. (NIH) (2020) *Criminal Justice DrugFacts*, *National Institute on Drug Abuse*. Available at: https://nida.nih.gov/publications/drugfacts/criminal-justice (Accessed: 13 April 2022).

Ochterbeck, D. and Forberger, S. (2022) 'Is a brain-based understanding of addiction predominant? An assessment of addiction researchers' conceptions of addiction and their evaluation of brain-based explanations', *Drug and Alcohol Review*, 41(7), pp. 1630–1641. Available at: https://doi.org/10.1111/dar.13520.

Ochterbeck, D., Frense, J. and Forberger, S. (2023) 'A survey of international addiction researchers' views on implications of brain-based explanations of addiction and the responsibility of affected persons', *Nordic Studies on Alcohol and Drugs* [Preprint]. Available at: https://doi.org/10.1177/14550725231188802.

Peele, S. (2016) 'People Control Their Addictions: No matter how much the "chronic" brain disease model of addiction indicates otherwise, we know that people can quit addictions - with special reference to harm reduction and mindfulness', *Addictive Behaviors Reports*, 4, pp. 97–101. Available at: https://doi.org/10.1016/j.abrep.2016.05.003.

Rundle, S.M., Cunningham, J.A. and Hendershot, C.S. (2021) 'Implications of addiction diagnosis and addiction beliefs for public stigma: A cross-national experimental study', *Drug and Alcohol Review*, 40(5), pp. 842–846. Available at: https://doi.org/10.1111/dar.13244.

Satel, S. and Lilienfeld, S.O. (2015) *Brainwashed: the seductive appeal of mindless neuroscience*. New York: Basic Books, Perseus Books Group.

Seear, K. (2017) 'The emerging role of lawyers as addiction "quasi-experts"', *The International Journal on Drug Policy*, 44, pp. 183–191. Available at: https://doi.org/10.1016/j.drugpo.2017.05.008.

Seear, K. (2023) 'Making addicts: critical reflections on agency and responsibility from lawyers and decision makers', *Psychiatry, Psychology, and Law: An Interdisciplinary Journal of the Australian and New Zealand Association of Psychiatry, Psychology and Law*, 30(1), pp. 33–50. Available at: https://doi.org/10.1080/13218719.2022.2112099.

Seear, K. and Fraser, S. (2016) 'Addiction veridiction: gendering agency in legal mobilisations of addiction discourse', *Griffith Law Review*, 25(1), pp. 13–29. Available at: https://doi.org/10.1080/10383441.2016.1164654.

Trujols, J. (2015) 'The brain disease model of addiction: challenging or reinforcing stigma?', *The Lancet. Psychiatry*, 2(4), p. 292. Available at: https://doi.org/10.1016/S2215-0366(15)00050-4.

Uusitalo, S., Salmela, M. and Nikkinen, J. (2013) 'Addiction, Agency and Affects – Philosophical Perspectives', *Nordic Studies on Alcohol and Drugs*, 30(1–2), pp. 33–50. Available at: https://doi.org/10.2478/nsad-2013-0004.

Volkow, N.D. (2021) 'Addiction should be treated, not penalized', *Neuropsychopharmacology*, 46(12), pp. 2048–2050. Available at: https://doi.org/10.1038/s41386-021-01087-2.

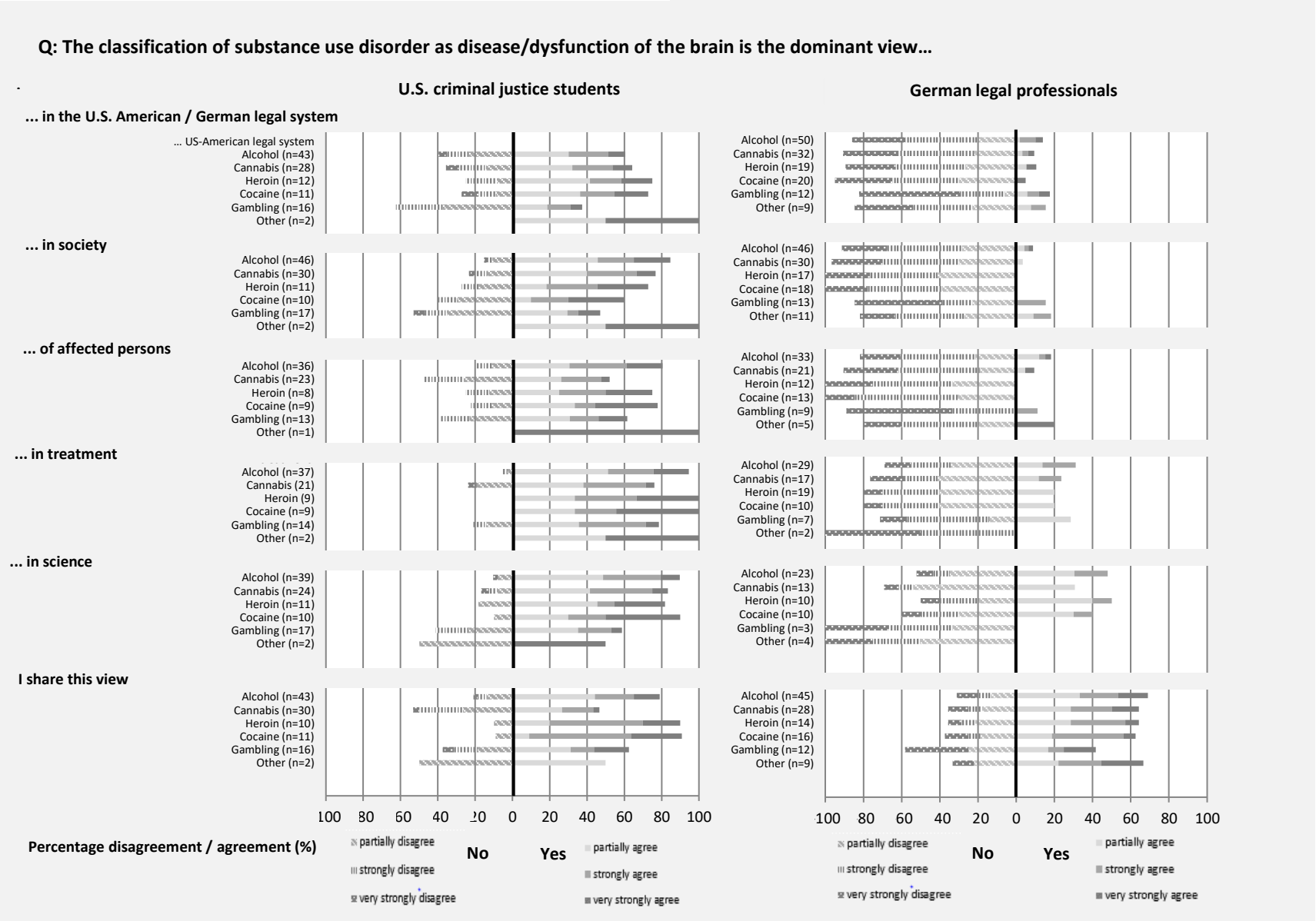
Volkow, N.D. and Koob, G. (2015) 'Brain disease model of addiction: why is it so controversial?', *The Lancet. Psychiatry*, 2(8), pp. 677–679. Available at: https://doi.org/10.1016/S2215-0366(15)00236-9.

Volkow, N.D., Koob, G.F. and McLellan, A.T. (2016) 'Neurobiologic Advances from the Brain Disease Model of Addiction', *The New England Journal of Medicine*, 374(4), pp. 363–371. Available at: https://doi.org/10.1056/NEJMra1511480.

Xu, Y. *et al.* (2022) 'Essentialist thinking predicts culpability and punishment judgments', *Psychology, Crime & Law*, 28(3), pp. 246–267. Available at: https://doi.org/10.1080/1068316X.2021.1905812.

Figure 1. Acceptance of brain-based explanations of addiction in different stakeholder groups

Source: Created by author


Q: The classification of substance use disorder as disease/dysfunction of the brain is the dominant view…
U.S. criminal justice students
German legal professionals
... in the U.S. American / German legal system
... US-American legal system
Alcohol (n=43)
Cannabis (n=28)
Heroin (n=12)
Cocaine (n=11)
Gambling (n=16)
Other (n=2)
Alcohol (n=50)
Cannabis (n=32)
Heroin (n=19)
Cocaine (n=20)
Gambling (n=12)
Other (n=9)
... in society
Alcohol (n=46)
Cannabis (n=30)
Heroin (n=11)
Cocaine (n=10)
Gambling (n=17)
Other (n=2)
Alcohol (n=46)
Cannabis (n=30)
Heroin (n=17)
Cocaine (n=18)
Gambling (n=13)
Other (n=11)
... of affected persons
Alcohol (n=36)
Cannabis (n=23)
Heroin (n=8)
Cocaine (n=9)
Gambling (n=13)
Other (n=1)
Alcohol (n=33)
Cannabis (n=21)
Heroin (n=12)
Cocaine (n=13)
Gambling (n=9)
Other (n=5)
... in treatment
Alcohol (n=37)
Cannabis (21)
Heroin (9)
Cocaine (n=9)
Gambling (n=14)
Other (n=2)
Alcohol (n=29)
Cannabis (n=17)
Heroin (n=19)
Cocaine (n=10)
Gambling (n=7)
Other (n=2)
... in science
Alcohol (n=39)
Cannabis (n=24)
Heroin (n=11)
Cocaine (n=10)
Gambling (n=17)
Other (n=2)
Alcohol (n=23)
Cannabis (n=13)
Heroin (n=10)
Cocaine (n=10)
Gambling (n=3)
Other (n=4)
I share this view
Alcohol (n=43)
Cannabis (n=30)
Heroin (n=10)
Cocaine (n=11)
Gambling (n=16)
Other (n=2)
Alcohol (n=45)
Cannabis (n=28)
Heroin (n=14)
Cocaine (n=16)
Gambling (n=12)
Other (n=9)
100 80 60 40 20 0 20 40 60 80 100
Percentage disagreement / agreement (%)
partially disagree
strongly disagree
very strongly disagree
No
Yes
partially agree
strongly agree
very strongly agree

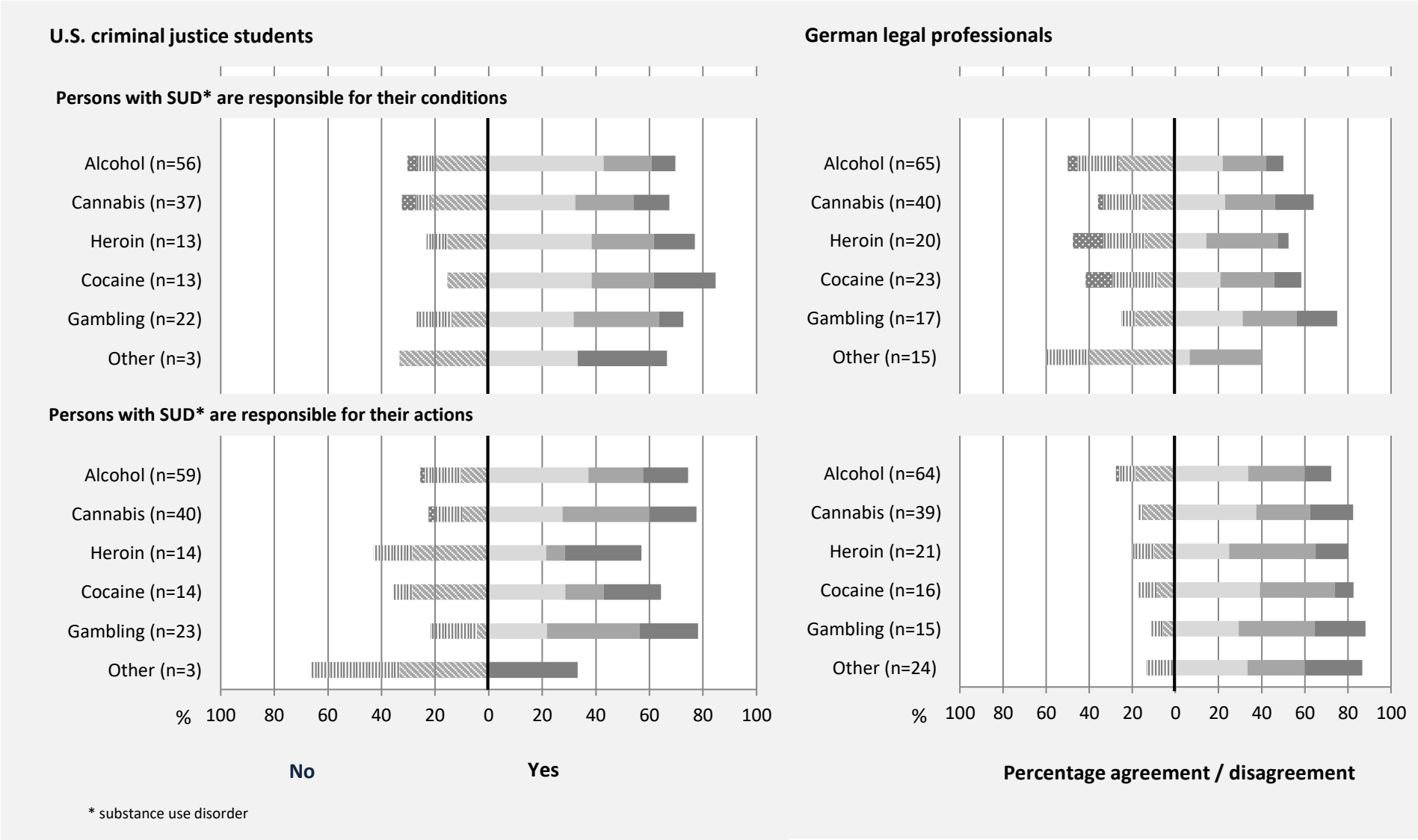
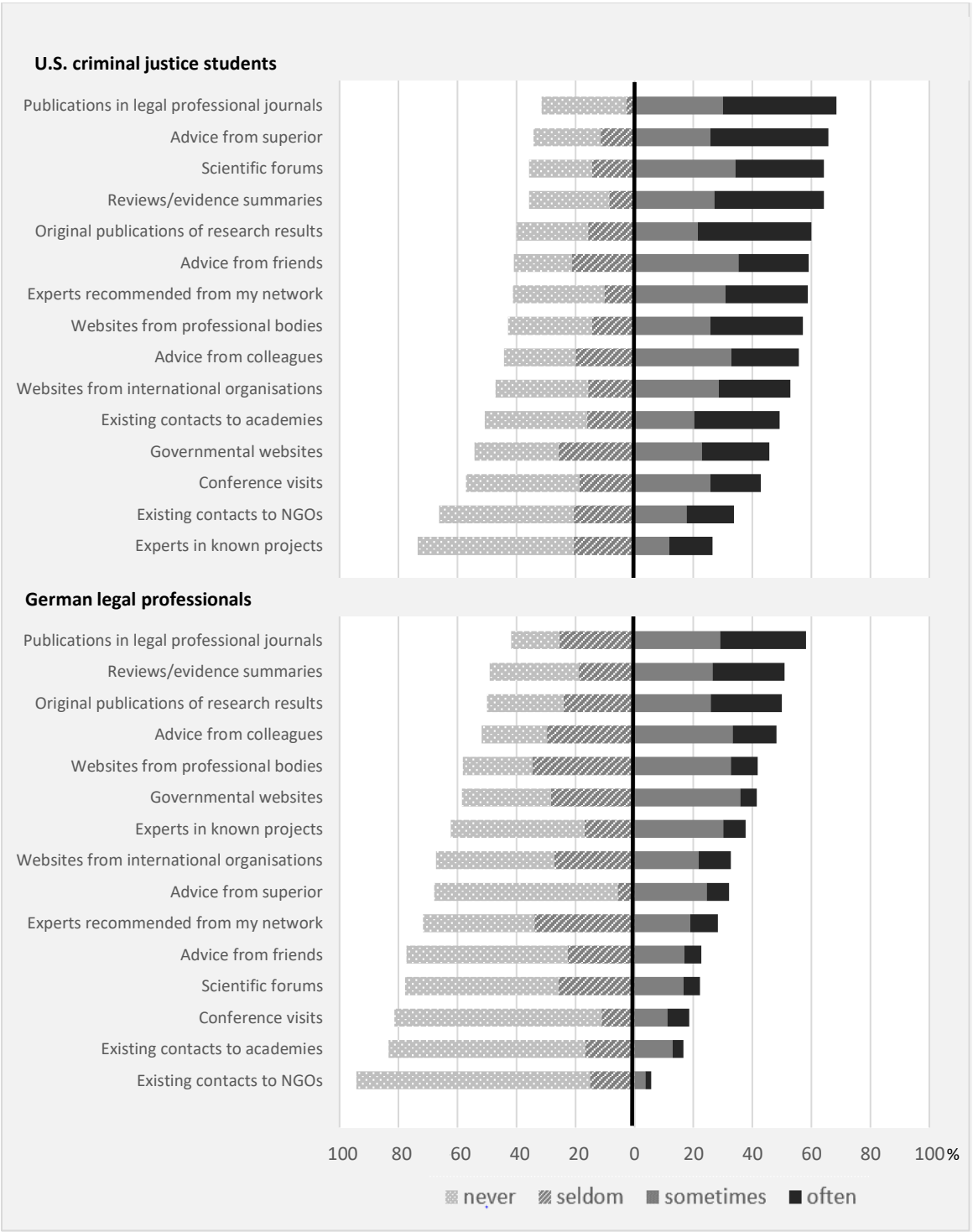


Figure 2 Perceived responsibility for condition and action as attributed to addicted persons

Source: Created by Author

Figure 3 Sources for advice on neuroscience research findings on addiction



Source: Created by author

Table I Participants' characteristics across both samples

Participants' characteristics		n	%
U.S. Criminal Justice Students		74	
Gender			
	Male	25	33.8%
	Female	45	60.8%
	Diverse	1	1.4%
	Unknown[1]	3	4.1%
Age (years)			
	Average	20.1	
	Maximum	37	
	Minimum	18	
	Missing	4	
Ethnicity (multiple nominations possible)			
	White	23	31.1%
	Hispanic or Latino	34	45.9%
	Black or African American	17	23.0%
	Asian / Pacific Islander	8	10.8%
	Other	5	6.8%
Current college major			
	Criminal justice	42	62.7%
	Psychology	10	14.9%
	Business & finance	3	4.5%
	Other	7	10.4%
	Undecided	5	7.5%
	Missing	7	
Future career plans			
	Lawyer, judge, prosecutor	22	35.5%
	Psychologist, psychiatrist	12	19.4%
	Law enforcement	7	11.3%
	Business & finance	4	6.5%
	Other	11	17.7%
	Undecided	6	9.7%
	Missing	12	
German Legal Professionals		74	
Gender			
	Male	31	43.1%
	Female	41	56.9%
	Unknown	2	2.7%
Current profession			
	Lawyer	26	46.4%
	Judge	11	19.6%
	Public prosecutor	2	3.6%
	Forensic medical	8	14.3%
	Forensic psychologist/psychiatrist	1	1.8%
	Researcher	7	12.5%
	Other	1	1.8%
	Missing	18	

Source: Created by author

Supplementary table S1 *German survey: invited groups*

- Rechtsanwaltskammern (bar associations)
- Deutscher Richterbund (DRB) Bundes- und Landesverbände (German Judges' Association)
- Neue Richtervereinigung (NRV) (New Judges' Association)
- Zivilrechtslehrervereinigung (ZLV) (Civil Law Teachers' Association)
- Deutsche Gesellschaft für Rechtsmedizin (German Society for Forensic Medicine)
- Fachausschuss Forensik d. Deutschen Gesellschaft für Soziale Psychiatrie (DGSP) (Expert Committee on Forensics of the German Society for Social Psychiatry (DGSP))
- Lehrstuhlinhaber Rechtswissenschaften der Universitäten in Deutschland (Chairholders of Law at the Universities in Germany)
- Rechtsmedizinische Institute in Deutschland (Institutes of Forensic Medicine in Germany)
- Lehrstuhlinhaber für forensische Psychiatrie in Deutschland (Chairholders of Forensic Psychiatry at the Universities in Germany)
- Rechtspsychologenregister (Register of Legal Psychologists)
- Pinnwand d. Sektion Rechtspsychologie des Berufsverbandes Deutscher Psychologinnen und Psychologen (bdp) (recommendation of participant)
- Homepage der Rechtsanwaltskammer Mecklenburg-Vorpommern (included by association)
- Kammerbericht 9/2020 der Rechtsanwaltskammer Hamburg (included by association)

Source: Created by author

Supplementary table S2 *Endorsement of brain-based explanations of addiction in different stakeholder groups* **Source:** Created by author

U.S. Criminal Justice students

	valid n	I don't know*	very strongly disagree		strongly disagree		partially disagree		partially agree		strongly agree		very strongly agree		disagree-ment total [%]	agree-ment total [%]
			n	%	n	%	n	%	n	%	n	%	n	%		
Q: What do you think about the classification of substance use disorders (SUD) as dysfunctions of the brain?																
I share this view																
Alcohol	43	16	1	**2.3**	2	**4.7**	6	**14.0**	19	**44.2**	9	**20.9**	6	**14.0**	20.9	**79.1**
Cannabis	30	11	1	**3.3**	7	**23.3**	8	**26.7**	8	**26.7**	5	**16.7**	1	**3.3**	53.3	**46.7**
Heroin	10	5					1	**10.0**	2	**20.0**	5	**50.0**	2	**20.0**	10.0	**90.0**
Cocaine	11	4					1	**9.1**	1	**9.1**	6	**54.5**	3	**27.3**	9.1	**90.9**
Gambling	16	6	1	**6.3**	2	**12.5**	3	**18.8**	5	**31.3**	2	**12.5**	3	**18.8**	37.5	**62.5**
Other	2	1					1	**50.0**	1	**50.0**					50.0	**50.0**
At present, this is the dominant view on SUD in…																
… the U.S. American legal system																
Alcohol	43	16	2	**4.7**	5	**11.6**	10	**23.3**	13	**30.2**	9	**20.9**	4	**9.3**	39.5	**60.5**
Cannabis	28	11	2	**7.1**	4	**14.3**	4	**14.3**	9	**32.1**	6	**21.4**	3	**10.7**	35.7	**64.3**
Heroin	12	3			2	**16.7**	1	**8.3**	5	**41.7**	2	**16.7**	2	**16.7**	25.0	**75.0**
Cocaine	11	4	1	**9.1**	1	**9.1**	1	**9.1**	4	**36.4**	2	**18.2**	2	**18.2**	27.3	**72.7**
Gambling	16	6			4	**25.0**	6	**37.5**	3	**18.8**	2	**12.5**	1	**6.3**	62.5	**37.5**
Other	2	1							1	**50.0**			1	**50.0**	0.0	**100.0**
… science																
Alcohol	39	20	1	2.6			3	**7.7**	19	**48.7**	12	**30.8**	4	**10.3**	10.3	**89.7**
Cannabis	24	17	1	4.2	1	**4.2**	2	**8.3**	10	**41.7**	8	**33.3**	2	**8.3**	16.7	**83.3**
Heroin	11	4					2	**18.2**	5	**45.5**	1	**9.1**	3	**27.3**	18.2	**81.8**
Cocaine	10	5					1	**10.0**	3	**30.0**	2	**20.0**	4	**40.0**	10.0	**90.0**
Gambling	17	5			3	**17.65**	4	**23.5**	6	**35.3**	3	**17.6**	1	**5.9**	41.2	**58.8**
Other	2	1					1	**50.0**					1	**50.0**	50.0	**50.0**
… affected persons																
Alcohol	36	22			3	**8.3**	4	**11.1**	11	**30.6**	11	**30.6**	7	**19.4**	19.4	**80.6**
Cannabis	23	18			5	**21.7**	6	**26.1**	6	**26.1**	5	**21.7**	1	**4.3**	47.8	**52.2**
Heroin	8	6			1	**12.5**	1	**12.5**	2	**25.0**	2	**25.0**	2	**25.0**	25.0	**75.0**
Cocaine	9	6			1	**11.1**	1	**11.1**	3	**33.3**	1	**11.1**	3	**33.3**	22.2	**77.8**
Gambling	13	8			2	**15.4**	3	**23.1**	4	**30.8**	2	**15.4**	2	**15.4**	38.5	**61.5**
Other	1	2											1	**100,0**	0.0	**100.0**
… U.S. society																
Alcohol	46	13	1	**2.2**	1	**2.2**	5	**10.9**	21	**45.7**	9	**19.6**	9	**19.6**	15.2	**84.8**
Cannabis	30	11	1	**3.3**	2	**6.7**	4	**13.3**	12	**40.0**	8	**26.7**	3	**10.0**	23.3	**76.7**
Heroin	11	4			1	**9.1**	2	**18.2**	2	**18.2**	3	**27.3**	3	**27.3**	27.3	**72.7**
Cocaine	10	5			1	**10.0**	3	**30.0**	1	**10.0**	2	**20.0**	3	**30.0**	40.0	**60.0**
Gambling	17	5	1	**5.9**	2	**11.8**	6	**35.3**	5	**29.4**	1	**5.9**	2	**11.8**	52.9	**47.1**
Other	2	1							1	**50.0**			1	**50.0**	0.0	**100.0**
… treatment																
Alcohol	37	22			1	**2.7**	1	**2.7**	19	**51.4**	9	**24.3**	7	**18.9**	5.4	**94.6**
Cannabis	21	18	1	**4.8**			4	**19.0**	8	**38.1**	7	**33.3**	1	**4.8**	23.8	**76.2**
Heroin	9	6							3	**33.3**	3	**33.3**	3	**33.3**	0.0	**100.0**
Cocaine	9	6							3	**33.3**	2	**22.2**	4	**44.4**	0.0	**100.0**
Gambling	14	8			1	**7.1**	2	**14.3**	5	**35.7**	5	**35.7**	1	**7.1**	21.4	**78.6**
Other	2	1							1	**50.0**			1	**50.0**	0.0	**100.0**

*Coded as missing

German Legal Professionals

	valid n	I don't know*	very strongly disagree		strongly disagree		partially disagree		partially agree		strongly agree		very strongly agree		disagree-ment total [%]	agree-ment total [%]
			n	%	n	%	n	%	n	%	n	%	n	%		
Q: What do you think about the classification of substance use disorders (SUD) as dysfunctions of the brain?																
I share this view																
Alcohol	45	16	5	**11.1**	3	**6.7**	6	**13.3**	15	**33.3**	9	**20.0**	7	**15.6**	31.1	**68.9**
Cannabis	28	10	3	**10.7**	2	**7.1**	5	**17.9**	8	**28.6**	6	**21.4**	4	**14.3**	35.7	**64.3**
Heroin	14	7	1	**7.1**	1	**7.1**	3	**21.4**	4	**28.6**	4	**28.6**	1	**7.1**	35.7	**64.3**
Cocaine	16	7	2	**12.5**	1	**6.3**	3	**18.8**	3	**18.8**	6	**37.5**	1	**6.3**	37.5	**62.5**
Gambling	12	6	4	**33.3**			3	**25.0**	2	**16.7**	1	**8.3**	2	**16.7**	58.3	**41.7**
Other	9	5	1	**11.1**			2	**22.2**	2	**22.2**	2	**22.2**	2	**22.2**	33.3	**66.7**
At present, this is the dominant view on SUD in…																
… the German legal system																
Alcohol	50	11	#	**28.0**	#	**38.0**	10	**20.0**	1	**2.0**	4	**8.0**	2	**4.0**	86.0	**14.0**
Cannabis	32	6	9	**28.1**	#	**40.6**	7	**21.9**	1	**3.1**	1	**3.1**	1	**3.1**	90.6	**9.4**
Heroin	19	2	5	**26.3**	7	**36.8**	5	**26.3**	1	**5.3**			1	**5.3**	89.5	**10.5**
Cocaine	20	3	6	**30.0**	7	**35.0**	6	**30.0**					1	**5.0**	95.0	**5.0**
Gambling	17	1	9	**52.9**	4	**23.5**	1	**5.9**	1	**5.9**	1	**5.9**	1	**5.9**	82.4	**17.6**
Other	13	1	4	**30.8**	4	**30.8**	3	**23.1**	1	**7.7**	1	**7.7**			84.6	**15.4**
… science																
Alcohol	23	38	2	**8.7**	2	**8.7**	8	**34.8**	7	**30.4**	4	**17.4**			52.2	**47.8**
Cannabis	13	25	1	**7.7**	1	**7.7**	7	**53.8**	4	**30.8**					69.2	**30.8**
Heroin	10	11	1	**10.0**	2	**20.0**	2	**20.0**	4	**40.0**	1	**10.0**			50.0	**50.0**
Cocaine	10	13	1	**10.0**	2	**20.0**	3	**30.0**	3	**30.0**	1	**10.0**			60.0	**40.0**
Gambling	3	15	1	**33.3**	1	**33.3**	1	**33.3**							100.0	**0.0**
Other	4	10	1	**25.0**	1	**25.0**	2	**50.0**							100.0	**0.0**
… affected persons																
Alcohol	33	26	7	**21.2**	#	**39.4**	7	**21.2**	4	**12.1**	1	**3.0**	1	**3.0**	81.8	**18.2**
Cannabis	21	17	6	**28.6**	9	**42.9**	4	**19.0**	1	**4.8**			1	**4.8**	90.5	**9.5**
Heroin	12	9	3	**25.0**	5	**41.7**	4	**33.3**							100.0	**0.0**
Cocaine	13	10	2	**15.4**	7	**53.8**	4	**30.8**							100.0	**0.0**
Gambling	9	9	5	**55.6**	3	**33.3**					1	**11.1**			88.9	**11.1**
Other	5	8	1	**20.0**	2	**40.0**	1	**20.0**					1	**20.0**	80.0	**20.0**
… German society																
Alcohol	46	15	#	**23.9**	#	**39.1**	13	**28.3**	2	**4.3**	1	**2.2**	1	**2.2**	91.3	**8.7**
Cannabis	30	8	8	**26.7**	#	**40.0**	9	**30.0**	1	**3.3**					96.7	**3.3**
Heroin	17	4	4	**23.5**	6	**35.3**	7	**41.2**							100.0	**0.0**
Cocaine	18	5	4	**22.2**	7	**38.9**	7	**38.9**							100.0	**0.0**
Gambling	13	5	6	**46.2**	2	**15.4**	3	**23.1**			2	**15.4**			84.6	**15.4**
Other	11	3	2	**18.2**	4	**36.4**	3	**27.3**	1	**9.1**	1	**9.1**			81.8	**18.2**
… treatment																
Alcohol	29	32	4	**13.8**	6	**20.7**	10	**34.5**	4	**13.8**	5	**17.2**			69.0	**31.0**
Cannabis	17	21	3	**17.6**	3	**17.6**	7	**41.2**	2	**11.8**	2	**11.8**			76.5	**23.5**
Heroin	10	11	1	**10.0**	3	**30.0**	4	**40.0**	2	**20.0**					80.0	**20.0**
Cocaine	10	13	1	**10.0**	3	**30.0**	4	**40.0**	2	**20.0**					80.0	**20.0**
Gambling	7	11	1	**14.3**	3	**42.9**	1	**14.3**	2	**28.6**					71.4	**28.6**

Other	2	12	1	**50.0**	1	**50.0**			100.0	**0.0**

*Coded as missing

Supplementary table S3 *Perceived responsibility for condition and action as attributed to addicted persons*

Source: Created by author

	n valid	I don't know	very strongly disagree		strongly disagree		partially disagree		partially agree		strongly agree		very strongly agree	
			n	%	n	%	n	%	n	%	n	%	n	%
U.S. criminal justice students														
Q: Persons with substance use disorders are responsible for their condition.														
Alcohol	56	5	2	3,6	4	7,1	11	19,6	24	42,9	10	17,9	5	8,9
Cannabis	37	5	2	5,4	2	5,4	8	21,6	12	32,4	8	21,6	5	13,5
Heroin	13	2			1	7,7	2	15,4	5	38,5	3	23,1	2	15,4
Cocaine	13	2					2	15,4	5	38,5	3	23,1	3	23,1
Gambling	22	1			3	13,6	3	13,6	7	31,8	7	31,8	2	9,1
Other	3						1	33,3	1	33,3			1	33,3
Q: Persons with substance use disorders are responsible for their actions.														
Alcohol	59	2	1	1,7	8	13,6	6	10,2	22	37,3	12	20,3	10	16,9
Cannabis	40	2	1	2,5	4	10,0	4	10,0	11	27,5	13	32,5	7	17,5
Heroin	14	1			2	14,3	4	28,6	3	21,4	1	7,1	4	28,6
Cocaine	14	1			1	7,1	4	28,6	4	28,6	2	14,3	3	21,4
Gambling	23				4	17,4	1	4,3	5	21,7	8	34,8	5	21,7
Other	3				1	33,3	1	33,3					1	33,3
German legal professionals														
Q: Persons with substance use disorders are responsible for their condition.														
Alcohol	64	1	3	4,7	12	18,8	17	26,6	14	21,9	13	20,3	5	7,8
Cannabis	39	1	1	2,6	7	17,9	6	15,4	9	23,1	9	23,1	7	17,9
Heroin	21		3	14,3	4	19,0	3	14,3	3	14,3	7	33,3	1	4,8
Cocaine	24		3		5	20,0	2	40,0	5	6,7	6	33,3	3	
Gambling	16	1		12,5	1	20,8	3	8,3	5	20,8	4	25,0	3	12,5
Other	15				3	6,3	6	18,8	1	31,3	5	25,0		18,8
Q: Persons with substance use disorders are responsible for their actions.														
Alcohol	65		1	1,5	5	7,7	12	18,5	22	33,8	17	26,2	8	12,3
Cannabis	40				1	2,5	6	15,0	15	37,5	10	25,0	8	20,0
Heroin	20	1			2	10,0	2	10,0	5	25,0	8	40,0	3	15,0
Cocaine	23	1			2	8,7	2	8,7	9	39,1	8	34,8	2	8,7
Gambling	17				1	5,9	1	5,9	5	29,4	6	35,3	4	23,5
Other	15				2	13,3			5	33,3	4	26,7	4	26,7

Supplementary table S3 *Importance of neuroscientific research results for participants' daily or expected future work and studies*

Source: Created by author

	Valid	Yes		No	
	n	**n**	**%**	n	%
U.S. Students					
Do you consider neuroscientific research results important for your studies?					
Criminal Justice major	42	**33**	**78.6**	9	21.4
Psychology major	10	**10**	**100.0**	0	0.0
All other majors	15	**10**	**66.7**	5	33.3
Are neuroscientific research results part of your curriculum?					
Criminal Justice major	42	**13**	**31.0**	29	69.0
Psychology major	10	**8**	**80.0**	2	20.0
All other majors	15	**5**	**33.3**	10	66.7
Do you expect neuroscientific research results being important for your job one day?					
Criminal Justice major	42	**32**	**76.2**	10	23.8
Psychology major	10	**10**	**100.0**	0	0.0
All other majors	15	**6**	**40.0**	9	60.0
German Legal Professionals					
Do neuroscientific research results in the field of addiction research influence your work? [own translation]					
Lawyers, judges, public prosecutors	38	**17**	**44.7**	21	55.3
Forensic medical professionals (e.g., psychiatrists, - psychologists)	9	**4**	**44.4**	5	55.6
Researchers	7	**3**	**42.9**	4	57.1
Other professions	1	**0**	**0.0**	1	100.0

Supplementary table S5 *Sources for advice on neuroscientific research findings on addiction*

	Q: If you needed professional advice or information about the use of neuroscientific research results in the field of addiction, where would you search for it?	missing	valid	often		sometimes		seldom		never	
		n	n	n	%	n	%	n	%	n	%
U.S. criminal justice students											
1	**Conference visits**	4	70	12	17.1	18	25.7	13	18.6	27	38.6
2	**Scientific forums**	4	70	21	30.0	24	34.3	10	14.3	15	21.4
3	**Advice from superior**	4	70	28	40.0	18	25.7	8	11.4	16	22.9
4	**Advice from colleagues**	4	70	16	22.9	23	32.9	14	20.0	17	24.3
5	**Advice from friends**	3	71	17	23.9	25	35.2	15	21.1	14	19.7
6	**Experts in known projects**	6	68	10	14.7	8	11.8	14	20.6	36	52.9
7	**Existing contacts to NGOs**	6	68	11	16.2	12	17.6	14	20.6	31	45.6
8	**Existing contacts to academies**	5	69	20	29.0	14	20.3	11	15.9	24	34.8
9	**Experts recommended from my network**	5	69	19	27.9	21	30.9	7	10.3	21	30.9
10	**Websites from professional bodies**	4	70	22	31.4	18	25.7	10	14.3	20	28.6
11	**Websites from international organizations**	4	70	17	24.3	20	28.6	11	15.7	22	31.4
12	**Governmental websites**	4	70	16	22.9	16	22.9	18	25.7	20	28.6
13	**Original publications of research results**	4	70	27	38.6	15	21.4	11	15.7	17	24.3
14	**Reviews/evidence summaries**	4	70	26	37.1	19	27.1	6	8.6	19	27.1
15	**Publications in legal professional journals**	4	70	27	38.6	21	30.0	2	2.9	20	28.6
16	**Other sources of information:**		1								
	Fact sheets, library resources & open access research										
German legal professionals											
1	**Conference visits**	20	54	4	7.4	6	11.1	6	11.1	38	70.4
2	**Scientific forums**	20	54	3	5.6	9	16.7	14	25.9	28	51.9
3	**Advice from superior**	21	53	4	7.5	13	24.5	3	5.7	33	62.3
4	**Advice from colleagues**	20	54	8	14.8	18	33.3	16	29.6	12	22.2
5	**Advice from friends**	21	53	3	5.7	9	17.0	12	22.6	29	54.7
6	**Experts in known projects**	21	53	4	7.5	16	30.2	9	17.0	24	45.3
7	**Existing contacts to NGOs**	21	53	1	1.9	2	3.8	8	15.1	42	79.2
8	**Existing contacts to academies**	20	54	2	3.7	7	13.0	9	16.7	36	66.7
9	**Experts recommended from my network**	21	53	5	9.4	10	18.9	18	34.0	20	37.7
10	**Websites from professional bodies**	19	55	5	9.1	18	32.7	19	34.5	13	23.6
11	**Websites from international organizations**	19	55	6	10.9	12	21.8	15	27.3	22	40.0
12	**Governmental websites**	21	53	3	5.7	19	35.8	15	28.3	16	30.2
13	**Original publications of research results**	20	54	13	24.1	14	25.9	13	24.1	14	25.9
14	**Reviews/evidence summaries**	21	53	13	24.5	14	26.4	10	18.9	16	30.2
15	**Publications in legal professional journals**	19	55	16	29.1	16	29.1	14	25.5	9	16.4
16	**Other sources of information, thereof:**		3	71		2		1		74	
	expert witnesses in court		2								
	books & scientific articles		1								

Source: Created by author