MARIJUANA USE WITHIN THE CONSTRUCTION WORKFORCE: THEORETICAL CONSIDERATIONS AND A RESEARCH PROPOSAL

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ABSTRACT

Alcohol and recreational drug use in construction is an area of growing concern. Workers are often found to have a higher prevalence of such behaviours than workers in other industries. Potential reasons for this are many. The social determinants of health negatively associated with work (the reasons why people drink or take recreational drugs) can be readily identified in construction work with temporary contracts, long working hours, and a lack of employment security for work within high-pressure and high-hazard environments. The legalisation of marijuana in several states of America has led to concerns from industry that there will be an increase in use amongst the local workforce, but it has also created the opportunity to study this phenomenon without ethical constraints regarding legality that may occur in other countries. This paper, presented for discussion rather than the dissemination of completed work, explores the theoretical issues that surround marijuana use within construction, focusing on its impact on construction site safety. This includes necessary considerations of accident causality, worker impairment, and physiological issues concerning the drug itself, as well as inherent problems with drug testing, and its effectiveness as a means of management control. This critical contextual review has been used to inform the development and proposal of a methodological approach to effectively examine this phenomenon empirically in the field, as part of a future research project to be undertaken in Colorado, USA.

Keywords: construction workforce, drug use, marijuana, safety, methodology

1. INTRODUCTION

There is growing concern over the use of alcohol and recreational drugs amongst construction workers, and the consequential impact this can have on sites, particularly in terms of site safety. Indeed, research on drug and alcohol use in the Australian construction

industry found that safety managers feel this problem is "a major issue that is only getting worse" (Biggs and Williamson, 2012:450). The legalisation of marijuana in several US states has resulted in various legal, moral and technical dilemmas for employers. Many assume that legalisation will increase use amongst their workforce, with negative consequences for safety and productivity.

Within the high-pressure, high-hazard construction site environment, any form of impairment can have serious repercussions, not only for the workers concerned, but for all those working on the site. Yet marijuana as a drug raises several unique problems. It is a natural product with different potencies, which are, in turn, influenced by how it is used, and its effects can therefore vary significantly. There is also a lack of scientific agreement on the quantifiable effects of marijuana on human performance, as well as inherent problems with drug testing using standard methods, as the longevity of marijuana in the body long outlasts actual intoxication. All of the above are aspects that require careful consideration now that the legal context has changed and states have granted their citizens the freedom to use marijuana recreationally without punishment.

This paper sets the scene for a proposed research project, itself aiming to establish how the legalisation of marijuana has impacted (or not impacted) construction site safety. At present, the impacts of marijuana use on construction safety and worker well-being and legalisation of marijuana are unknown. The theoretical and social context of marijuana legalisation is explored in depth, and then used to inform the development of a methodological approach to effectively examine this phenomenon empirically in the field.

2. MARIJUANA AND CONSTRUCTION WORK

Construction workers take drugs. The industry consistently ranks very highly for illicit drug use (e.g. Gerber and Yacoubian Jr, 2002; French et al., 2004; Minchin et al., 2006; Larson et al., 2007; Schofield et al., 2013; Bush and Lipar, 2015, cited in Fardhosseini and Esmaeili, 2016), with statistically significantly higher use than in other comparable high-hazard industries, such as oil and gas (Tan and Lloyd, 2016).

There are a number of reasons why this could be the case. Researchers have highlighted the links between work-related stress and drug use (Fardhosseini and Esmaeili, 2016), and the contribution of unsocial work patterns, long travel, and abnormal shifts to elevated risks of substance abuse (Miller et al., 2007). Remote job locations mean that workers are far from family and friends, they feel lonely, and so they become bored and tempted (Pinto et al., 2011). Feelings of powerlessness that come from short-term employment and job insecurity (Frone, 2013), and the very nature and pressure of construction work, including facing hazards on a daily basis (Biggs and Williamson, 2012), can also have a major effect, associated, as they are, with the social determinants of health, the reasons why people take drugs (Wilkinson and Marmot, 2003).

It is arguable that this "why" of marijuana use is perhaps the more critical consideration here, and research could better focus on such fundamental causes of poor worker health, rather than simply examining the symptoms, of which drug use is just one. The reader should be reassured that this work has been undertaken elsewhere (Sherratt, 2016a). For the purposes of this paper, the focus shall remain on the symptoms of drug use, specifically marijuana use, amongst the workforce, and the concerns this has raised for construction site safety, given recent changes in the legal status of marijuana for recreational use in the USA,

together with due consideration of the potential benefits and positive impacts of marijuana use and legalisation.

3. MARIJUANA, WORKER IMPAIRMENT, AND SAFETY

The physiological and psychological effects of marijuana have been well researched, not only because it is the most-consumed illicit drug in the world (Fernandes and De Campos Moreira, 2011:95), but also due to its potential medicinal benefits. Effects of its use have been found to include dizziness, tachycardia (accelerated heart rate), psychomotor retardation, and alterations to perceptual and motor speeds and coordination, while cognitive function, learning, and memory are also affected (Fernandes and De Campos Moreira, 2011). The extent of cognitive impairment caused by marijuana has been the subject of much debate recently, and no accepted answer has yet been found (Caulkins et al., 2015:35), although long-term users can have problems with brain development, intelligence quotient (IQ), reaction time (Caulkins et al., 2015), attention, and loss of memory, and can be prone to knee-jerk reactions (Fernandes and De Campos Moreira, 2011). Yet, as Caulkins et al. (2015:33) also note, problems in determining the extent of such cognitive functions are linked to the difficulties of separating the direct effects of marijuana from what they term "the personality traits" of the user.

However, these effects are not consistent from user to user; marijuana affects everyone differently. In part, this is because marijuana is a natural product, and its potency varies from plant to plant, with the result that there is no "standard" dosage. Active cannabinoids within the plant can vary in concentration from 0.3% to 30%, which results in variation in the levels in human tissues after use (Fernandes and De Campos Moreira, 2011). The way the drug is used also alters its effects, which can differ significantly (bioavailability of the drug can vary from 2% to 56%) due to what are termed "smoking dynamics" – for example, the hold time, the number of puffs taken, and the inhalation volume – all of which influence the degree of drug exposure (Huestis, 2007). A rough "timeline" of impairment has been established: peak concentration of the drug comes 10–30 minutes after inhalation, and it is then stored in the fatty tissues of the body, from where it is slowly released and removed (Fernandes and De Campos Moreira, 2011). The effects last for about 3–5 hours, after which the influence on physiology wears off and the user gradually returns to normal (National Highway Traffic Safety Administration, 2015). It should also be noted that marijuana use can create a "stone-over" effect, similar to an alcohol-related hangover, in which aspects of impairment can continue into the following day.

From the above, it is unsurprising that concerns have been raised over marijuana and safety, particularly in the workplace. It is often argued that any substance abuse creates a recognised serious risk to the safety of the user and others (Miller et al., 2007), and evidence has been established from controlled laboratory trials that "marijuana use reduces psychomotor performance in ways that increase overall risk of accidents, and in particular, impairs driving" (e.g. Ramaekers, et al., 2004; Ramaekers et al. 2006, cited in Caulkins et al., 2015:33). Miller et al. (2007) also note that although limited, previous studies that have examined the relationship between illicit drug users and occupational injury have found that drug users have higher injury rates, while Spicer et al. (2003) simply state that illegal drug use causes impairment, which, in turn, triggers occupational injury. Indeed, there are many studies that have correlated impaired coordination with a reduction in worker ability to perceive and respond to hazards (see Miller et al., 2007 for a summary of studies on

driving vehicles and piloting ships and aircraft). However, this body of research often examines the impacts of impairment within relatively controlled work environments, where decision-making can be linear and can follow relatively simple and prescriptive sequences. Construction sites are highly complex places, so impairment within these environments may be even more problematic.

Yet, in spite of such findings, and suggestions of a correlation between specifically marijuana use and accidents, causality is much harder, if not impossible, to prove. Indeed, Caulkins et al. (2015:xii) state that current literature is "insufficient to determine the extent to which marijuana use is causally linked to any of these outcomes". Wickizer et al. (2004) suggested that substance abuse may be a risk factor for occupational injuries and accidents, but there is conflicting evidence about the "risk gradient", with some studies unable to find a link, others establishing a weak link, and others an arguably clearer link, although all vary in the parameters of type of drug, frequency of use, and amount of use. The problem is the difficulty in establishing a direct correlation between workplace injury and drug use, and some researchers have even suggested there is no correlation at all (e.g. Pidd and Roche, 2014), while Frone (2013) goes further to argue that the claimed correlation between drug use and cognitive and psychomotor performance, on the one hand, and work safety, on the other hand, is not only unconvincing, but it is also to some extent prejudiced. Little is known about what proportion of construction site accidents are directly attributable to marijuana use (Biggs and Williamson, 2012), yet, given the inherent complexities and multiple causes behind almost any accident on a construction site (e.g. Gibb et al., 2001), the lack of any statistically significant causal relationship is perhaps not all that surprising.

It should be noted that marijuana use, and, by extension, marijuana legalisation, may have some positive benefits. Use of marijuana is well known to induce a short-term increase in relaxation, a decrease in stress, and an increase in appetite. For some construction workers, use of legalised marijuana may be beneficial in the same way that many patients have benefited from medicinal marijuana for years. In this study no presumptions are made about the net positives or negatives of marijuana use; however, it is recognised that being high at work is unacceptable.

4. DRUG-FREE WORKPLACE PROGRAMMES

The response to increasing issues concerning drug and alcohol use within any industry workforce has often been to implement drug-free workplace (DFW) programmes. As Gerber and Yacoubian Jr (2002:54) note with specific consideration of the construction industry, the "high rates of alcohol and other drug use coupled with the high risk safety-sensitive nature of the industry have prompted the development of a variety of drug surveillance and prevention strategies", and there has been an increase in policy development to improve safety through addressing problems of worker impairment (Biggs and Williamson, 2012). DFW programmes can involve a variety of worker education and assistance elements, but most tend to include some form of drug and alcohol testing of the workforce. This can be introduced in a number of ways, either carried out pre-employment, post-accident, randomly, or because of reasonable suspicion, or some combination of the four (Schofield et al., 2013), with the goal of deterring substance abuse amongst currently employed workers, and avoiding hiring drug-using applicants (Minchin et al., 2006).

Although testing programmes have been associated with reductions in safety accidents, again, causality has not been proved. For example, Schofield et al. (2013:99) found that construction companies using drug-testing programmes generally exhibited lower, although often non-significant, injury rates than companies not using drug-testing programmes, with results varying by trade and injury types. Waehrer et al. (2016) established that drug testing was only effective to lower minor injury rates with no lost-work, but they could not establish any relationship with lost-work injuries. The much-quoted work by Gerber and Yacoubian Jr (2002) found that construction companies with drug-testing programmes experienced a 51% reduction in incident rates within two years of implementation, although this did not continue to improve beyond the first few years of implementation, and the authors were careful to present this statistic as an association with no claim to causality, despite the misuse of this statistic since.

Indeed, Gerber and Yacoubian Jr (2002:67) twice reiterate in the conclusions to their work that "drug testing does not, in and of itself, constitute a drug-abuse prevention programme […] only one component". Indeed, it is highly probable that the introduction of a new safety-related programme, be it educational or simply involving drug and alcohol testing, reorients the workplace to safety, which then, in turn, sees improvements in practice. This cyclical relationship in safety management has been established by Lingard et al. (2017), where intervention and consequential improvement can readily be seen on sites, followed by an increase in safety failures, as the worksite reverts to "normal" practice. Indeed, ancillary benefits to safety have been found with many different types of intervention, as Goldenhar and Stafford (2015) found with "stretch and flex" programmes for worker health, which saw unintended improvements in many other areas, including safety. This hypothesis of the beneficial consequences of intervention is also acknowledged by Miller et al. (2007:566), Schofield et al. (2013), and Wickizer et al. (2004:107) throughout their DFW research.

Marijuana has certain characteristics that do not facilitate a simple testing process. The active ingredient in marijuana is tetrahydrocannabinol, known as THC, and this is what creates impairment. It has been argued that any presence of THC could be indicative of sufficient impairment, because although THC only lasts for a relatively short time in the body, consequential psychomotor effects can last for 8 days or more (Caulkins et al., 2015). However, testing methods (using urine, blood, or hair) do not test for THC; instead, they test for one of the cannabinoid metabolites. This chemical, called C-THC, is actually generated as the impairing effects of THC are wearing off, and has a much longer life in the body than THC itself. This time duration can vary from person to person, depending on the strength of the marijuana, the frequency of use, and the individual's physiology. C-THC can last in the body for over 30 days, and it varies considerably between users, even in controlled studies, where the dose and smoking pace is controlled. A standard positive test for marijuana (e.g. a urine test) therefore only indicates that drug exposure has historically occurred; it is not confirmation of current impairment (Huestis, 2007). Despite scientific best efforts, there are not yet accepted quantitative metrics that correlate a level of THC or its metabolites to the more familiar measure of blood alcohol. Although in Washington State, a legal level of impairment has been set at five nanograms of THC per millimetre of blood, this has not been adopted countrywide.

5. LEGALISATION OF MARIJUANA IN THE USA

Although marijuana remains a Class 1 drug under US federal law, some state law has seen a shift towards decriminalisation and legalisation of its use for medical, and most recently recreational, purposes. In 2012, Colorado and Washington both legalised recreational marijuana, and although the full impacts of this are unlikely to be established for some time due to their complex social consequences (both good and bad), initial benefits have been sufficient to encourage two other states to follow suit in 2014, and four more in 2016. The rather confusing situation is that marijuana is both technically legal and illegal, although the US Department of Justice has stated that it will tolerate state-led legalisation as long as there are effective regulatory and enforcement systems to ensure that public safety, health, and other law-enforcement interests are not compromised (Caulkins et al., 2015).

Yet, this adds a further level of complexity to that already established concerning marijuana use. First and foremost, legalisation can influence existing use patterns, as well as potentially encouraging more users. Caulkins et al. (2015) suggest that changes will also occur in frequency and intensity of use, and modalities of use, as well as the potency and quality of the drug now available. Secondly, construction companies can no longer test workers and penalise them for positive marijuana test results simply due to the illegality of marijuana. Now that marijuana is legal for recreational use in the state, and testing is not able to distinguish between current impairment and historical use, the situation becomes even more problematic.

Indeed, there was a reported increase of 20% in positive drug tests after the law change in 2012 (Assurex Global, n.d.), and although supporters of drug testing admit that it is "conceivable that an employee could test positive for marijuana despite not showing any outward signs of impairment" (Halverson, 2013), they are reluctant to acknowledge that this is not just conceivable, but given the problems with testing, it is actually highly probable. Yet this possibility does not seem to have tempered practice. Indeed, Minchin et al. (2006) report a case of an organisation that repeatedly fired employees for failed drug tests, rather than for any problems with the employee's work or safety performance, with no consideration that the employee's failed test may have had no link to immediate impairment. Organisations and other worker associations have also fallen back on the fact that marijuana remains a Class 1 drug under federal law, and they therefore do not allow the use of marijuana either medically or recreationally within their workforce at all (Halverson, 2013). The state legalisation laws generally do not prohibit drug testing of workers or organisational DFW policies, despite problems with what testing is actually indicating, or the lack of direct evidence of causality in workplace accidents.

As a consequence of failing drug tests, workers can still be fired, even in states where marijuana has been legalised for medicinal and recreational use (Bogot and Neville, 2015). In different cases, unemployment benefits have been both awarded and withheld from workers fired due to a failed drug test from using marijuana outside of working hours, although the marijuana was detected by testing during working hours. Indeed, the acknowledged problems of underreporting of accidents on sites (Sherratt, 2016b) are only likely to be exacerbated by such legal complexities. Similar inconsistencies exist with regard to worker compensation; in some cases, it has been awarded, and in others it has not, with further complexities added should the claim be made that intoxication was the cause of the accident. Case law is still developing precedent, and so it is perhaps unsurprising that

the recommended industry response has been to follow federal and not state law, so that businesses can ensure that they do not "go up in smoke" (Halverson, 2013).

6. CRITICAL REFLECTIONS

The above discussion has revealed some interesting considerations about the use of marijuana within the construction workforce, and the implications of its legalisation. Central to this is the continued reliance on testing, which is particularly pertinent when traditional methods of testing are inherently flawed. Furthermore, any testing is arguably an interference in a worker's private life (Fardhosseini and Esmaeili, 2016) and raises issues around employer violations of worker privacy, freedoms, and autonomy, which are all the more prominent in a situation where the state has seen fit to specifically grant those freedoms to its residents. Yet testing is likely to continue, not least because companies with an established testing programme are often able to receive discounts on their worker compensation insurances. Furthermore, the desires of the commercial drug-testing industry should also be acknowledged here. It is an industry worth millions, and it is therefore keen to continue to convince organisations that drug testing does reduce accidents on sites (Wickizer et al., 2004).

More worrying is the potential for drug-testing programmes to give employers a simple "get-out" in the case of any on-site accident. Despite the fact that testing positive for marijuana does not necessarily equate to worker impairment, it creates a straightforward "cause" for any site accident, enabling more systemic problems, such as poor management, to be ignored. That is, marijuana use can be blamed for accident causation when the actual impacts may be minimal or nil. While worker impairment must be recognised as a potential factor in site accidents, and should not be tolerated by managers or peers in practice, care must be taken to ensure that this new step in legalisation is not utilised as an excuse for poor safety management, or a way to simply "blame the worker" (Frederick and Lessin, 2000) for wider management failings. This also has the potential to lead to underreporting and concealment of incidents for fear of the consequences (Miller et al., 2007; Schofield et al., 2013) should a test prove positive after an accident has occurred.

There is a fairly strong disconnect between company drug-testing policies, the drug-testing methods themselves, and legal drug use. Where tests for impairment due to alcohol directly measure the amount of alcohol in the body at the time of testing, marijuana testing can show positive results many days after legal use and impairment. This disconnect causes some employers to adopt blanket policies where no marijuana use is acceptable, citing federal law. The risk is that workers will not report marijuana use, and that employers will cite any positive marijuana tests as a cause of injury, when management issues or other human factors are really at play.

7. A RESEARCH PROPOSAL

It has been established that there are several interrelated factors at play within the scope of this phenomenon. The legalisation of marijuana has led to increased concerns around impairment and safety (and indeed productivity), yet "science" is struggling to respond in terms of establishing causality, developing appropriate testing, and finding solutions to the ethical and moral questions that have now been raised. As Caulkins et al. (2015:36) note, there is an "inherent ambiguity that accompanies non-experimental findings on complex

human phenomena involving many potential causal pathways", and while human experiments are possible, generalisability often remains questionable.

Indeed, many of these questions would not be answered easily by research grounded in a positivistic paradigm, where establishing the validity and reliability of the findings would be a challenge. For example, issues around respondent self-implication and corporate protocol can soon disrupt any quest for the "truth" around drug use or safety, while the debate is still ongoing as to whether accident causality can ever really be "proved" (Hollnagel, 2014). Given ongoing arguments around the effectiveness of drug testing as a preventive tool, and the fact that despite its use as a deterrent, any post-incident testing actually comes too late for safety, as well as the inherent issues regarding marijuana longevity in the body, research focused on the science of testing is perhaps best left to the scientists. What should be explored, however, are the social consequences of such testing amongst the workers and management on sites. It could be suggested that this has already been carried out, and, indeed, "attitudes" to the legalisation of marijuana have been explored from a positivistic foundation, yet, as such researchers note, whether such attitudes are themselves valid, or even relevant, in terms of future utility is debatable.

Therefore, an alternative is proposed. A social constructionist approach (Gergen, 1999) grounds itself methodologically in the perspective that the world we experience is socially constructed by the people within it, through interactions, systems, and practices (Gergen and Gergen, 2004). This results in shared versions of knowledge within particular communities (Gergen and Gergen, 2003; Filmer et al., 2004), and the "truth" is simply the current accepted way of understanding the world. Social construction is therefore able to accept shifting truths. It allows for conflict between, or inconsistency within, the understandings of individuals, something that could predictably emerge, given the complex nature of the phenomenon under examination here. Indeed, such an approach has been demonstrated to be useful in exploring sensitive issues such as construction site safety, while also allowing for inconsistency, complexity, and change within individuals (Sherratt et al., 2013; Sherratt, 2016b).

Such an approach can ask deceptively simple questions, such as "How is the legalisation of marijuana working on this site?", which will, in turn, reveal how people are now making sense of this legal change and creating new shared understandings of marijuana use, both recreationally and in the workplace. Employing discourse analysis to explore conversations, focus groups, induction scripts or slides, site posters, and other documentary data (Sherratt, 2016b), marijuana, its legalisation, its role in impairment, and its relationship to safety on the construction site can be illuminated, and therefore better understood. It is perhaps important to note here that the sample for such a study will focus on the workers and site-based management, those for whom safety actually matters, as the majority of previous work in this area has focused on the opinions of employers or human resource or safety managers, and not on the opinions of those actually carrying out the work (e.g. Gerber and Yacoubian Jr, 2002; Fardhosseini and Esmaeili, 2016). Focusing data collection on the site is essential to explore how marijuana legalisation has actually changed understandings and practice. As Miller et al. (2007:570) note, informal norms take precedence over formal policies, and they are not readily revealed by a questionnaire completed by a senior manager.

Furthermore, a social constructionist approach, by exploring and highlighting the network of discourses that create our shared social understandings, is also able to better illuminate that highly sought-after, yet frustratingly intangible, asset, namely site safety culture. This very much reflects the goal of the approach, if not the methodology, of work currently being undertaken by Biggs and Williamson (2012) on drug and alcohol use on sites in Australia, where this work is itself grounded in a "safety culture" approach that seeks effective interventions, and where the goal of such interventions is "to render it unacceptable to arrive at a construction workplace with impaired judgement" (Biggs and Williamson, 2012:446). The project presented here seeks a similar goal, namely to explore how things are currently understood on sites, so as to better inform the development of programmes that seek to support a site safety culture where immediate impairment is not acceptable, but that are still able to find fit with the wider societal change in terms of legalisation.

8. SUMMARY

This paper presents a theoretical context and a research proposal. The legalisation of marijuana for recreational use in various states of the USA has led to the emergence of a complex and ethically influenced debate on construction site safety, with no clear way for the industry to respond to ensure effective management of this change on construction sites. This research proposal, which is grounded in a social constructionist approach to safety, seeks to explore this through the shared understandings of those who work on sites, and how they are now making sense of the legalisation of marijuana, their work, and their workplace.

The authors have presented this work for discussion, and they welcome feedback, comment, and critique from their W099 colleagues.

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