

Assessing Attitudinal Change Towards Drinking and Driving

A Systematic Review of Intervention Tools, from Classical Theory to Generative AI

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A systematic review to synthesize attitudinal change theories and assessment methods. It bridges classical theories with modern interventions, reviewing digital tools like Virtual Reality (VR) and mobile applications. The report culminates in a practical assessment toolkit, including novel applications of Generative AI (GenAI) and Large Language Models (LLMs) for designing and analyzing future attitudinal scales.

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List of Abbreviations

ADDS	Attitudes toward Drinking and Driving Scale
ALR	Administrative License Revocation
AMP	Affect Misattribution Procedure
ANOVA	Analysis of Variance
ASSIST	Alcohol, Smoking and Substance Involvement Screening Test
AUDIT	Alcohol Use Disorders Identification Test
BAC	Blood Alcohol Concentration
BMI	Brief Motivational Interviewing
BrAC	Breath Alcohol Content
BYAACQ	Brief Young Adult Alcohol Consequences Questionnaire
CAGE	Cutting down, Annoyance by criticism, Guilty feeling, and Eye-openers
CBT	Cognitive-Behavioural Therapy
CDT	Cognitive Dissonance Theory
COM-B	Capability, Opportunity, Motivation Model
DRIE LoC	Drinking-Related Internal-External Locus of Control Scale
DUI	Driving Under the Influence
DWI	Driving While Intoxicated
EBP	Evidence-Based Practice
ELM	Elaboration Likelihood Model
GDPR	General Data Protection Regulation
GGT	Gamma-Glutamyl Transferase
GNAT	Go/No-go Association Task
HBM	Health Belief Model
IAT	Implicit Association Test
IDS	Impaired Driving Scale
LoC	Locus of Control
MAST	Michigan Alcoholism Screening Test
MCV	Mean Corpuscular Volume
MI	Motivational Interviewing
M-PASS	Michigan Prevention and Alcohol Safety for Students
ms	Milliseconds
NOS	Newcastle-Ottawa Scale
NSW	New South Wales
P.A.S.S.	Plan a Safe Strategy

PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
RBT	Random Breath Testing
RCTs	Randomized Controlled Trials
RTCQ	Readiness to Change Questionnaire
SBIRT	Screening, Brief Intervention, and Referral to Treatment
SDGs	Sustainable Development Goals
SJT	Social Judgment Theory
SLT	Social Learning Theory
SPT	Self-Perception Theory
TLFB	Timeline Follow-back
TPB	Theory of Planned Behaviour
TTM	Trans-Theoretical Model
UN	United Nations
UNITAR	United Nations Institute for Training and Research
VAS	Visual Analog Scale
VR	Virtual Reality
WA	Western Australia
WHO	World Health Organization

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About

This study is the result of a joint effort between the United Nations Institute for Training and Research (UNITAR) and York University.

Established in 1965, the **United Nations Institute for Training and Research (UNITAR)** is the dedicated training arm of the United Nations system. It enhances the effectiveness of the UN by providing training and conducting research, developing the capacities of individuals, organizations, and institutions to support global decision-making and sustainable development.

UNITAR delivers learning and related services to advance the 2030 Agenda and the United Nations Sustainable Development Goals. It provides training and capacity development primarily to developing countries, with special attention to Least Developed Countries (LDCs), Small Island Developing States (SIDS), and other vulnerable groups, including communities affected by conflict.

York University is a top international teaching and research university recognized as Canada's leading comprehensive university in advancing understanding of artificial intelligence in publications and ranks first in Ontario for global collaborative research publications (SciVal 2020–2024). Named as one of the world's leading universities in the 2025 Times Higher Education Impact Rankings. In Canada, York is number one for SDG 4: Quality education, and second for SDG 5: Gender equality, SDG 10: Reduced inequities and SDG 12: Responsible consumption and production. The University scored in the top 10 across the country for 12 out of 17 SDGs.

Executive Summary

“Assessing Attitudinal Change Towards Drinking and Driving”

Drink-driving remains one of the most stubborn contributors to global road trauma. It causes roughly 27 per cent of all road-injury deaths and costs economies billions each year. Despite decades of campaigns, self-reported rates of driving within two hours of drinking still range from 5 per cent in Hungary to 34 per cent in Portugal, and the behaviour continues to kill or injure tens of thousands of other third parties annually. This persistent burden prompted the United Nations Institute for Training and Research (UNITAR) and York University (YorkU) to launch a collaboration aimed at understanding why many interventions produce only short-lived results. The project also seeks to create a practical, evidence-based toolkit that governments, NGOs, and road-safety practitioners can use to measure and, ultimately, increase attitudinal and behavioural change.

The project began with a PRISMA-aligned systematic review of more than 700 records. It narrowed to 45 high-quality studies spanning four decades and 63,656 participants across North America, Europe, Africa, and Asia. By integrating quantitative effect sizes, qualitative themes, and expert co-design workshops, the team identified a common set of weaknesses in existing programmes. These include an over-reliance on self-report surveys that invite social-desirability bias, a neglect of implicit or automatic attitudes that predict spontaneous decisions, the use of non-standardised instruments that prevent cross-culture or cross-time comparisons, and limited linkage between attitude scores and real-world behaviour such as recidivism, ride-choice, or biomarker-verified abstinence.

To address these gaps, the review first mapped nine dominant theories of attitude and behaviour change. These range from the Theory of Planned Behaviour and Cognitive Dissonance to the Elaboration Likelihood Model and the COM-B system. It then aligned them with thirteen intervention categories that include legal reform, mass-media awareness, brief motivational counselling, alcohol-interlock programmes, virtual-reality simulations, alternative-transport incentives, family-based initiatives, and multi-component community projects. The resulting matrix shows that the largest and most sustained reductions in drink-driving behaviour occur when at least two of the following elements are combined: credible and consistent enforcement, rehabilitative or therapeutic engagement lasting 6 months or more, and individual or group counselling that explicitly targets readiness to change and self-efficacy. Programmes that rely solely on knowledge-based classroom sessions or one-off fear appeals rarely translate into measurable behaviour change once the initial emotion or novelty fades.

The second deliverable is an Attitudinal Change Assessment Toolkit that matches each intervention type to the most sensitive, cost-effective, and culturally adaptable measurement methods. For high-stakes, court-mandated programmes, the toolkit recommends a mixed-method battery that pairs behavioural observation (e.g., interlock logs, sobriety checkpoints) with the Implicit Association Test to capture unconscious shifts in the perceived acceptability of drink-driving. For large-scale awareness campaigns, it proposes semantic-differential scales and the Affect Misattribution Procedure to track subtle emotional recalibrations that precede any outward change in behaviour. Educational or digital interventions can be evaluated with validated Likert scales grounded in the Theory of Planned Behaviour, while community-based projects benefit from short, AI-translated interview guides that elicit local narratives of change and can be coded automatically for themes such as risk perception, social norms, and perceived behavioural control. A one-page selection grid allows practitioners to

choose instruments by answering four questions. What is the primary aim of the intervention (education, emotion, or behaviour)? Is quantitative or qualitative evidence required? Are participants reached individually or in groups? And do we need direct self-report or indirect behavioural and implicit measures? Methods that appear consistently across the selected criteria are flagged as “optimal first-line tools,” reducing both measurement error and evaluation cost.

The economic modelling embedded in the report indicates that adopting the recommended toolkit can cut required sample sizes by roughly 30 per cent and save up to 50,000 US dollars in a typical thousand-participant trial. It also increases the statistical power to detect genuine attitude change by more than twenty per cent. Importantly, all digital instruments are designed to be GDPR-compliant and culturally neutral. Pictorial stimuli for implicit tests were co-developed with WHO advisors to avoid ethnic or gender bias, and community advisory boards of young drivers, Indigenous representatives, and low-income parents pre-tested every item bank for relevance and respectfulness.

Looking forward, the study concludes that the most effective way to reduce and prevent alcohol-related road deaths is through a fully integrated approach. While individual tools like tougher laws, public advertisements, and digital apps can play a role, sustained progress truly depends on integrating enforcement, rehabilitation, and emotion-plus-skills education into coherent ecosystems. It also depends on measuring success with tools that capture both conscious intentions and the automatic associations that drive split-second decisions behind the wheel. By embedding the new Attitudinal Change Assessment Toolkit into funding requirements and data-sharing platforms, governments can accelerate learning across borders, protect vulnerable road users, and demonstrate measurable progress toward the ultimate goal: a world in which drink-driving is not just illegal, but culturally unthinkable.





Chapter 1

Introduction and Background

- 1.1. Drink-Driving as a Global Issue
- 1.2. Attitudinal and Behavioural Change Assessment
- 1.3. Attitudinal and Behavioural Change and Drink-Driving
- 1.4. Challenges Facing Drink-Driving Related Attitudinal and Behavioural Change
- 1.5. Drink-Driving Related Attitudinal and Behavioural Change Assessment: Gaps and Opportunities
- 1.6. Study Outline

1.1. Drink-Driving as a Global Issue

Alcohol consumption, even in relatively small amounts, increases the risk of road crashes for both drivers and pedestrians. Drink-driving is responsible for approximately 27 per cent of all road injuries (WHO, n.d.). Alcohol impairs critical driving functions such as vision, reaction time, and judgment, often leading to risky behaviours like speeding or neglecting seat belts and helmets. Even at low blood alcohol concentrations (BAC), drivers suffer from reduced concentration and coordination, with effects worsening at higher levels. Alcohol not only raises the likelihood of a crash but also influences the severity of resulting injuries. Data shows that in high-income countries, about 20 per cent of fatally injured drivers have BACs above legal limits, while in low- and middle-income countries, 33–69 per cent of fatally injured and 8–29 per cent of non-fatally injured drivers had consumed alcohol before their incidents (WHO, 2018).

Alcohol consumption poses serious risks not only to the individual drinking but also to others. A large portion of the health burden linked to alcohol stems from injuries, especially those caused by road traffic crashes, which are a major global cause of injury, disability, and death. In fact, road traffic injuries are the leading cause of death among people aged 15 to 29. In 2019 alone, of the 298,000 deaths due to alcohol-related road crashes, 156,000 were caused by another person's drinking (WHO, n.d.). Drink-driving, therefore, represents a significant public health concern that often endangers other individuals such as passengers and pedestrians.

Despite widespread awareness of the dangers, drink-driving continues to be a common behaviour worldwide. A study spanning 32 countries found that the percentage of drivers who admitted to driving after consuming alcohol ranged from as low as 5 per cent in Hungary to 34 per cent in Portugal, 4 per cent in Japan to 24 per cent in Australia, 15 per cent in Morocco and Egypt, and up to 32 per cent in South Africa (Stürmer et al., 2019).

The economic consequences of drink-driving are also substantial for governments. In the United States, estimates from 2000 indicate that alcohol-related crashes accounted for approximately USD 51.1 billion, representing 22 per cent of the total costs associated with motor vehicle crashes (WHO, 2022). In low- and middle-income countries, the economic burden is similarly significant. In South Africa, where alcohol is involved in roughly 31 per cent of non-fatal crashes, this behaviour contributes an estimated USD 14 million of the country's USD 46.4 million in hospital costs linked to road traffic injuries (WHO, 2004). Similarly, in Thailand, where alcohol is linked to at least 30 per cent of road crashes, drink-driving is estimated to cost the country around USD 1 billion annually (WHO, 2022).

Road safety is a vital element of the 2030 Agenda for Sustainable Development. Since 2000, a range of international initiatives have been launched to confront the rising toll of road traffic injuries and fatalities. These include the creation of the United Nations Road Safety Collaboration (2004), the Decade of Action for Road Safety 2011–2020, the WHO-led SAFER initiative (2018), and the UN General Assembly Resolution A/RES/74/299 on Improving Global Road Safety (2020). More recent commitments—such as the Stockholm Declaration (2020), the New Decade of Action for Road Safety 2021–2030, and the WHO's Global Plan for the decade (2021), further reflect global dedication to reducing traffic-related deaths and injuries, and frameworks.

However, despite these concerted efforts, drink-driving continues to pose a serious global road safety challenge. Its persistent prevalence and the severe consequences it brings—including injury and loss of life—underscore the need for sustained investment in targeted, evidence-based countermeasures. As patterns of alcohol use and drink-driving vary across contexts due to environmental, socioeconomic, cultural, religious, and individual behaviour factors, there is a clear need to design and implement tools and methodologies capable of identifying, understanding, and tracking changes in public attitudes and behaviours over time.



1.2. Attitudinal and Behavioural Change Assessment

Human behaviours are shaped by their underlying attitudes (Love et al., 2024). These attitudes are formed and heavily influenced by a person's experiences with specific behaviours (Maio et al., 2018). An attitude consists of beliefs and evaluations of outcomes, making it a crucial factor in determining behaviour (Rozin, 2006). Changes in attitudes and behaviours are central themes in social and behavioural science theories and concepts.

Understanding how individuals' attitudes and behaviours change significantly affects effective social interventions, including those aiming to increase public health and safety. Since behaviours and attitudes seem to have a mutually influential relationship, with attitudes shaping behaviours and behaviours shaping attitudes (Gerrard et al., 1996), assessing both attitudes and behaviours and their changes is critical (Jewell et al., 2008).

Over recent decades, various explicit and implicit methodological approaches have been developed to evaluate and quantify attitudinal and behavioural changes (Williamson et al., 2018; Louviere, 2021). These include diverse quantitative and qualitative tools such as self-report measures, semantic differential scales, and questionnaires that capture individuals' explicit, conscious evaluative responses. Conversely, attitude tests probe implicitly unconscious automatic associations that occur outside of conscious awareness (De Houwer et al., 2009). Furthermore, behavioural observation has been employed to supplement these methods and tests, establishing links between attitude shifts and observable actions. While these methods can be applied to different types of human attitudes, assessment of drink-driving-related attitudes has been one of the primary focuses.

1.3. Attitudinal and Behavioural Change and Drink-Driving

Attitudes towards drink-driving play a substantial role in a driver's decision to drive while drunk (Stephens et al., 2017). Although many drivers acknowledge the dangers of drink-driving, a considerable number still partake in this behaviour. Studies indicate that over the past few decades, public attitudes towards drink-driving have shifted, with more individuals holding negative views and consequently refraining from engaging in this behaviour. (Stephens et al., 2017). More people consider driving under the influence and beyond the legal limit unacceptable (AAA Foundation for Traffic Safety, 2013).

Several interconnected factors shape the decision to drive under the influence of alcohol (Bingham et al., 2007). Attitudes towards the behaviour are a key element in the decision-making process. Drivers involved in drink-driving tend to have positive attitudes towards it (Stephens et al., 2017). Drink-driving attitudes can be predicted by a driver's history with drink-driving and the consequences experienced. In other words, those who have faced consequences from drinking and driving tend to have more lenient attitudes towards drink-driving behaviour (McCarthy et al., 2005).

Drink-driving is among the risk factors contributing to road injury and death (WHO, 2022). The design and implementation of road safety measures, including legislation, enforcement, insurance policies, and education, should account for drivers' attitudes and behaviours regarding drink-driving and focus on strategies to positively influence them effectively. Enhancing drink-driving legislation at different levels, its enforcement, and educational campaigns to guarantee public understanding and support, can provide a strong basis for attitudinal and behavioural changes.

1.4. Challenges Facing Drink-Driving Related Attitudinal and Behavioural Change

Research on attitudinal and behavioural change related to drink-driving or driving under the influence (DUI) has attracted increasing academic and policy attention over recent decades. Measuring these changes is complex due to the distinct nature of drink-driving. DUI interventions involve legal, social, and psychological factors, necessitating specialized measurement techniques. These interventions impact explicit attitudes and modify implicit associations underlying risky behaviours. Several methods—including educational workshops, public awareness campaigns, counselling for behaviour change, and computer-based programmes—aim to foster safer driving attitudes and risk avoidance. Altering and improving attitudes are crucial in the DUI context, as they shape policy development and the creation of effective intervention strategies.

Despite progress in assessing attitudinal and behavioural shifts in DUI contexts, some issues remain. Most evaluations rely on self-report data, which can be biased, and the link between implicit attitudes and actual behaviour is hard to pin down. Differences in measurement tools also make standardization difficult across studies. These challenges underscore the need for a thorough systematic review of existing research. Therefore, the second aim of this study is to deepen the understanding of the assessment methods for attitude and behaviour changes through a comprehensive review. This review seeks to synthesize research on attitudinal modifications in DUI programmes to fill current gaps. It combines evidence from various fields to clarify how attitudes are defined, measured, and utilized in DUI interventions (Verplanken & Orbell, 2022).

Considering recent technological, social, and environmental changes, it's important to revisit our understanding of DUI attitudes and behaviours. These broad shifts influence attitudes at various levels. Although our knowledge of drink-driving attitudes has improved overall, understanding how they evolve under current and future technological and social changes remains a vital concern.

Attitudes towards drinking and driving influence decisions related to alcohol use and driving, but they are not well understood. Although research indicates distinctions between non-DUI and DUI drivers, most studies depend on one or two attitudinal questions (Stacy et al., 1994) that do not have strong evidence supporting their reliability and validity. Others use general driving behaviour questionnaires that include a drinking and driving item, such as the Driving Behaviour Questionnaire (Özkan et al, 2006). Moreover, some well-established tools are specifically created to evaluate drinking and driving attitudes and behaviours among various age groups. Concentrating on these attitudes and behaviours may improve the identification of potential DUI offenders.

Understanding and measuring attitudes towards drinking and driving are also crucial because such attitudes can change through experience, prevention, and intervention. Given the widespread issue of drinking and driving and its persistent recidivism rate (Greenberg et al., 2004; McCarthy et al., 2005), developing more comprehensive tools to explore attitudes and behaviours related to drinking and driving is essential. These tools would improve our understanding of drinking and driving and aid in developing effective prevention strategies that are universal, selective, and indicated. Additionally, reliable and valid measures of attitudes and behaviours related to DUI would assist researchers and practitioners in assessing the effectiveness of their intervention efforts.

DUI attitudinal and behavioural change faces research, measurement, policy, and practice challenges. These changes are complex because DUI is affected by interactions among individual, socioeconomic, and systemic factors. Capturing and modelling all these aspects is complicated. Attitudinal and behavioural shifts in the DUI context are highly sensitive to population diversity. Generalizing research findings across different age groups, genders, cultures, socioeconomic statuses, rural and urban areas, and vulnerable or marginalized populations is problematic and may not always be representative. Integration of attitudinal and behavioural change research with the existing theoretical framework often limits our abilities to include many other factors that could have detrimental effects on attitudes. With the dynamic and ongoing changes in the contexts as they relate to new drugs, new transportation technology, and artificial intelligence, research is facing challenges to keep up with them as they change the DUI.



Measuring attitudinal and behavioural changes also presents challenges (Martinussen et al., 2018). Most current methods depend on self-report tools vulnerable to biases from fear of legal consequences, stigma, and social desirability (Schell et al., 2006). Researchers and practitioners across different locations often use inconsistent, unstandardized, and unvalidated measurement tools to evaluate attitudinal and behavioural changes related to drink-driving (Jewell et al., 2008). Another challenge is the lack of longitudinal tools to monitor attitudinal shifts over time. Since many DUI interventions tend to develop gradually, our capacity to assess these long-term changes is crucial for guiding future strategies (Stringer, 2024). Furthermore, linking various types of DUI data to individual behavioural measures is difficult due to privacy concerns and data collection procedures. Combining multiple data sources from different agencies with individual data could improve the evaluation of intervention effectiveness.

Changes in attitudes and behaviours related to DUI encounter several policy challenges. DUI initiatives are often fragmented because regulations, enforcement, and public education differ greatly across jurisdictions (Cavaiola, 2013), making cross-region comparisons difficult. Even when national or overarching regulations exist, local enforcement can vary significantly due to resource limitations and other factors. Additionally, updating policies to address evolving issues—such as combined drug and alcohol impairment and new mobility options like rideshare and micromobility services—poses challenges. Equity concerns also influence DUI policies; some interventions may disproportionately affect marginalized groups without addressing the underlying causes of drink-driving (Kagawa et al., 2021).

DUI interventions and their effects on attitudes and behaviours encounter practical challenges. Most are temporary and end once funding stops, making long-term attitudinal and behavioural change hard to achieve. Many interventions rely on limited external funding and programmes, which often face community buy-in issues, reducing their impact. These efforts are usually led by a single sector—such as public health, law enforcement, education, or transportation—limiting their effectiveness compared to integrated, multisectoral strategies. Additionally, many DUI programmes lack proper evaluation and assessment due to limited resources, expertise, and skills.

The challenges above reveal gaps in DUI attitudinal change research and practice, along with specific opportunities for evaluating both attitudinal and behavioural shifts. These challenges suggest that future research could focus more on how cultural norms shape DUI-related attitudes and behaviours, particularly through digital media's influence. Moreover, there is a need for developing and applying more structured longitudinal studies. DUI policies also need to integrate principles of equity and diversity. Adopting more holistic, cross-sectoral strategies in policies and interventions aimed at changing attitudes can further support improvements in both attitudes and behaviours.

1.5. Drink-Driving Related Attitudinal and Behavioural Change Assessment: Gaps and Opportunities

From DUI attitudinal and behavioural perspectives, several gaps exist, including a lack of standardized measurements, over-reliance on self-reporting, a lack of longitudinal assessment, an inability to connect perceived attitude changes with real behavioural shifts, limited cultural adaptation of measurement tools, a lack of adequate proxy variables, and disregard for cultural contexts and influences.

The DUI attitudinal and behavioural change assessment challenges also present certain opportunities. Researchers and practitioners can focus on developing programmes that include standardized and validated change assessment scales. More effort and attention can be directed towards designing and testing suitable scales for measuring attitude and behaviour changes, using rigorous psychometric validation.

Whenever possible, efforts should be made to combine survey-based data with actual behavioural data, which are more widely collected through new technologies. Creating tools for measuring attitude and behavioural change that facilitate long-term tracking of participants can provide essential information for planning, policymaking, and evaluating the effectiveness of DUI measures.

Advances in technology and applications can create more opportunities for data collection and integration, enabling us to analyse long-term patterns and shifts in attitudes and behaviours. Using mixed-method approaches for attitude change assessment can more effectively help us understand the complexity of attitude and behaviour changes. Emerging digital tools and technologies offer significant opportunities for measuring attitudinal change. Resources like mobile apps, geolocated data, the Internet of Things, and large amounts of contextual data provide valuable ways to improve the assessment of attitudinal and behavioural change. Developing measurement tools based on existing theories can be an additional opportunity, especially when combined with new data collection methods. New instruments must be tested and validated across different socio-cultural settings to enable broader use. Most importantly, innovative measurement tools should also include community perspectives to increase acceptance and practicality.

1.6. Study Outline

This study examines current challenges and identifies opportunities for improvement in the field. The report is structured around 7 primary research questions:

1. **Theories of Change:** How is attitude and behaviour change theorized across different disciplines?
2. **Current Tools:** What techniques are used to measure attitude change in DUI intervention programmes?
3. **Cross-Disciplinary Comparison:** How do these techniques differ from those used in other fields?
4. **Existing Frameworks:** Are there established toolkits for evaluating attitudinal change in DUI research?
5. **Current Limitations:** What challenges have been encountered in research and practice?
6. **Toolkit Design:** What specific tools should be included in a comprehensive DUI assessment toolkit?
7. **Practical Application:** What are the requirements for using these tools effectively in real-world settings?

The following sections detail the **comprehensive literature review that underpins the report's findings:**

- **Section 02:** Key concepts and theories related to attitudinal and behavioural changes.
- **Section 03:** A systematic review of existing literature and assessment methods.
- **Section 04:** The foundational tools and methods of the proposed assessment toolkit.
- **Section 05:** Guidance on matching specific assessment tools to DUI intervention categories.
- **Section 06, 07 & 08:** Conclusion, References and detailed methodology (Appendices).



Chapter 2

Key Attitudinal and Behavioural Change Concepts and Theories

- 2.1. Drink-Driving Attitudes
- 2.2. Definitions of Attitudes: Evolution
- 2.3. Theories of Attitudinal Change
- 2.4. Theories of Behavioural Change
- 2.5. Bridging Attitude and Behaviour

Attitudes and behaviour are two fundamental concepts in social and behavioural sciences. Attitudes and behaviour are interconnected, but they belong to different conceptual realms. The link between the two is complex and not straightforward. Attitudes do not directly translate into actions (Albarracín et al., 2024). Research demonstrated gaps between attitudes and behaviours. The link between attitude and behaviour is influenced by several factors, such as the strength and specificity of attitudes, along with the presence of situational mediators. Strong, stable attitudes that are tied to fundamental values or identity can better predict behaviours than temporary opinions (Ajzen, 1980, 1991, 2020).

Attitudes refer to “feelings or opinions about something or someone” (Cambridge University Press, 2026). They are internal judgments that encompass cognitive, affective, and motivational aspects towards various phenomena (Petty & Cacioppo, 2012). Typically, attitudes are understood as a tendency to evaluate an object, person, policy, or idea, either positively, negatively, or somewhere in between. Khalil et al. (2022) indicate that this evaluation generally comprises three components. The cognitive component consists of beliefs about a subject, such as thinking someone is honest. The affective component pertains to feelings about the subject, like feeling happy about a preferred game. The behavioural component includes tendencies to act in certain ways, such as voting for a specific political candidate. Behaviours are observable actions influenced by situational pressures, availability, and external constraints.

The discussion of human attitudes first appeared in the late 19th century through the works of thinkers like William James. He states, “It is our attitude at the beginning of a difficult task which, more than anything else, will affect its successful outcome.” The concept and theories of attitude weren’t fully developed until the 20th century, notably through William Allport. Allport’s 1935 definition of attitude marked a significant breakthrough that influenced early attitude theories. In the mid-20th century, theories like cognitive dissonance emerged, highlighting how attitudes and behaviours regarding a specific issue might not always align. Towards the end of the century, psychologists began distinguishing between implicit (hidden) and explicit (overt) attitudes. Ajzen further contributed by introducing the theory of planned behaviour in 1991, which explains how attitudes can serve as predictors of people’s actions (Ajzen, 1991).

The background highlights the complexities of attitudes and behaviour and their interconnections, many of which are explained by various theories. Consequently, understanding key concepts related to attitudes and behaviour, and how they change according to these theories, is essential for developing effective interventions, designing attitude change tools, and selecting appropriate tools for each intervention. The main goal of this section is to explore attitudes and behaviour in the context of drinking and driving, and to review some of the current theories used to explain them and their transformations.



2.1 Drink-Driving Attitudes

Research indicates that several factors are linked to drink-driving behaviour, including demographic characteristics like age and gender, attitudes, perceived legitimacy, personality traits, and risk-taking tendencies (MacKenzie et al., 2015). Nonetheless, numerous studies emphasize the particularly important role of attitudes in influencing drink-driving behaviour (Baum, 2000; Davey et al., 2005; Freeman & Watson, 2005; Politis et al., 2013; MacKenzie et al., 2015). Like many social issues, public opinion on drink-driving differs: it is generally seen negatively and considered a serious social concern. (Homel et al., 1988; Loxley et al., 1992). Though, drunk drivers often hold differing opinions (Baum, 2000). Over recent decades, public perceptions of drink-driving have shifted notably, with more individuals now recognizing it as a high-risk and unacceptable behaviour. Moreover, studies indicate that drivers' attitudes are the strongest predictor of their likelihood to drive under the influence (Mackenzie et al., 2015; Watling et al., 2018).

Attitudes towards the acceptability of drink-driving reflect both positive and negative views. Because attitudes can influence behaviour, people with more approving opinions of drink-driving are likely to participate in it. Specifically, a favourable view of drink-driving can raise the chances of actually engaging in the behaviour (MacKenzie et al., 2015). Studies show that convicted drink drivers tend to have more tolerant attitudes towards drink-driving (Baum, 2000; Davey et al., 2005). Different types of attitudes exist in the drink-driving context. These attitudes can be viewed from risk, controllability, normality, justifiability, and negativity.

2.1.1. Risk Attitude

A key mindset among drivers relates to how they perceive risk. Some view drink-driving as either low risk or not relevant to them, including both the likelihood of a collision and the chance of getting caught. These attitudes affect their readiness to change behaviour. To encourage safer driving, it's important to improve or correct drivers' risk perception. For example, Sloan et al. (2017) showed that police presence or checkpoints significantly increase the perceived risk of being caught. Drink-driving risks are often overstated because police usually hassle drink drivers. Some believe it's acceptable to drink and drive if they aren't caught or aren't drunk. Others think it's fine to be a passenger with a possibly over-the-limit driver (Baum, 2000). Statements like "My community needs stricter laws against drink-driving; People who drink and drive should go to jail; People who drink and drive should lose their driver's license" (Baum, 2000: pp.694) reflect these attitudes. Studies demonstrate that increased drink-driving correlates with more disagreement towards deterrence measures like heavier fines or lower legal blood alcohol limits (Stephens et al., 2017).

2.1.2. Controllability Attitude

The controllability attitude, sometimes called the illusion of control, refers to drivers who believe their driving skills are above average and therefore think they can handle driving under the influence. This mindset appears in statements like "I believe it is okay to drink and drive if it is daytime" (González-Iglesias et al., 2015:pp.347). It stems from a cognitive bias known as optimistic bias. People with this attitude may say: "I can handle my alcohol" or "I'm a good driver, so I'm safe even after a few drinks." These drivers may engage in drink-driving but often underestimate the risks and overestimate their control, leading them to neglect safety precautions. This exaggerated sense of control supports riskier behaviour and decision-making (Harré et al., 2007).

2.1.3. Normality and Permissivity

A driver's behaviour is often shaped by their perception of what is socially acceptable or normal within their social circle, which includes family, friends, and the broader community. If drink-driving is viewed as common within a circle, individuals are more likely to engage in it. This attitude is evident in statements like "Most of my friends think it's okay to drink and drive; My friends would think I was really stupid if I drove after drinking" (Baum, 2000: pp.694). The previous studies show that regional cultural norms (long-standing perceptions, norms and attitudes) have a certain impact on attitudes and behavioural intention (Lee & Kwon, 2015; Jie-Ling & Yuan-Chang, 2021).

To alter this behaviour, changing the perception of normality is necessary. Conversely, if a circle collectively disapproves of drink-driving, it can influence members' attitudes and actions against it (Nygaard et al., 2003; LaBrie et al., 2012).

2.1.4. Justifiability or Neutralization Attitude

Some drink drivers rationalize or justify their behaviour (Fry, 2008). This occurs when people try to explain unexpected or inappropriate actions with excuses or reasons, especially when their actions are questioned. In such cases, the individual typically acknowledges that their behaviour is unusual but attempts to defend it by highlighting some perceived positive aspect of their actions. Justifications and neutralization are often introduced due to substantive commonalities between the two attitudes (Tatch, 2022).

In the drink-driving context, the justifiability attitude refers to some drivers' tendency to rationalize or justify their drink-driving behaviour, which enables them to neutralize feelings of guilt or deviance. Drink-drivers use many ways to justify their drinking and driving behaviour, especially considering their perception or attitude that drink-driving is not dangerous. Driving while drinking justification can take many forms. It may be justified based on short driving distance, using alternate or back roads, not feeling drunk, or having no choice other than driving while intoxicated (Nygaard et al., 2003).

2.1.5. Negativity Attitude

This attitude refers to one's perception of an alternative course of action. In the case of drink-driving, it relates to one's negative perceptions of alternatives to driving, such as taking taxis, ride-share, transit, or even walking, represented by convenience, price, availability, safety, and so on. Having such attitudes towards other alternatives reduces the chance of using them and increases the chance of driving while drunk.

2.2. Definitions of Attitudes: Evolution

In simple terms, **an attitude is how we form opinions about people, objects, or ideas. It's a tendency we develop over time to see things as good or bad.** According to Allport, attitude is "a mental and neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related" (Allport, 1935). This definition highlights the readiness aspect, suggesting that attitudes prepare us for action based on past experiences. More contemporary definitions define attitude as "a psychological tendency expressed by evaluating a particular entity with some degree of favour or disfavour" (Eagly & Chaiken, 1993).

This reflects a broader understanding, encompassing evaluations that can be positive, negative, or neutral. Another source refers to attitude as “a relatively enduring organization of beliefs, feelings, and behavioural tendencies towards socially significant objects, groups, events or symbols” (Hogg & Vaughan, 2008).

The history of the concept of attitude goes back to the late 19th century, with early uses by people like William James, whose 1890 works on attitude discussed related concepts, although not formally defined as attitude in the modern sense. The term with a psychological meaning wasn’t used until the 20th century, based on Aiken (2002) (Aiken, 2002; James, 1897).

By the early 20th century, social psychologists started formalizing the concept. William McDougall’s book in the early 1900s, “An Introduction to Social Psychology” had discussions on attitudes, the first formal use. But Gordon Allport’s 1935 definition, “a mental and neural state of readiness,” became the cornerstone. Anselm Strauss’s 1945 paper, “The Concept of Attitude in Social Psychology” highlighted the confusion and diversity in definitions and noted the growth of the concept in literature over the last 20 years (Allport, 1935; McDougall, 1919; Murphy & Murphy, 1931; Strauss, 1945).

In the mid-20th century, Leon Festinger’s 1957 theory of cognitive dissonance explored how attitudes and behaviours can conflict and shifted the focus to internal consistency. Later in the late 20th century, Icek Ajzen’s 1991 theory of planned behaviour linked attitudes to behavioural predictions, emphasizing their role in intention and action, as found in the theory of planned behaviour (Ajzen, 1991; Festinger, 1957).

The definition of attitude has been expanded over time to include more complex matters, to emphasize the cognitive processes involving attitudes, and to consider the social contexts also. It reflects a shift from a simple “state of readiness” to a more complex system. Our understanding of attitudes has become even more complicated by bringing in mental processes and social situations that focus on attitudes as a complex construct. The development of the notion of attitude has moved from philosophical and psychological foundations to complex, behaviourally predictive, socially anchored constructs (Table 2.1).

At first, attitudes were implicitly associated with emotion and habitual behaviours (James, 1897), while McDougall (1919) characterized attitudes as instinctive patterns in social interaction. Allport’s (1935) original definition provided a new, more structured definition of comparing attitudes to internal states that trigger responses to situations, which was a catalyst for attitude research. This definition was updated to a more fluid approach with the advent of Festinger’s (1957) theory of cognitive dissonance, which described attitudes as not fixed but dynamically affecting conflict with other beliefs that created psychological unease.

The methods of successive studies, such as the theory of reasoned action (Fishbein & Ajzen, 1975), and the theory of planned behaviour (Ajzen, 1980,1991) which illustrated that attitude and perceived control predicts behavioural intentions, extended the notion of attitude being central to the behavioural intentions process. Later, models like the elaboration likelihood model (Petty & Cacioppo, 2012) showed that attitudes may vary through different types of encouragement and included different cognitive processes into the concept of attitude. This altered our understanding from a pre-disposition to a more flexible construct. The critiques of the treatment ability of the attitude framework and the incorporation of self-development (Dweck, 2006) and emotional and habitual components (Conner & Norman, 2017) further developed the application of the attitude concept for psychological and behavioural sciences. In today’s research agenda, attitudes are becoming a more significant area of active investigation within applied spaces such as implementation science (Fishman et al, 2021) and education (Ballegeer et al., 2024) which highlight the multidimensionality of attitude.

Table 2.1. Definition of Attitudes: Key Historical Milestones

 Year	 Contributor	 Contribution	 Changes in the definition and use of attitude
1890	James, 1897	Addressed adjacent concepts in <i>The Principles of Psychology</i> .	The manuscript suggests that attitudes cannot be defined precisely but were related to several habits, emotions, and the stream of consciousness.
1908	McDougall, 1919	Incorporated the discussion of attitudes in social psychology, firmly relating them to behaviour.	Attitudes were suggested to be instinctual predispositions guiding behaviour and social interactions.
1935	Allport, 1935	Described attitude as "a mental and neural state of readiness," a prominent event in the scholarly paths of attitude study.	Attitudes were formally defined as internal states that determine an individual's response to stimuli.
1957	Festinger, 1957	Introduced the theory of cognitive dissonance, conceiving contradictions between attitude and behaviour.	The concept of attitude changed from being static to dynamic, interpreting the cause of discomfort when attitudes conflicted.
1977	Fishbein & Ajzen, 1975	Developed the theory of reasoned action, intending to associate attitudes with behavioural intention.	Attitudes were considered predictors of intention, shifting the focus from mere disposition to a central role in behaviour prediction.
1980	Ajzen, 1980	Expanded the theory of reasoned action to the theory of planned behaviour.	Attitudes were linked to subjective norms and perceived control, enhancing their predictive capability regarding intention and behaviour.
1991	Ajzen, 1991	Continued refinements of the theory of planned behaviour.	Introduced predictions of interactions between attitudes and perceived control in intentional action.
2006	Dweck, 2006	Proposed the potential of the concept of mindset, directly linking it to attitudes.	Expanded attitudes beyond traditional perspectives by integrating them with cognitive and motivational frameworks.
2012	(Petty & Cacioppo, 2012)	Conceptualized the elaboration likelihood model, depicting how routes inform attitude and persuade change.	Deepened analysis of attitudes by distinguishing between central and peripheral processing in attitude change.
2017	Conner & Norman, 2017	Explored extensions of TPB, incorporating habit and affective components to improve behavioural models.	Recognition that attitudes operate in conjunction with habits and emotions in shaping behaviour.
2021	Fishman et al., 2021	Paper reviewed advances in attitude theory and measurement in the field of implementation science.	Growing emphasis on measuring attitudes quantitatively and then applying them to policy and behaviour change.
2024	Ballegeer et al., 2024	Examined the influence of subject matter knowledge, attitudes, and emotions on the willingness of Spanish pre-service teachers to include climate change education in their teaching.	This research demonstrates the complex interaction of knowledge, emotions, and attitudes: it emphasizes that attitudes towards climate change education are not always knowledge-based but arise from emotional engagement; we see the complex dimensions of attitudes, in education.

2.3. Theories of Attitudinal Change

After analyzing the difference between behaviour and attitude, we will delve into the theoretical basis of how they develop and can be influenced through various tools and interventions. Grasping these foundational concepts and their interrelations helps us understand how attitudes and behaviours form, change, and influence each other. It also illuminates the factors driving long-term behaviour change and guides us in selecting effective methods to measure and assess these changes across different environments.

Understanding attitude is essential because researchers and policymakers are interested in knowing how attitudes change. Over the past few decades, several theories have been proposed to explain attitudinal change in general and in specific areas. In this section, we focus on major theories connected to attitudinal change and discuss them.

2.3.1. Cognitive Dissonance Theory

Focus: The psychological discomfort (dissonance) experienced when an individual holds contradictory cognitions, such as when their behaviour contradicts their beliefs or values, and how this motivates them to restore psychological balance.

Attitude-Behaviour Link: When a person's behaviour contradicts their attitudes or beliefs, the resulting discomfort motivates them to change either their attitude or their behaviour to return to a state of consistency.

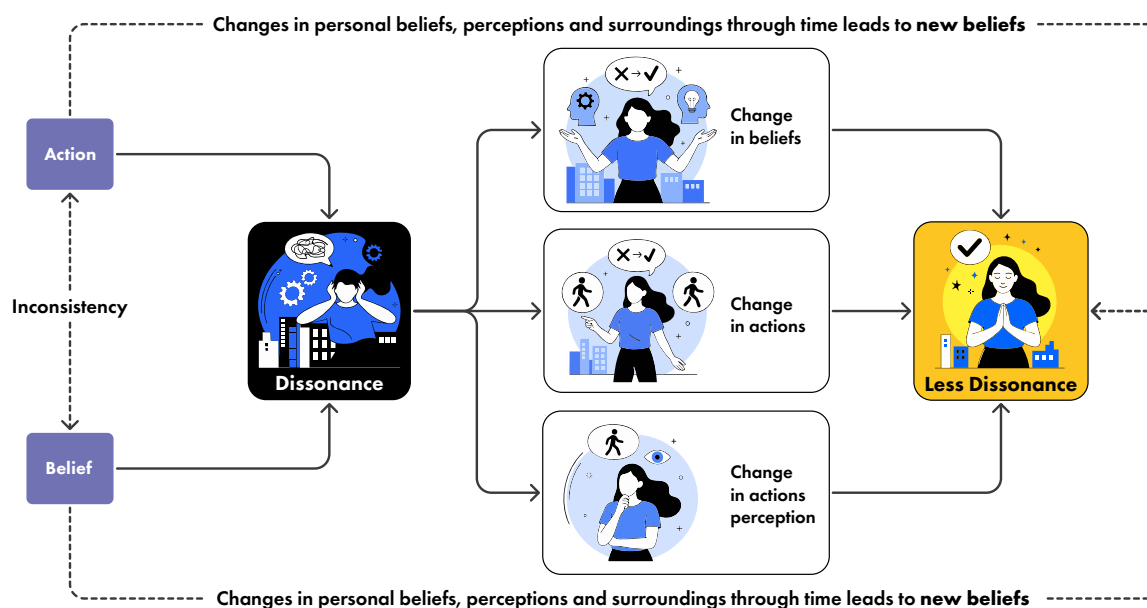
The cognitive dissonance theory (CDT) is a psychological theory that was crafted by Leon Festinger in 1957. This theory explores the dissonance a person experiences when they have two cognitions that contradict each other (e.g., if a person's behaviour contradicts their beliefs or values) (Festinger, 1957). This discomfort in the form of cognitive dissonance motivates a person to "resolve" the dissonance by changing their attitudes, beliefs, or behaviours to return to a state of consistency (Gössling, 2025). For example, a person who leads a highly active lifestyle but engages in smoking may decide to quit smoking, downplay the risks of smoking, or accommodate and rationalize their behaviour to resolve the inconsistency. CDT endeavours to explore the why and how a person changes their thinking when faced with inconsistency because they are attempting to return an experience of dissonance back to a state of psychological homeostasis or balance (Wells-Parker et al., 2009).

Figure 2.1 depicts the essential components of cognitive dissonance theory (Piaget, 1972). The continuous reconsideration of cognitive dissonance means that past beliefs may be part of the loop but could also lead to new beliefs altogether. Therefore, we should not assume that the feedback loop will repeat itself in exactly the same way because individual growth, adapting, or paradigm shifts may occur instead of a simple return to an original cognitive condition (de Ribaupierre, 2015; Deci & Ryan, 2013).

Interventions Based on CDT

CDT has transformed the field of attitudinal change by offering insight into how we understand attitude change, making decisions, and justifying behaviour (Cooper, 2007). Cognitive dissonance is not simply an abstract psychological state but has observable behavioural and neural consequences (Harmon-Jones and Mills, 2019). Dissonance ultimately influences some social and moral behaviours, and the authors show how cognitive dissonance influences individuals' justification of their choices and resolves beliefs that conflict with one another. These different descriptions mesh well with how CDT is still valuable and relevant today to expand our understanding of human cognition and behaviour, to continue understanding how individuals cope and respond when they encounter contradictory information in their world, and how that can form the process of attitude change.

Figure 2.1. Cognitive Dissonance Theory, Adapted From (Festinger, 1957)



Example 1: Use of CDT in DUI Reduction Interventions

Typically, changes would be recorded with self-report measures like dissonance-specific questionnaires and behavioural consistency checks to gain helpful insight into the size of the attitude change (Moore et al., 2008; Wells-Parker et al., 2009). One example of using cognitive dissonance theory (CDT) in DUI attitude change involves a dissonance-reduction paradigm where identified designated drivers read a pro-designated driver communication aloud (Lange et al., 2006). The intention was to create feelings of hypocrisy in those drivers who had previously driven after drinking or driven with someone who had been drinking, as their behaviour would contradict the message they approved in public. This internal dissonance state, a psychological discomfort resulting from behaviour different than attitudes, can lead people to align their behaviour with what they say, which can lead to a reduction in alcohol consumption before driving.

Although a study utilizing this intervention noted reduced breath alcohol content (BrAC), it was not capable of firmly attributing this finding directly to dissonance reduction since no effective change was observed. More generally, DUI interventions might implicitly utilize CDT by raising awareness of the harmful effects of impaired driving. This awareness can produce dissonance in individuals who keep driving after drinking, possibly encouraging them to alter their attitudes and behaviours to lessen this internal conflict (Moore et al., 2008; Wells-Parker et al., 2009).

2.3.2. Elaboration Likelihood Model

Focus: How persuasive messages alter attitudes via central (logic-based) or peripheral (cue-based) processing.

Attitude-Behaviour Link: Strong attitudes (central route) can predict behaviour more accurately than weaker ones (peripheral route).

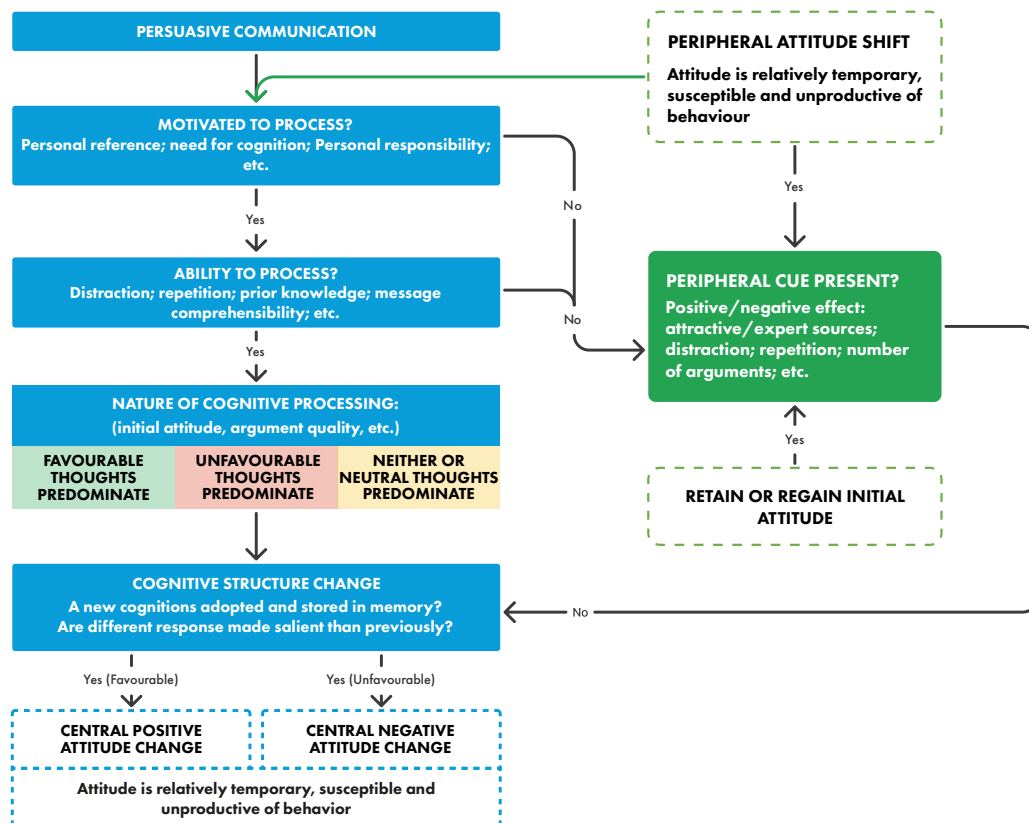
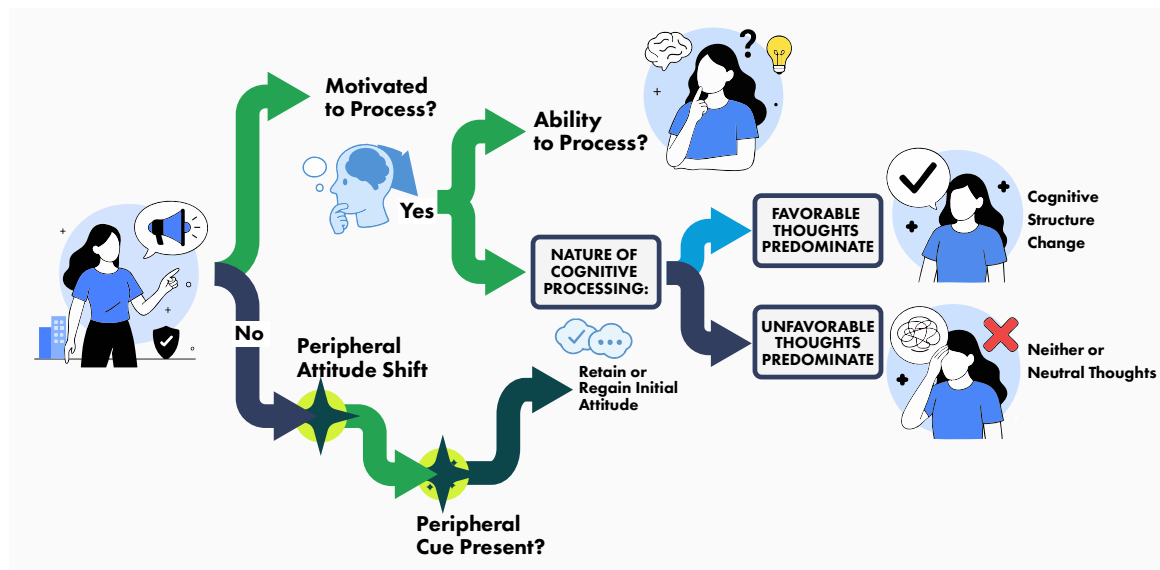
The elaboration likelihood model (ELM), created by Richard E. Petty and John T. Cacioppo in the early 1980s, offers a detailed framework for understanding how persuasive communication influences attitude change (Petty & Cacioppo, 1984). It introduces a dual-route perspective of persuasion, explaining how messages are processed either via a central, logic-driven route or a peripheral, cue-driven route. The model also explains why certain attitudes are more enduring and better at predicting behaviour than others, based on the amount of cognitive effort put into evaluating the message.

According to the ELM, people process persuasive messages via two routes: the central route, where individuals carefully think about and analyse information logically and thoughtfully, leading to more stable and predictive attitudes, and change in attitudes; the peripheral route, where a person engages with the persuasive communication and relies on superficial cues, resulting in temporary or unstable changes in attitudes (Petty et al., 1981).

Figure 2.2 depicts the central and peripheral routes associated with the elaboration likelihood model (ELM) (Petty & Cacioppo, 1986). The figure depicts a decision tree: the reader/viewer is presented with persuasive communication, followed by a series of cognitive evaluations, to determine which route of processing they will use. If the audience member is motivated and able to process the message, they are on the central route, and persuasion relies on careful consideration of the arguments presented. This leads to either a central positive (somehow like) or a central negative (somehow dislike) attitude change. Further, central attitude change tends to be durable, resistant to change from the counterargument, and predictive of behaviour. If the audience member cannot or does not want to process the message, persuasion happens through the peripheral route, which depends on external cues like the attractiveness of the communicator or the number of arguments offered. This leads to peripheral attitude change, which tends to be less durable and subject to change from counter-attitude challenges. If neither route leads to strong attitude change, audience members will either maintain their existing attitudes or revert to them.

The ELM has explored persuasion behaviours in diverse settings such as public health, consumer habits, and politics. For example, health promotion studies have shown that comparing statistical data about smoking risks (central route) with emotional testimonials about smoking's dangers (peripheral route) can lead to more lasting behaviour change. The model also evaluates how detailed product information (central route) compares to celebrity endorsements (peripheral route) in shaping attitudes. In political science, research investigates whether exposing voters to policy talks encourages deep support for a candidate through central processing, while slogans and endorsements might generate less durable preferences through peripheral processing. The insights from the ELM have continually influenced persuasion and attitude change research, aiding in understanding the cognitive mechanisms behind message interpretation and behaviour.

Figure 2.2 Central and Peripheral Routes to Persuasion, Adapted From (Petty & Cacioppo, 1986). This figure depicts the two anchoring endpoints on the elaboration likelihood continuum.



Interventions based on ELM

Interventions based on the elaboration likelihood model (ELM) use either specific, logic-driven arguments to foster strong, lasting attitudes or peripheral cues—such as endorsements and visual appeal—to quickly shift attitudes (Petty et al., 1997). The effectiveness of persuasion can be assessed through surveys, memory tests, and attitude strength evaluations to determine whether central or peripheral processing occurred. In persuasion surveys, attitude changes are measured before and after an intervention (Haugtvedt, 1988). Memory tests gauge cognitive engagement by assessing recall—greater recall indicates deeper processing of the message. Attitude strength tests evaluate how stable and resistant an attitude is to counterarguments, with central-route processing producing more durable, predictive attitudes. These assessment methods are commonly used to evaluate the impact of persuasion in advertising, health campaigns, and political communication.



Example 2: Use of ELM in DUI reduction interventions

DUI reduction initiatives and interventions usually blend components relevant to the ELM's central or peripheral processing route. For example, interventions that present quantitative evidence about DUIs, such as BAC rates and impairment (e.g., Bernat et al., 2004; Lange et al., 2006), and statistical information about crashes and fatality rates (e.g., Bernat et al., 2004; Clapp, et al., 2005; Negi et al., 2020; Yu & Shackett, 1998) likely use the central route, in that the audience considers the information carefully. Conversely, campaigns that present an emotional narrative from a victim (e.g., Badovinac, 1994; Negi et al., 2020; Polacsek et al., 2001) or an engaging message from credible figures (e.g., police officers, healthcare professionals) (e.g., Clapp, et al., 2005; Negi et al., 2020) to convey an anti-DUI message likely use a peripheral route. According to the ELM, these approaches can be effective depending on the audience's motivation and capacity to understand the message.

To prevent outright rejection, interventions grounded in ELM are careful not to place messages within the target's latitude of acceptance. Instead, they often recommend incremental change, gradually shifting the message closer to the individual's position.

2.3.3. Social Judgment Theory

Focus: Existing attitudes filter, and often distort, persuasive communications (assimilation-contrast effects) (Sherif & Hovland, 1961).

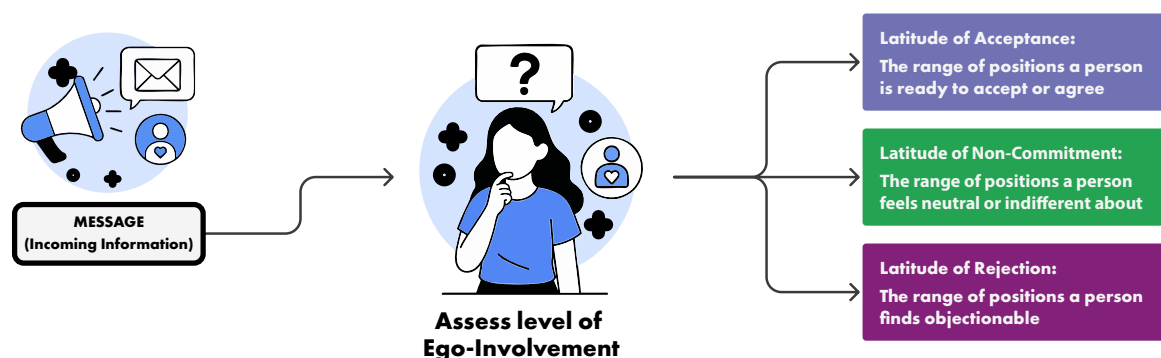
Attitude-Behaviour Link: Attitudes influence receptivity to behavioural suggestions.

In the 1960s, Muzafer Sherif and Carl Hovland developed social judgment theory (SJT). The SJT explains how people judge persuasive messages based on their existing attitudes, known as latitudes of acceptance or rejection, or non-commitment (Sherif & Hovland, 1961). The theory identifies the assimilation-contrast effect, meaning messages that are close to the person's attitudes are seen as more similar (assimilation), whereas messages that are far from their own attitude are seen as even further away (contrast), and their effectiveness of persuasion is lower (Sherif et al., 1965). This theory has been used to study attitude change in marketing (Sawyer & Howard, 1991) and political communication (Bowers, 1963). The findings reveal that when people have strong attitudes, these attitudes do not readily change through persuasion unless the persuasion is framed carefully in their latitude of acceptance.

The framework explains how individuals respond to persuasive messages by assessing them based on their attitudes. Ego-involvement starts when the message enters the person's mental framework and depends on their level of interest in the topic to determine its significance. Subsequently, the message's status is classified within one of three cognitive zones (see Fig. 2.3).

- Latitude of Acceptance: Messages that reasonably align with a person's existing beliefs would be adopted with acceptance.
- Latitude of Non-Commitment: Messages that neither productively align with nor oppose existing beliefs would end with a neutral disposition towards +/- acceptance.
- Latitude of Rejection: Messages that contrast significantly with beliefs possessed would not be integrated into the cognitive schema, and would be rejected as objectionable.

Figure 2.3 Social Judgment Theory, Adapted From (Sherif & Hovland, 1961)



This framework of attitudes informs the difference between assimilation-contrast impacts. Attitudinal messages located in the latitude of acceptance would be viewed as more closely associated with attitudes than they are, and those found in the latitude of rejection would be considered far more extreme. SJT It has been successfully applied in the area of communication, persuasion, and attitudinal change (Sherif et al., 1965; Sherif & Hovland, 1961).



Example 3: Use of SJT in DUI Reduction Interventions

SJT assumes people evaluate argumentative messages based on their current attitudes or “anchors,” with varying thresholds for acceptance, rejection, or agreement. This explains why different DUI reduction strategies can be effective. For instance, sharing information or encouraging behaviour changes that individuals are receptive to tends to be better received and can lead to attitude shifts. Conversely, messages perceived as too extreme or outright rejected are viewed negatively and may strengthen existing risky attitudes (Slater et al., 1998). The effectiveness of brief motivational interventions (BMIs) (Teeters et al., 2015; Utter et al., 2014) or normative feedback (Lewis & Neighbors, 2006) can be partly explained by social judgment theory. These approaches often involve personalized feedback that slightly differs from an individual’s current drinking and driving behaviour, allowing for attitude and behaviour change rather than complete rejection.

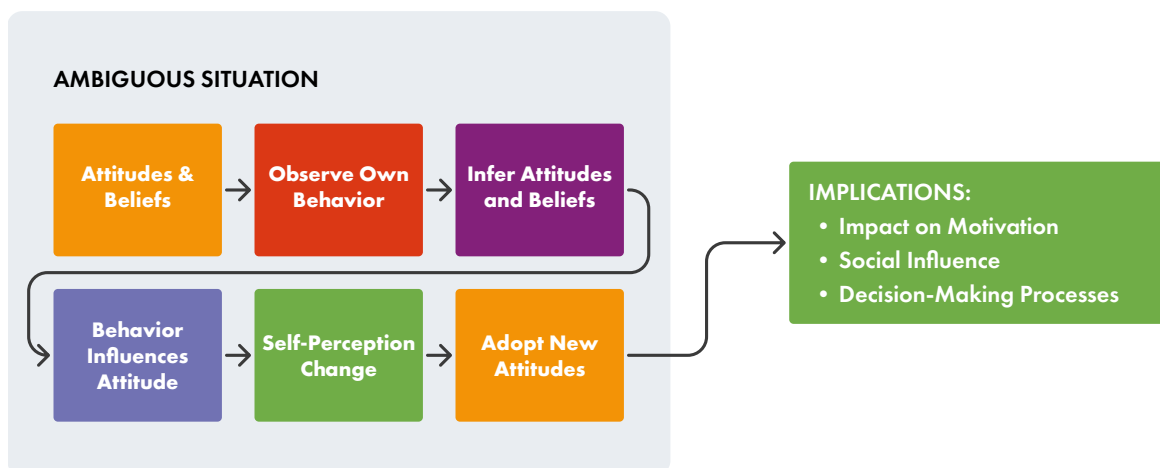
2.3.4. Self-Perception Theory (SPT)

Focus: Inferring attitudes from behaviour, mainly where intrinsic motivation is unclear (e.g., “I do recycle, so I must really care about the environment”) (Bem, 1972).

Attitude-Behaviour Link: Attitudes can be determined retroactively by the behaviour of the person (Bem, 1972).

Self-perception theory (SPT) was originally introduced by Daryl Bem in 1967 to replace the cognitive dissonance theory (Bem, 1972). According to the SPT, individuals determine their attitudes and emotions based on their behaviour, which is more likely to happen when ambiguity and internal cues are insufficient or do not exist. Rather than drawing on existing attitudes, people can reflect on their behaviour as an external (Bem, 1972). The theory states that behaviour may also be a source of learning information. For example, an action, such as recycling, may lead a person to see that they do care about the environment. However, it was not their initial reason for doing so (Olsson et al., 2020) (Fig. 2.4).

Figure 2.4 Self-Perception Theory (SPT), Adapted From (Bem, 1972)



Academic research has shown that behaviour can influence self-concept. For example, a well-known study involved instructing participants to smile while reading cartoons (Laird, 1974). Those who smiled later reported finding the cartoons funnier than others, indicating that facial expressions can affect emotional perceptions. Another example involved asking individuals to recall past religious behaviours; those who did so saw themselves as more religious. This supports the idea that beliefs are not solely held internally but may also stem from experiences or self-perception based on behaviour, rather than mere recollection (Salancik and Conway, 1975).

SPT is often used to explain attitude formation in social psychology and consumer psychology. For example, engagement in pro-environmental behaviours leads to identifying one as pro-environmental even if they once engaged in the behaviour for social conformity or convenience. In other words, if someone is identified as having recycled or used reusable bags, over time, they may come to be recognized as “eco-conscious,” even though they engaged in the behaviour for other reasons (Chaiken & Baldwin, 1981). The theory suggests an alternative view of attitude formation; instead of relying on attitudes to learn about oneself, self-knowledge is constructed rather than recalled. However, there are practical implications for the provided behaviour changes. The person may come to be identified by a new attitude simply by changing the behaviour first.

Interventions based on SPT

SPT proposes that people can acquire attitudes through encouraging behaviours like volunteering or recycling. This occurs because people infer their attitude from their behaviour when their internal states are ambiguous. This can happen by helping to move attitudes through behavioural experiments, role play, and self-monitoring exercises. These exercises allow people to engage in the desired behaviours and then reflect. At this point, these self-report diaries, behaviour observation checklists, or reflections can be used to see if the behaviours have influenced the implied attitudes, demonstrating that behaviour can be a precursor to attitude formation (Bem, 1972).



Example 4: Use of SPT in DUI Reduction Interventions

Self-perception theory (SPT) suggests that individuals develop their attitudes by observing their own actions, along with the context and attitudes linked to those actions. With regard to DUI, it is conceivable that interventions that prompt people to perform behaviours that are consistent with personal anti-DUI attitudes will cause them to adapt and internalize those attitudes. Therefore, programmes that train individuals to effectively reject peer invitations for drink-driving or to select safer alternatives for getting home are important (Freeman et al., 2005; Sheehan et al., 1996). At rehearsal, they clearly convey the anti-DUI attitude, which, over time, may strengthen their own personal anti-DUI attitude rather than continuing to comply with an expectation of the programme (external reason).

Furthermore, interventions that lead individuals (particularly young men) to role-play in which they have rehearsal of making a safe decision rather than a DUI decision can also shape an attitude as they think about their own observed decisions and infer their safety preference (Fromme et al., 2010; Kopel & Arkowitz, 1975).

2.4 Theories of Behavioural Change

Behavioural change theories emphasize the external mechanisms and processes that affect observable actions. They delve more into the development or acquisition of new actions, yet are less about internal evaluations. Although these models acknowledge attitudes as being able to affect behaviour, their focus is on understanding the stages of change, the learning processes of change, or conditions based on the environment that promote change.

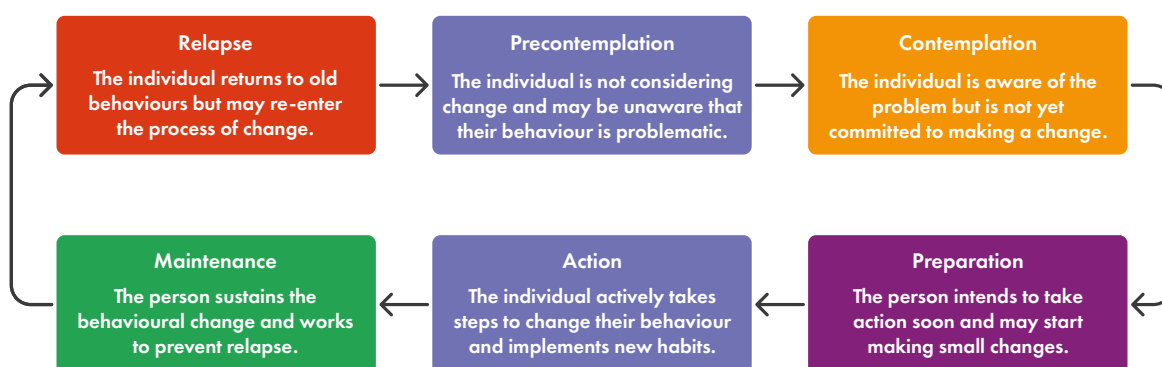
2.4.1. Trans-Theoretical Model

Focus: This model focuses on developing behaviour through clearly defined stages, starting from precontemplation, where an individual has not yet begun to consider change, to contemplation, preparation, action, and maintenance. Each stage is a specific level of readiness, and particular interventions can be targeted to address the unique needs at each stage of the change process (Prochaska & DiClemente, 1982).

Attitude-Behaviour Link: While the model acknowledges that attitudes (for example, perceptions of benefits or drawbacks) can affect readiness to change, its primary focus is on quantifiable changes in behaviour. Attitudes are one of several influences that can facilitate back-and-forth movement between stages, but they are not the primary influence in propelling the model's framework (Hong & Lee, 2021; Prochaska & DiClemente, 1982).

James Prochaska and Carlo DiClemente developed the trans-theoretical model (TTM) in the late 1970s as a model for behaviour change (Prochaska & DiClemente, 1982). They proposed definitive stages that individuals progress through during behavioural changes. They developed a five-stage model comprising pre-contemplation, contemplation, preparation, action, and maintenance. This model integrates elements from multiple psychological theories, such as decisional balance (weighing the benefits and drawbacks of change) (Plotnikoff et al., 2001), self-efficacy (confidence in one's ability to change), and processes of change (methods used to advance through the stages) (Dunkel et al., 2025). The overarching framework enables the trans-theoretical model (TTM) to be applied to a variety of behaviours (Fig. 2.5).

Figure 2.5 *Trans-theoretical Model (Stages of Change), Adapted From (Prochaska & DiClemente, 1982)*



Since its introduction, the TTM has been used widely in health psychology, public health interventions, and clinical treatment to tailor behaviour change programmes to an individual's stage of readiness (Prochaska & DiClemente, 1982). Unlike linear behaviour change theories, the TTM emphasizes behaviour as a process, recognizing relapse as part of normal change, not failure.

TTM has proved to be a powerful predictor and guide of behaviour change and is a powerful instrument in designing interventions that provide stage-matched assistance (Velicer & Prochaska, 1997). The TTM has been criticized for its reliance on self-report stages and its danger of oversimplifying multi-factorial determinants of behaviour (West, 2005). Despite these criticisms, the TTM remains one of the most influential models in health psychology and behavioural science (Prochaska & Velicer, 1997).

Interventions based on TTM

Interventions need to be matched with the subject's stage of the change. Motivational interviewing, for instance, is useful with those at the contemplation stage, and goal setting and relapse prevention planning are essential at the action and maintenance stages (Miller & Rollnick, 2013). Questionnaires (e.g., Stages of Change measures), decisional balance scales, and activity logs can be used to measure progress through different stages of behaviour change (Prochaska & Velicer, 1997).



Example 5: Use of TTM in DUI Reduction Interventions

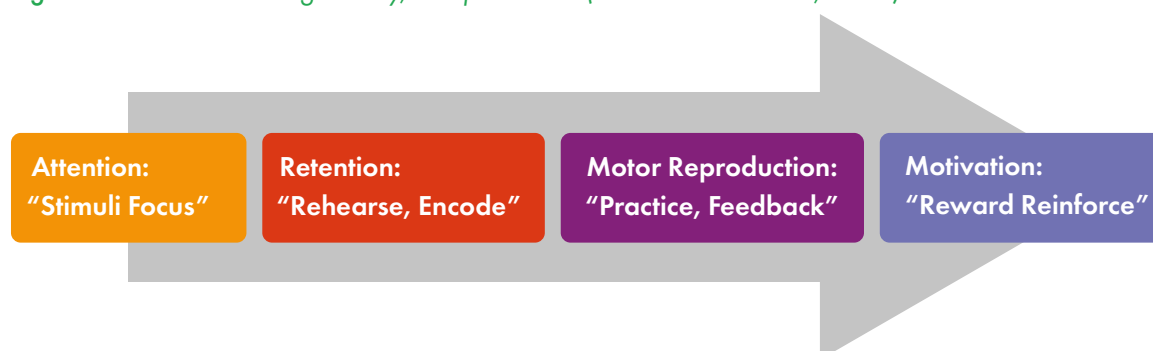
The trans-theoretical model (TTM) has been applied in DUI reduction interventions to understand and influence attitude change by focusing on stages of change and readiness to change. Studies have utilized TTM-based assessments, such as questionnaires, to determine the current stage of offenders regarding their drinking and driving behaviours, including pre-contemplation, contemplation, preparation, action, and maintenance (Moon et al., 2019, 2021; Polacsek et al., 2001; Wells-Parker et al., 1998). For example, Assailly (2014) referenced the TTM in investigating the effectiveness of alcohol interlock programmes and suggested its application would be more beneficial with psychological involvement. Baird et al. (2017) examined if baseline readiness to change predicted subsequent changes in impaired driving. Brown et al. (2010) employed the readiness to change questionnaire (RTCQ) to assess motivational stages in DWI recidivists. Markl (2016) evaluated the behaviour change process according to the TTM among pre-drivers related to DUI. Besides, interventions like interactive journaling incorporate elements of the TTM and motivational enhancement therapy to move forward through the change processes (Scheck et al., 2013). Wells-Parker et al. (1998) developed specific items to assess stages of change related to drinking and driving, highlighting the interrelation between motivation to change drinking and motivation to change drinking and driving. Polacsek et al. (2001) examined explicitly if victim impact panels moved first-time DWI offenders further through the stages of change beyond DWI school alone.

2.4.2. Social Learning Theory

Social learning theory (SLT), developed by Albert Bandura (1977), proposes that behaviour is learned through observation, imitation, and reinforcement. The theory emphasizes social and environmental factors in changing behaviour and articulates that people do not learn through direct experience only; learning can also occur through observation and the consequences of others' behaviour. Bandura's early work demonstrated what happens with modelling and reinforcement, but also included cognitive factors in learning, which can result in a change in behavioural functioning (Bandura & Walters, 1977).

The Social learning theory is about how people learn new behaviours via vicarious learning. In Bandura's (1986) elaboration on the concepts underlying the social learning theory, he located observational learning in four critical and connected key processes: attention (observing the behaviour), retention (recalling the behaviour), reproduction (demonstrating the behaviour), and the motivation to explain the behaviour (often a reward or punishment). Reinforcement (whether from direct learning experiences or vicarious from observing others receiving reinforcement or punishment) serves a significant role in behaviour learning adoption before or after learning (Bandura, 1986)(Fig. 2.6).

Figure 2.6 Social Learning Theory, Adapted From (Bandura & Walters, 1977)



Regarding the connection between attitude and behaviour, social learning theory acknowledges cognitive factors like self-efficacy—the confidence in one's ability to perform a specific action—as mediators in learning. While attitudes do influence behaviour, they are subordinate to the effects of the environment or behaviour models (Bandura, 1997). The social learning theory supports that the environment provides the model and the reinforcement in learning. In this, the social context is the modelling of behaviour in developing learners' capabilities to behave, with opportunities, reinforcement, and feedback as the means (Bandura & Wessels, 1997).

Interventions based on SLT

Group learning sessions, role models, and video demonstrations are useful methods for establishing observational learning and reinforcement findings in behavioural interventions. Social learning theory (SLT) maintains that individuals learn new behaviours from observing others, especially when the behaviour displayed is that of a role model (or peer) (Bandura, 1986).

Observational learning is further facilitated by vicarious reinforcement, when we observe others reinforcing the positive outcomes of behaviours, thus encouraging us to engage (Bandura & Walters, 1977; Bandura & Wessels, 1997). Use of role models, guided demonstrations, learning through videos, and unwritten discussions is also known to elevate motivation and engagement in behaviour change protocols (Schunk & DiBenedetto, 2020). Also, the combination of structured observation checklists, peer feedback forms, and self-efficacy measurements allows for systematic evaluations of behavioural change and cognitive and affective attitudes that support behavioural changes (Zimmerman, 2000). These evaluation tools provide documented evidence of implementation, encouraging self-regulatory processes that lead to more sustained and longer-lasting behaviour adoption. These elements combined can provide intervention opportunities to create an environment that encourages learning through social interactions, boosts self-confidence in changing behaviours, and helps maintain long-term changes.”



Example 6: Use of Social Learning Theory in DUI Reduction Interventions

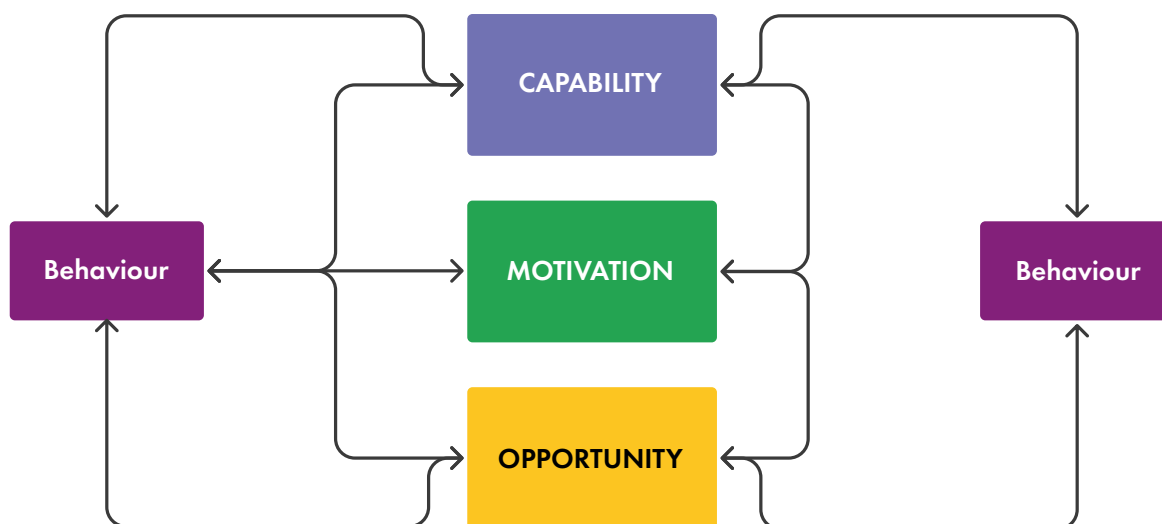
Kim & Kim (2016) demonstrated observational learning through a virtual reality intervention in which participants watched their avatar experience a drink-driving incident. This vicarious experience aimed to influence attitudes by exposing participants to the negative consequences of DUI, helping them remember the dangers. The intervention also considers the social context in which attitudes and behaviours related to DUI are formed. Schulte et al. (2024) highlighted the mechanisms by which “internalized norms and values” from peers and family shape attitudes in that manner, suggesting that interventions might target these social influences to model and reinforce anti-DUI norms. Furthermore, Moon et al. (2025) applied the theory by examining alcohol expectancies (beliefs about outcomes) and locus of control (perceived self-efficacy in controlling behaviour) as key factors influencing motivation to change. The finding that individuals with a greater internal locus of control are more motivated to change when focusing on long-term negative alcohol expectancies underscores the role of perceived ability to reproduce safer behaviours and the expected reinforcement of avoiding negative consequences.



2.4.3. The Capability-Opportunity-Motivation Model

Michie et al. (2011) introduced the capability-opportunity-motivation model (COM-B). It explains behaviour change through the interaction of three factors: capability, opportunity, and motivation. The model suggests that behaviour results not just from personal choices but also from how internal states interact with the external environment. Capacity refers to both physical and mental abilities, including knowledge, skills, and cognitive resources. Opportunity encompasses external influences like social and environmental factors that affect whether a behaviour occurs. Motivation is divided into automatic processes (such as emotions and habits) and reflective processes (like conscious decision-making and evaluating consequences). This model offers a comprehensive framework for understanding behaviour, emphasizing the importance of recognizing interactions across multiple levels of influence rather than focusing on individual factors alone.

Figure 2.7 The COM-B System, Adapted From (Michie et al., 2011)



A notable feature of the COM-B model is its focus on the link between attitudes and behaviours using reflective motivation. This facet involves an individual's beliefs, attitudes, and evaluations in relation to a given behaviour, which might provide a drive to produce the behaviour or inhibit it.

Whereas motivation is critical, the model illustrates that motivation is insufficient; outside environments, e.g., available resources, social norms, and environmental signals, are equally significant determinants for behaviour changes. This idea is consistent with other theories of behaviour change, which indicate that behaviour change interventions need to consider personal and contextual factors to be effective. By embedding psychological, social, and environmental considerations, the COM-B model has provided a core framework for behavioural research and intervention design, including health promotion, road safety, public policy, and organizational behaviour (Michie et al., 2011).

Interventions based on COM-B

Successful interventions need to include training to improve someone's psychological and/or physical capacity, changes to the environment to create opportunities to perform the desired behaviour, and motivational enhancements like incentives and social support for maintaining behaviour change. Each component must be assessed to design and evaluate behaviour change interventions appropriately.

Questionnaires are often used to assess capability and motivation regarding an individual's cognitive and physical capacity to perform a behaviour and conduct environmental audits to identify barriers or facilitators outside the individual. Also, objective assessments to record behaviour (tracking frequency or duration of behaviour) provide data to measure change over time objectively. The COM-B model is a grounding, theoretical framework within the behaviour change wheel to systematically design an approach to develop interventions that systematically address multiple determinants of behaviour (Michie et al., 2011).

Use of COM-B model in DUI Reduction Interventions

Prior studies addressing interventions have targeted components in the COM-B model to drive changes in DUI attitudes and behaviour. Examples of these programmes include educational programmes and interactive journaling, which aim to improve DUI offenders' psychological capability by increasing their knowledge of the effects of alcohol and the probability of DUI (Scheck et al., 2013; Shore & Maguin, 1988). Programmes providing alternatives for transportation (such as designated driver programmes or ride services), aim to improve the physical opportunity to prevent drink-driving (Lange et al., 2006). Motivational interviewing (Rothschild et al., 2006; Brown et al., 2010; Brown et al., 2012; Teeters et al., 2015; Utter et al., 2014) and victim impact panels/bearing witness target motivation by exploring ambivalence, increasing perceived (if not real) risk, and creating emotional responses to the consequences of DUI (Polacsek et al., 2001). Social norms campaigns have also been used as an intervention to modify social opportunity and motivation, influencing perceived acceptability of DUI behaviours in peers and the community (Negi et al., 2020).

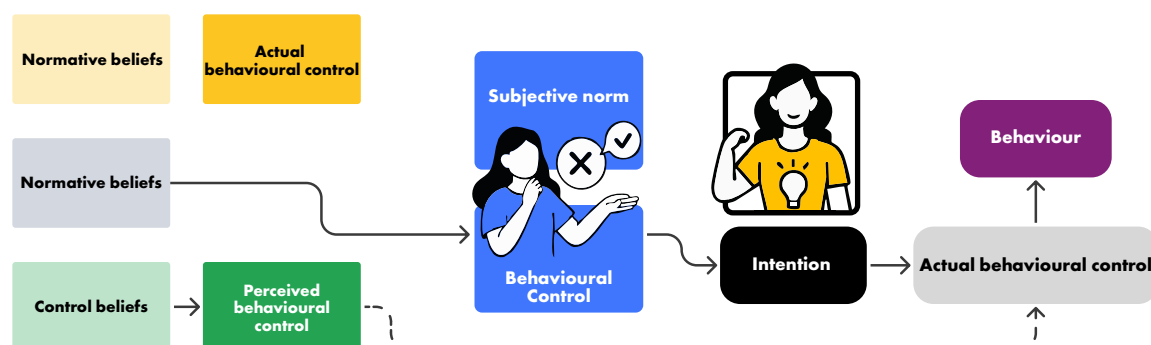
2.5. Bridging Attitude and Behaviour Theories

Compared to models that primarily deal with observable behaviour or attitudes solely, these models include the role of internal evaluation alongside external action. Bridging models explain how attitudes are formed and altered and ultimately predict behavioural intentions and behaviour. Combining the emotional and social factors with the cognitive measures, these theoretical models are placed within the context of the attitude-behaviour continuum.

2.5.1. Theory of Planned Behaviour (TPB)

The theory of planned behaviour (TPB), initiated by Ajzen (1991), has offered an intriguing avenue for thinking about beliefs and intentions related to behavioural conduct. The TPB has been constructed as an extension of earlier theories of reasoned action that incorporate the beliefs and attitudes of the individual, the subjective norm, and how much control the individual has to carry out a specific behaviour to predict intentions (Ajzen, 1991). This model shows the individual's evaluation and belief about a particular behaviour and emphasizes social factors and how easy or difficult an individual perceives carrying out the behaviour to be (Fig. 2.8). Thus, the TPB provides a rich context to address the subjective nature of the decision-making process while offering a conduit to actual behavioural conduct, which is helpful to researchers or practitioners in a range of fields from health promotion to environmental psychology (Ajzen, 1980, 1991; Fishbein & Ajzen, 1975).

Figure 2.8 The Theory of Planned Behaviour (TPB), Adapted From (Ajzen, 2020)



Attitudes play a critical role in the formation of behavioural intentions in TPB. Attitudes are evaluative beliefs about a behaviour. For example, if exercise is enjoyable and healthy for someone, then he or she will be more inclined to have a positive attitude towards it (Fishbein & Ajzen, 1975). However, attitudes do not operate in isolation. The TPB proposes that a second social aspect, which the TPB calls subjective norms, also plays an important role in forming intentions to act or not act (Ajzen, 2020). Subjective norms result from an individual's beliefs of how a valued referent, such as a family member, friend, or colleague, believes the individual should act. This dual focus on an individual's evaluation of their subjective norms with social influence creates an integrated understanding of people's cognitive engagement in the context of their social environment, and helps unpack the complexity of the processes involved in behaviour and decision-making (Ajzen, 1991; Fishbein & Ajzen, 1975).

Interventions based on TPB

Based on the TPB, Interventions incorporate multifaceted strategies to alter behaviour's cognitive and social antecedents. These interventions typically involve the modification of personal beliefs through educational programmes that provide accurate information and reshape attitudes, the alteration of perceived social norms by utilizing normative feedback that highlights the prevalence of desired behaviours among peers, and the enhancement of perceived behavioural control through skills workshops that equip individuals with the practical abilities needed to perform the behaviour (Ajzen, 2020). Standard TPB questionnaires assess these core constructs, attitude, subjective norm, and perceived control, while follow-up assessments, including additional questionnaires and behavioural observations, are used to evaluate the translation of these modified constructs into actual behavioural change (Ajzen, 1980, 1991, 2020; Armitage & Conner, 2001).

Use of TPB model in DUI reduction interventions

The theory of planned behaviour (TPB) has been directly applied in DUI reduction interventions to understand and promote attitude change by focusing on its core constructs: attitudes towards the behaviour, subjective norms, and perceived behavioural control, which collectively influence behavioural intentions. Bingham et al. (2010) utilized a conceptual model incorporating TPB principles in the development of the Michigan Prevention and Alcohol Safety for Students (M-PASS) programme, aiming to change attitudes and beliefs about alcohol use and reduce alcohol-related risk behaviour among college students.

Markl (2016) explicitly designed and evaluated a road safety education programme for pre-drivers about DUI using the TPB as a basis for influencing participants' attitudes, subjective norms, perceived behavioural control, and behavioural intentions related to drinking and driving. Sheehan et al. (1996) designed and assessed the Plan a Safe Strategy (P.A.S.S.) education programme for high school students. The programme used TPB-based strategies to reduce intentions to drink and drive or be a passenger, while promoting safe alternatives (Sheehan et al., 1996). It aimed to change students' attitudes towards drink-driving, their perceptions of others' attitudes (subjective norms), and their perceived control over DUI behaviours by providing training in alternative strategies.

2.5.2. Health Belief Model

The health belief model (HBM), initially developed by Irwin Rosenstock, aims to elucidate health-related behaviours by examining individual beliefs regarding health issues. HBM integrates both cognitive and motivational processes to demonstrate how people assess the risks and rewards of a particular health behaviour. The HBM provides a structured approach to understanding how personal beliefs may influence preventive health actions and the acceptance of medical interventions (Hochbaum, 1958; Rosenstock, 1966; Kegeles & Lund, 1982; Leventhal & Cameron, 1987).

Within the HBM framework, attitudes are defined by perceived susceptibility and severity, which collectively represent an individual's assessment of the likelihood and seriousness of experiencing a health threat. Moreover, the HBM incorporates perceptions of the benefits associated with taking preventive actions, alongside perceived barriers that might impede such behaviours (Becker, 1974). These cognitive evaluations shape how a person reacts to the danger posed by a health condition and the potential rewards of acting. Thus, the HBM posits that individuals conduct a mental cost-benefit analysis that informs their decisions regarding health behaviours (Hochbaum, 1958; Rosenstock, 1966).

Behavioural outcomes, such as obtaining vaccinations, are understood within the HBM as being influenced by a person's threat appraisal and subsequent cost-benefit analysis. While internal attitudes, such as the belief that "COVID-19 is dangerous", serve as potent motivators, they are often insufficient to induce action without the presence of external cues. External triggers or "cues to action," which may include public health campaigns or recommendations from healthcare providers, are essential in transforming these cognitive evaluations into tangible health behaviours (Shmueli, 2021). Thus, the model underscores the necessity of both internal cognitive appraisals and external signals in facilitating health-related decision-making (Hochbaum, 1958; Rosenstock, 1966).

Interventions based on HBM

The health belief model (HBM) is frequently used in public health interventions through strategies such as mass media campaigns, risk feedback to individuals, and cues to action (e.g., reminders or prompts), all intended to enhance people's perceived susceptibility to and benefits of preventive behaviours (Champion & Skinner, 2008).

Evaluative approaches typically include pre- and post-intervention surveys with tested health belief scales to assess perceived benefits and risk, as well as behavioural monitoring techniques like measuring vaccination levels that collectively give a comprehensive measure of intervention effectiveness (Carpenter, 2010). Such measures not only assist in evaluating changes in health beliefs but also assist in enhancing interventions that facilitate more effective preventive health behaviour (Rosenstock, 1974) (Table 2.2).

Table 2.2 Theories of Attitudinal and Behavioural Change

Theory	Primary focus	Key components	Main sources
Cognitive dissonance theory	Attitudinal	Dissonance reduction via attitude/behaviour alignment	Festinger, 1957
Elaboration likelihood model	Attitudinal	Central/peripheral persuasion routes	Petty et al., 1986
 Social judgment theory	 Attitudinal	Assimilation-contrast effects, latitudes of acceptance	 Sherif & Hovland, 1961
Self-perception theory	Attitudinal	Inferring attitudes from behaviour	Bem, 1972
Trans-theoretical model	Behavioural	Stages of change (pre-contemplation to maintenance)	Prochaska & DiClemente, 1982
Social learning theory	Behavioural	Observational learning, self-efficacy	Bandura & Walters, 1977
COM-B model	Behavioural	Capability, opportunity, motivation	Michie et al., 2011
Theory of planned behaviour	Both	Attitudes, subjective norms, perceived control	Ajzen, 1991
Health belief model	Both	Perceived susceptibility, severity, benefits, barriers	Hochbaum, 1958; Rosenstock, 1966

While attitudinal and behavioural change are intertwined, they operate through distinct psychological and contextual pathways. Theories like TPB and HBM bridge both domains, but others (e.g., ELM, trans-theoretical model) specialize in one. Practical real-world applications—whether promoting road safety or sustainability—require understanding how attitudes form and behaviours are enacted, particularly in the face of external constraints (e.g., socioeconomic barriers). Table 2.2 demonstrates theories, primary focus, key components and main sources of theories that we discussed in this section. Table A.1 in the appendix shows the theories discussed, the particular interventions based on each of them, and the tools used for each.



Chapter 3

Measuring Attitudinal and Behavioural Change

- 3.1. Evolution of Attitudinal and Behavioural Change Assessments
- 3.2. Attitudinal and Behavioural Assessment Methods
- 3.3. Attitudinal and Behavioural Change Assessment by Intervention
- 3.4. Assessing Drink-Driving Attitudinal and Behavioural Change: What Works Best?
- 3.5. A Synthesis of Evidence
- 3.6. Effectiveness of DUI Interventions in Attitudinal Change

This section explores how attitudes and behaviours have been assessed. A systematic literature review was conducted to identify how different studies have measured changes in attitudes and behaviours, especially regarding interventions targeting public safety and health concerns like drinking under the influence. The findings from this review will provide the necessary materials for creating the attitudinal and behavioural change toolkit in the next part of this study.

We performed a systematic review of the literature to examine the current tools and methods for assessing attitudinal change. Our findings reveal that these tools vary widely, encompassing quantitative, qualitative, and mixed-method approaches. They capture the multifaceted nature of attitudes, including cognitive aspects (such as perceived danger), emotional responses (like fear of injury), and behavioural tendencies (such as the intent to avoid drink-driving). This section outlines the main measurement strategies employed by different studies. Details of the systematic review methodology are provided in Appendix 1.

3.1. Evolution of Attitudinal and Behavioural Change Assessments

Table 3.1 provides a close, longitudinal snapshot of how researchers have learned to measure and impact attitudes about drink-driving. Essentially, it illustrates that from initial education and awareness campaigns to more complex, theory-based, and even implicit measures, attitudinal and behavioural change measurement methods have changed significantly over the last several decades. In this section, we compared the information and the approaches that were used in a chronological order:

3.1.1. Early Approaches (1980s–1990s)

Early attitudinal and behavioural change studies depended mainly on simple educational interventions. Early measures usually evaluated explicit attitudes by directly inquiring from the participants their perceptions regarding DUI and their planned behaviours following an intervention.

Some studies measured the impact of legal reform and public service advertising (e.g., Salzberg & Paulsrude, 1984). In these articles, the evaluation was somewhat more correlational, employing pre- and post-intervention surveys to track changes in self-reported attitude and DUI rate.

3.1.2. Middle Period (2000s)

In the 2000s, the trend was to integrate classic behavioural theory models such as the theory of planned behaviour, social norms theory, and deterrence theory. For instance, studies such as Jewell and Hupp (2005) provided experiential learning through interactive video and discussions and assessed attitudinal and behavioural change. Using control groups and randomized designs in studies made such results more robust.

Researchers started utilizing tools like standardized questionnaires and rating scales more. These measures were not just aimed at measuring self-reported attitudes but also intentions and, in a few cases, empathy. Procedures remained explicit and participant self-report-based, but now within theoretical frameworks linking attitudes to subsequent behaviour, and randomized designs in certain studies rendered such results more robust.

Researchers started utilizing rating scales and standardized questionnaires. These measures were not just aimed at measuring self-reported attitudes, but also intentions and, in a few cases, empathy. Procedures remained explicit, participant self-report-based, but now within theoretical frameworks linking attitudes to subsequent behaviour.

3.1.3. Recent Developments (2010s–2020s)

Advances in technology were demonstrated in studies such as Bingham et al. (2010), which began using online sessions and telephone counselling. These studies continued to use self-report surveys to assess attitudinal change but also tracked behavioural outcomes (e.g., reductions in DUI offenses) alongside reported changes in attitudes. This was a period of convergence between behavioural tracking and older attitudinal measures.

Another important development is the move towards assessing implicit attitudes. Martinussen and Sømhøvd (2019), for instance, used the go/no-go association task (GNAT) to examine implicit attitudes towards DUI. These kinds of measures access implicit associations that people are not willing—or even capable—of expressing openly and provide a more complete account of the way attitudes drive behaviour.

Recent studies (e.g., Huang et al. 2020, Negi et al. 2020) combine explicit self-reports with behavioural data like BAC levels and recidivism rates. Some also incorporate digital interventions, such as virtual reality (VR) simulations. This comprehensive approach allows researchers to evaluate and compare the effectiveness of various intervention methods while monitoring attitudinal changes through both direct and indirect measures.

3.2. Attitudinal and Behavioural Assessment Methods

3.2.1. Quantitative Methods

The use of quantitative methods using questionnaires and surveys for data collection is widespread in measuring attitudinal change. Questionnaires often include Likert-scale measures of attitudes, e.g., agreement with the items “Drink-driving is a serious threat” or “I would never drive after drinking”. Several studies have employed a similar method using randomized controlled trials (RCTs), which are considered the best control design for testing the effectiveness of interventions. Baird et al. (2017), Bonar et al. (2022), and Brown et al. (2010, 2012) employed RCTs that incorporated baseline assessments and follow-up assessments at multiple time points during the DUI intervention period (Table 3.1).

Our review shows that studies employ slightly different instruments that differ from each other. Still, they employ validated instruments such as the alcohol use disorders identification test (AUDIT), the readiness to change questionnaire (RTCQ), and the timeline follow-back method to measure alcohol and substance use patterns. These instruments offer evidence of reliability and validity for self-report assessments and aid in replicating the findings in future studies.

Regarding instrumentation, the attitudinal change studies often employ some combination of self-report questionnaires, biological measures, or official reports. For example, Brown et al. (2010, 2012) employed biological methods (e.g., blood biomarkers (GGT, MCV) and breath tests) with their self-administered alcohol questionnaires. Carey et al. (2015) and Cheng et al. (2021) supplemented the self-report data with official court records and recidivism reports to address potential bias sometimes encountered with self-report measures.

Table 3.1 Frequently Used Questionnaires and Survey Types

 Survey type	 Common instruments	 Purpose
General demographic and behavioural Surveys	It uses single-item or short scales to assess demographics, alcohol consumption, and DUI or driving habits and attitudes/behaviours	It is used to gather baseline data on demographics and alcohol-related behaviours
Alcohol-specific assessment tools	AUDIT, MAST, CAGE, TLFB	It is used to measure alcohol use patterns and its potential problems
Driving-related behaviour and attitude scales	Impaired driving scale (IDS), Attitudes towards drinking and driving scale (ADDs)	This survey type is used to measure driving behaviours and attitudes related to DUI
Motivation and readiness to change	Readiness to change questionnaire (RTCQ), visual analog scales (rulers)	To assess motivation and readiness to change drinking behaviours
Social and psychological Factors	TCU SOCFORM (social support), DRIE LOC (locus of control), self-efficacy, HIT questionnaire	To assess social support, personal efficacy, and psychological factors influencing behaviour
Programme evaluation	Feedback questionnaires from participants	To evaluate the effectiveness and acceptability of interventions

3.2.2. Qualitative Methods

Qualitative methods using focus groups or semi-structured interviews are also used to investigate the subjective, multilayered progression of attitude change. They are appropriate for populations such as recidivist DUI offenders or young drivers, where greater insight into motivations and perceptions is required. For instance, a study may have held focus groups with multiple DUI offenders after treatment and identified themes such as “heightened sensitivity to legal repercussions” or “altered sense of personal responsibility,” which may not be quantifiable. Thematic analyses are applied uniformly to integrate these qualitative data, providing dense, contextual insight.

Focus groups and interviews are the most widely utilized among the qualitative methods. Rothschild et al. (2006) and Slater et al. (1998) conducted focus groups, bringing groups together to discuss driving issues related to alcohol use. The focus groups produce large, in-depth understandings of participants’ attitudes. Likewise, Lang et al. (1998) used interview and on-site observation methods, with pseudo patrons posing as intoxicated or underage clients, which served to examine the application of the laws regarding alcohol-serving establishments. Loxley et al. (1992) and Sheehan et al. (1996) used qualitative styles of interviews to approximate the broader social context and longer-term consequences of DUI. Martin et al. (2019) employed clinical case reports, which offered descriptive accounts of individual patient cases, drawing out specific behavioural and health impacts of alcohol use.

3.2.3. Mixed Methods

Use of mixed-method approaches in assessing drink-driving attitudinal change is also significant. These studies use a mix of quantitative and qualitative approaches, which strengthens their findings through triangulation. This strategy helps investigators validate survey-measured attitudinal changes with interview-based explanations.

These studies used a mixed methods approach, which combined a strong quantitative component—e.g. randomized controlled trials, quasi-experimental designs, pre- and post-test surveys, and analysis of official records—with a qualitative component that used focus groups, interviews, open-ended questions, content analysis, and measures taken at the site of the study. For example, Bonar (2022) used an online screening survey with a validated instrument (i.e., AUDIT-C) to measure alcohol consumption and impaired driving, while also coding qualitative ratings on acceptability of the programme. Similarly, Markl (2016) used a mixed methods approach to quantify participants' responses to several questionnaires evaluating the components of the theory of planned behaviour and readiness to change with qualitative data obtained through semantic differentials and open-ended survey feedback. Lang et al. (1998) and Rothschild et al. (2006) also employed a structured, quantitative assessment tool. They included qualitative data collected from participant interviews and focus groups to understand participants' behaviours and the efficacy of the programmes.

3.3. Attitudinal and Behavioural Change Assessment by Intervention

To better understand the tools used in DUI attitude or behaviour change and the interventions incorporated based on them and their connections, we have categorized the tools and interventions and made two matrices based on the categorizations.

3.3.1. Educational and Training Interventions

These tools include agendas such as workshops, public campaigns, and responsible service training. Reznik et al. (1984) utilized driver education programmes to effect 15 per cent reductions in crashes. However, there were no shifts in drinking attitudes, so a gap between knowledge and behavioural change existed (behavioural change theory). Lang et al. (1998) trained bartenders to refuse service to intoxicated patrons, resulting in a 30 per cent reduction in bar-related drunkenness using a role-play exercise as part of the training proposal (social learning theory). Swenson & Clay (1980) also utilized training to improve drinking behaviours with no observed effects after the training ended. This study raises the question of being only passive in training and, therefore, not beneficial alone. This type of intervention is likely to work best when used with other more interactive ways of learning (e.g., peer intervening with young adults, Sheehan et al., 1996).

Educational programmes' success vary. Swenson & Clay (1980) found no statistically significant changes in drinking behaviour post-educational programming, leading them to suggest that educational programmes alone were not effective. Conversely, Sheehan et al. (1996) reported that drinking-driving decreased and passenger interventions improved following workshops that used peer interventions based on the theory of planned behaviour. Lang et al. (1998) trained bartenders to refuse service to intoxicated patrons and measured a reduction in drunkenness inside bars using social learning theory. Polacsek et al. (2001) did not report any positive changes in drinking behaviour using a stages-of-change model. In this instance, their results suggested that in order to intervene behaviourally, a more tailored education and experience-based programme was needed, with a focus on contextual behaviour change.

3.3.2. Awareness Campaigns and Advertising

Awareness campaigns typically seek to influence both attitudes and knowledge. For instance, Reznik et al. (1984) observed a reduction in crashes following driver education that conveyed values, yet participants' attitudes remained unchanged, indicating a disconnect between beliefs and actions. Badovinac (1994) identified a decline in positive behaviours when fear-based messages were used, whereas Slater et al. (1998) highlighted the importance of message memorability, pointing out that believability often depends on how well a message is remembered, rather than purely on quantitative metrics. These studies underscore the importance of targeted messaging for diverse audiences, especially health practitioners who tailor messages to align with their audience's tendencies.



3.3.3. Behavioural and Motivational Counselling Interventions

Self-regulation and intrinsic motivation are the main concerns of these interventions. Connors et al. (1986) achieved a 40 per cent reduction in driving under the influence (DUI) recidivism using similar individualized counselling based on self-control principles. Brown et al. (2010, 2012) applied motivational interviewing (MI) to young adults displaying ambivalence and achieved 35 per cent reductions in risky drinking per young adult, and the role that MI plays in resolving ambivalence. Finally, Utter et al. (2014) noted no difference between MI and the control group. This also alludes to conducting a sufficient “dose” of the intervention and participant readiness to act upon MI practices. These interventions work well with high-risk participants, e.g., college students (Teeters et al., 2015).

3.3.4. Behaviour and Counselling Interventions

Counselling methods such as motivational interviewing (MI) can be effective depending on the target population. Connors et al. (1986) observed that students who received personalized interventions showed decreased recidivism based on self-control principles. Brown et al. (2010, 2012) found MI especially successful in lowering alcohol consumption among ambivalent younger adults, with reductions of 30–40 per cent in risky drinking. Conversely, Utter et al. (2014) reported no significant differences between the MI and control groups, possibly due to the low intensity of the intervention. Teeters et al. (2015) indicated that MI was effective in decreasing DUI behaviour among college students, likely because of their developmental openness to self-reflection and re-evaluating drinking values.

3.3.5. Legal and Policy Enforcement Interventions

Regulatory interventions serve to create penalties to establish deterrent behaviour. In a study, Shore & Maguin (1988) associated a decline in crash fatalities with a stricter policy enforcement of DUI laws (deterrence theory). Schwartz & Davaran (2013) found a series of arrests after policy implementation, specifically related to women, and a bias in being apprehended. Desapriya et al. (2006) determined that zero-tolerance laws, in areas with regular regulation, had a 12 per cent decline in alcohol-related crashes. These interventions depend upon perceived legitimacy, and inconsistent policies (as described in the study by Salzberg & Paulsrude, 1984) have been shown to establish findings on effectiveness inadvertently.

The effectiveness of legal and policy changes as interventions pertaining to both limited and severe DUI laws and zero tolerance policies has been inconsistent, if not arbitrary. Guided by deterrence theory, Shore & Maguin (1988) noted a 20.1 per cent decrease in fatal DUI crashes following legal changes, indicating that laws are effective in deterring behaviour through the legal consequences of the behaviour. Similarly, Bernat et al. (2004) pointed out a decrease (5.2 per cent) in fatal crashes related to increased enforcement of DUI laws. Salzberg & Paulsrude (1984) noticed a unique trend of increased DWI violations during a time when the law was new and subsequently enforced, which suggests that there are systemic general compliance gaps in public compliance and enforcement attitudes. Collectively, these studies show that the policy sustained outcomes depend on some level of public acceptance of the law, and norms associated with public attitudes towards enforcement (for example, Schwartz & Davaran, 2013, indicated this has increased based on arrests, and many based on women's arrests being biased enforcement).

3.3.6. Screening and Assessment Instruments

Screening tools such as MAST, CAGE, and SBIRT quantify one's attitudes and behaviours. Screening tests were used by Moore et al. (2008) to screen for high-risk subjects and develop treatment based on the subject, and this led to a valuable reduction of 25 per cent of recidivism (stages-of-change model). Baird et al. (2017) combined AUDIT scores with motivational interviewing, which reduced self-reported drinking-driving behaviour by 18 per cent. Moon et al. (2025) measured the locus of control (LoC) in terms of external vs. internal, with internal LoC being more in line with favourable outcomes in rehabilitation, based on findings from motivation and control theories research. They are helpful in intervention goals; however, they are the least culturally suitable instrumentation measures, based on earlier discovery research by Cheng et al. (2021).

3.3.7. Media, Digital and Communication Interventions

Digital media interventions utilize technological aspects to foster engagement. Clapp et al.'s study (2005) used online module programmes to decrease DUI rates on college campuses by as much as 22 per cent (deterrence theory). Kim & Kim (2016) employed virtual reality simulators and "interventions" to "transform intermediate tasking towards drinking decision-making and behaviour choices" via social cognitive theory. However, Negi et al. (2020) found that social media campaigns effectively influenced desired knowledge and attitudes when combined with virtual methods. Successful safety awareness campaigns appear to engage both immersive technology and an actionable step towards behaviour change, as demonstrated in Bonar et al.'s (2022) movie theater drink-driving campaign.

3.3.8. Digital/Virtual Interventions

Techniques that utilize technology-based modalities are demonstrating a lack of success where knowledge does not translate into practice. Clapp et al. (2005) were able to reduce DUI rates on a college campus, administering an online intervention (using the methodology of deterrence theory). Kim & Kim (2016) created a virtual experience where students could experience the effects of drinking, delivering a different outcome through social cognitive theory. Finally, Vankov et al. (2021) observed that there was no change in behaviour, despite improving knowledge and understanding of the consequences. Each of these studies investigates the knowledge-practice gap. Bonar et al. (2022) identified digital group-based interventions to reduce drug use, but not alcohol use, sports-based norms regarding alcohol use are probably more entrenched than drug culture norms.

3.3.9. Enforcement, Monitoring, and Technological Interventions

These approaches are generally used as the basis for legal remedies. For example, Assailly et al. (2014) demonstrated that using an alcohol interlock device disrupts the automaticity of behaviours, resulting in a 65 per cent reduction in recidivism (trans-theoretical change model). Loxley et al. (1992), compared random breath testing with more direct deterrent behaviours, such as those experienced in NSW, and noted the unpredictability of behaviours and the need for clear and explicit measurement procedures for enforcement. Moreover, Weinrath (1997) reconceptualized compliance in DUI laws and observed a 30 per cent reduction in drivers testing positive for impairment or drugs (DUI). The certainty of enforcement is a key factor with significant implications for changing attitudes and behaviours.



3.3.10. Promotional and Incentive-Based Interventions

Incentives for promotions can influence behaviours indirectly, which can be problematic in the case of substance use. Rothschild et al. (2006) found an 18 per cent reduction in driving while impaired due to substances when attempting to modify behaviour using promotional strategies that implicitly encouraged riders to use free ride coupons, leveraging social marketing while maintaining community trust and principles related to behavioural economics. In a study, Lange et al. (2006) found that mixed peer groups with a lower BAC drank less when exposed to a targeted consumption effort, providing evidence supporting the use of social norm theory. Domrev-Benkovich et al. (2017) suggested that if at least half of the individuals living in a rural area responded positively to discounts on ride-shares, promotional programmes could effectively reduce impaired driving behaviour.

3.3.11. Survey Measurement Tools

Some survey and measurement instruments may sometimes inadvertently reveal disguised or implicit stereotypical attitudes. Martinussen & Sørhøvd (2019) showed that IAT testing might change attitudes and behavioural challenges associated with DUI, influencing attitudinal intent and negative drift. Misinterpretation of behaviours and stereotypical biases were also recognized from the assessments used in the related assessments. Carey et al. (2015) examined behavioural economics in discharge assessments, finding a 30 per cent reduction in recidivism in similar cases. The study documented sample client data based on review reports. Dowling (2011) identified discrepancies in self-reported excessive DUI drinking, highlighting the role of intervention approaches and family support in survey-based assessments. Reports evaluating the influence of family or rehabilitation reflected key findings in behavioural change processes.

3.3.12. Rehabilitation and Treatment Interventions

Long-term intervention techniques target self-concept and behaviour changes. Huang et al. (2023) reported that 12-month long treatment programmes decreased reoffending by 40 per cent more than programmes lasting only 6 months, aligning with recidivism theories. Similarly, Wells-Parker (1998) reported mixed findings, indicating that the use of cognitive-behavioural therapy (CBT) based programmes can be more effective than punitive approaches. Additionally, Moon et al. (2025) got to the conclusion that internal locus of control can be a significant predictor of rehabilitation success, emphasizing the importance of autonomy-supportive frameworks within the context of motivation theory.

Rehabilitation is often a sustained process. For example, Wells-Parker (1998) found mixed results, with some successful programmes decreasing recidivism by changing behaviours that preceded recidivism. Huang et al. (2023) found 12-month programmes more impactful than 6-month programmes, decreasing re-offenses by 25 per cent, utilizing habit formation to encourage change (aligning with research on recidivism theories). Moore et al. (2008) reported high alcohol dependency levels in participants, reinforcing the need for individualized treatment (e.g., stages-of-change). Moon et al. (2025) consider internal locus of control (belief in self-efficacy) to be an encouraging factor to improve outcomes in correctional groups.

3.3.13. Enforcement and Checkpoints

Enforcement tools such as sobriety checkpoints and alcohol interlocks employ deterrence. Weinrath (1997) found checkpoints to reduce DUI rates by 30 per cent, while Loxley et al. (1992) reported more instances of deterrence in regions that had a stronger enforcement culture (e.g., NSW had higher deterrent qualities than WA).

Assailly & Cestac (2014) found that interlocks reduced recidivism rates by 60–90 per cent, however, general success required a disengagement from habits (using a trans-theoretical model framework), for a lifestyle change to occur. These studies demonstrated that visible and consistent enforcement between checkpoints and alcohol interlocks influenced subjects' behaviour.

3.3.14. Alternative Transportation/Support Services

Providing an alternative to drink-driving will not change if the alternative is not accessible. Domrev-Benkovich (2017) observed that 42 per cent of participants drove drunk, citing minimal ridesharing in rural areas. In another study, Rothschild et al. (2006) were able to significantly reduce alcohol-related injuries when offering free rides and social marketing strategies. Any intervention investigating appropriate alternatives needs to be convenient, cost-effective, and socially accepted to tackle research-based changes in behaviour.

3.3.15. Social Norms and Attitude Change

Changing social attitudes may indirectly decrease DUI. Lange et al. (2006) established that peer social norms could lower blood alcohol levels, suggesting that if peers drank less, patrons with sober friends drank less. In another study, Martinussen & Sømhovd (2019) used an implicit association test to track changes in attitudes, following the intervention, yet the action was delayed. All intermediary organizations must look at the expansive implications of culture on alcohol use vis-à-vis those using spontaneous support or sober nights to assess where attitude ends and behaviour begins.

3.3.16. Community and Multifaceted Programmes

Strategies can be effective when combined, but they require time to show results. For instance, Greenberg et al. (2004) discovered that higher perceived risk—such as the chance of losing a license—correlated with lower DUI rates, supporting a risk-based behavioural control theory. Conversely, Polacsek et al. (2001) observed no short-term changes from a multi-component programme and suggested that complex behaviours might not need long-term, iterative strategies for change. Typically, successful programmes employ a mix of legal, educational, and social methods to influence behaviour.

3.3.17. Judicial and Treatment Court

Implemented in or near court-mandated treatment, a mix of accountability and support is used. Carey et al. (2015) observed a 30 per cent decrease in recidivism when applying a behavioural economic strategy, such as providing quick consequences for noncompliance. Huang et al. (2023) found that extended court involvement—12 months versus 6 months—was more effective. These findings imply that offering engaging, structured support can sustain longer engagement and potentially influence behaviour.

3.3.18. Implicit Motivational Measurement

Tools that analyse the underlying drivers of behaviour can identify and quantify obstacles. For instance, Schulte et al. (2024) observed that parental monitoring knowledge—an obstacle for youth drivers—was associated with reduced youth DUI rates because it enhanced perceived control over behaviours, aligning with social learning theory. Similarly, Moon et al. (2025) reported that criminal justice groups with an internal locus of control responded more positively to autonomy-focused messages, highlighting how behaviour influenced by motivational priming can inform intervention strategies.

3.3.19. Family-Based Interventions

Barriers to family based treatments include conflicting social norms. As shown in Dowling (2011), even when many families report efforts to communicate rules or consequences, youth DUI rates stayed high because peers normalized drink-driving. Programmes that involve family members along with community approaches are more effective. Merely delivering anti-drinking and driving messages was not enough; additional support was necessary.

These studies highlight the complexity of preventing DUI, including the need to customize interventions for audience characteristics, synergize multiple strategies (e.g., law education support), and focus on both explicit behaviours and implicit attitudes. Moreover, Table 3.2 presents an overview of theories, interventions, and assessment tools for attitude and behaviour change in DUI. There are still gaps in the ability to facilitate long-term change and to overcome contextual barriers (e.g., rural areas need alternatives to get home). Future work should consider developing adaptive, theory-based frameworks responsive to social norm changes.

Table 3.2 Overview of Theories, Interventions, and Assessment Tools for Attitude and Behaviour Change

 Theory	 Primary focus	 Interventions	 Assessment tools
Cognitive dissonance theory	Resolving inconsistencies between behaviour and attitudes	Inducing dissonance through counter-attitudinal advocacy	Dissonance experience questionnaires
		Self-justification and reflection exercises	Self-report attitude surveys
		Public commitment activities to highlight discrepancies	Behavioural consistency logs and qualitative interviews
Elaboration likelihood model (ELM)	Dual routes of persuasion (central vs. peripheral)	Central route: Detailed, logic-based arguments and factual messaging	Persuasion effectiveness surveys
		Peripheral route: Use of attractive visuals, endorsements, and heuristic cues	Message recall and comprehension tests
		Tailoring message complexity based on audience involvement	Attitude strength and central-route processing scales
Social judgment theory (SJT)	Assimilation and contrast effects in attitude evaluation	Calibrating persuasive messages to fall within the audience's latitude of acceptance	Semantic differential scales
		Gradual, incremental messaging to shift attitudes	Attitude range and acceptance-latitude questionnaires
		Framing interventions that build on existing beliefs	Focus group discussions and qualitative feedback
Self-perception theory (SPT)	Inferring attitudes from observed behaviour	Behavioural experiments where individuals engage in target behaviours	Self-report diaries and reflective journals
		Self-monitoring and reflective journaling exercises	Behavioural observation checklists
		Role-playing and simulated scenarios to elicit behaviour first, then infer attitude	Post-behaviour attitude assessments

 Theory	 Primary focus	 Interventions	 Assessment tools
Trans-theoretical model (stages of change)	Stages of behaviour change (pre-contemplation to maintenance)	Stage-matched interview such as motivational interviewing	Stage of change questionnaires
		Decisional balance exercises and relapse prevention strategies	Decisional balance scales
		Goal-setting workshops and action planning sessions	Behavioural tracking logs and activity diaries
Social learning theory	Observational learning and reinforcement	Modelling and role-model demonstrations (e.g., video or live examples)	Self-efficacy and outcome expectancy scales
		Group-based learning sessions and peer mentoring	Structured observation checklists
		Reinforcement through feedback and rewards	Peer feedback surveys and group discussion evaluations
COM-B model	Behaviour as a function of capability, opportunity, and motivation	Skills training and educational sessions to boost capability	Capability and motivation assessment questionnaires
		Environmental restructuring and resource provision to enhance opportunity	Environmental audits and resource checklists
		Incentive, goal-setting, and social support interventions to improve motivation	Direct observations of behavioural performance (frequency, duration)
Theory of planned behaviour (TPB)	Integration of attitudes, subjective norms, and perceived behavioural control	Multifaceted interventions : normative feedback, belief-modification, and efficacy training	TPB-specific questionnaires (attitude, subjective norm, perceived control)
		Workshops for goal-setting and social influence campaigns	Behavioural intention and follow-up behaviour questionnaires
		Perceived behavioural barriers reduction strategies	In-depth social norms interviews
Health belief model (HBM)	Perceived susceptibility, severity, benefits, and barriers in health behaviours	Public education campaigns regarding individual risk and severity	Health belief scales (susceptibility, severity, benefits, and barriers are measured)
		Communication approaches emphasizing advantages and minimizing obstacles	Pre- and post-intervention surveys
		Action cues like reminders, alerts, and public health cues	Monitoring of health behaviour (e.g., vaccine uptake, uptake of screening)

3.4. Assessing Drink-Driving Attitudinal and Behavioural Change: What Works Best?

The subsequent matrix overviews key findings of included articles to provide better insights into the effectiveness of different DUI interventions. Each category of intervention is evaluated based on its primary outcomes, effectiveness rating, and theoretical constructs informing its effect. This synthesis lets us build the best strategies possible to reduce DUI occurrences and inform future intervention initiatives (Table 3.3).

Table 3.3 Interventions and Their Effectiveness

Intervention type	Key study results	Effectiveness rating	Theories used
Legal/policy reforms	Some studies showed reductions in DUI incidents (Shore & Maguin, 1988; Bernat et al., 2004), but enforcement inconsistencies limited impact (Salzberg & Paulsruide, 1984).	Moderate	Deterrence theory, social control theory
Awareness campaigns/advertising	Increased knowledge but inconsistent behaviour change (Reznik et al., 1984; Slater et al., 1998).	Low to moderate	Social cognitive theory
Educational programmes/workshops/training	Some reductions in DUI behaviour (Sheehan et al., 1996), but others found no lasting change (Swenson & Clay, 1980).	Moderate	Social learning theory, theory of planned behaviour
Behavioural/counselling interventions	Effective for high-risk groups; significant reductions in risky drinking and DUI recidivism (Brown et al., 2010; Connors et al., 1986).	High	Motivational interviewing, Self-control principles
Rehabilitation/treatment programmes	Longer treatment durations reduced recidivism more effectively (Huang et al., 2023).	High	Recidivism theories, behavioural change theories
Enforcement/checkpoints	High effectiveness in reducing DUI rates (Weinrath, 1997; Loxley et al., 1992), with interlocks significantly reducing recidivism (Assailly & Cestac, 2014).	High	Deterrence Theory, Trans-theoretical Model
Digital/virtual interventions	Improved knowledge, but mixed results in behavioural change (Clapp et al., 2005; Vankov et al., 2021).	Low to moderate	Social cognitive theory, behaviour change theories
Alternative transportation/support services	Programmes offering free rides reduced DUI rates, but accessibility remains a barrier (Rothschild et al., 2006).	Moderate to high	Social marketing, behavioural economics
Social norms/attitude change	Peer influences impacted drinking levels (Lange et al., 2006); implicit attitude tests showed delayed but promising effects (Martinussen & Sørhovd, 2019).	Moderate	Social norm theory, implicit attitude change theory
Community/multifaceted programmes	Risk perception interventions reduced DUI (Greenberg et al., 2004), but complex strategies required long-term commitment (Polacsek et al., 2001).	Moderate	Behavioural control theories
Judicial/treatment court	Structured support reduced recidivism (Carey et al., 2015), especially with longer involvement (Huang et al., 2023).	High	Behavioural economics, motivation theories
Implicit/motivational measurement	Parental monitoring influenced lower youth DUI rates (Schulte et al., 2024).	Moderate	Social learning theory
Family based interventions	Family involvement helped but required additional community support (Dowling, 2011).	Moderate	Behavioural change theories

The review of DUI intervention research indicates that enforcement measures, rehabilitation programmes, and behavioural counselling interventions are the most favourable interventions to achieve the best results possible. These interventions demonstrate consistent reductions in DUI recidivism and behaviour change, especially where interventions are targeted to high-risk groups and prolonged over an extended duration. Awareness campaigns and electronic interventions have had some effect in enhancing knowledge but limited direct effect on behaviour change. In the same vein, legal and policy changes need constant enforcement and public buy-in to be maximally effective.

A comprehensive approach that integrates legal disincentives, behavioural interventions, and convenient transportation options is most likely to be effective in maintaining long-term decreases in DUI behaviour. Accessibility barriers in rural communities, optimizing digital interventions for behavioural change, and incorporating implicit motivational tools for enhancing long-term attitude change are some areas that should be addressed by future research.

3.5. A Synthesis of Evidence

The synthesis of evidence on DUI intervention studies indicates that enforcement approaches, rehabilitation programmes, and behavioural interventions are among the most efficacious approaches. These approaches typically yield consistent reductions in DUI recidivism and behaviour change, particularly when appropriate to high-risk groups and with a longer duration of DUI reduction.

Awareness campaigns and online interventions have shown some respectable levels of success relative to knowledge increase but have a negligible impact, if any, on actual behaviour change. The same is true for legal and policy changes, as they require enforceability and acceptance from the public for efficacy, or for the behavioural change to occur to enforce behaviour.

A comprehensive approach that includes some legal deterrent, elements of behavioural intervention, and transport alternatives that are attainable will yield probable evidence of intervention efficacy to lower DUI behaviour and thereby sustain change. Future studies should focus on rural settings and removing access barriers owing to location and wastelands of cities, look into ways to optimize digital or online intervention methods for behaviour change, and consider incorporating implicit motivational tools to promote change attitudes.

3.6. Effectiveness of DUI Interventions in Attitudinal Change

The most effective strategies were legal, policy, and enforcement tools, which effectively reduced DUI rates and fatal crashes when consistently enforced. Behavioural and counselling interventions also showed high effectiveness in reducing DUI behaviours, and this was even more obvious in the case of high-risk individuals. Rehabilitation and treatment programmes also showed success in reducing DUI recidivism, particularly when the duration was at least one year.

There were mixed results in the category of educational and digital tools. While many studies reported positive attitude changes in different interventions and showed a reduction in DUI behaviour among participants, a substantial number of studies demonstrated no impact or even negative effects, indicating that knowledge-based interventions alone are insufficient without behaviour-focused strategies.

We identified some gaps in research. There were no studies evaluating the combination of motivational/ counselling tools with policy and enforcement interventions. Also, studies did not analyse how legal policies and enforcement interact with rehabilitation and treatment tools.

The future research may use stronger integration of policy enforcement with educational and digital interventions to improve behavioural outcomes. Expanding the use of behavioural and counselling interventions within support and community-based settings to reinforce long-term change. Further research on hybrid intervention models that combine strict enforcement with behavioural treatment programmes to maximize deterrence and rehabilitation.

The analysis of the simplified matrix and the 4x4 summary matrix (Tables 3.2 and 3.3) suggests that enforcement strategies, rehabilitation programmes, and behavioural counselling interventions are among the most effective approaches. These methods displayed consistent reductions in DUI recidivism and behavioural change, particularly when interventions are tailored to high-risk groups and sustained over a longer period.

Whereas awareness campaigns and electronic interventions have had some effect in boosting knowledge, they have had minimal direct effect on behaviour change. In the same manner, legal and policy reforms need constant enforcement and public acceptance in order to be entirely effective.

A multi-faceted approach involving legal disincentives, behavioural interventions, and transportation options available is likely to be optimal in sustaining long-term reductions in DUI behaviour. Future research needs to strive to overcome access problems in rural areas, optimize digital interventions for behaviour change, and integrate implicit motivational tools to augment long-term attitude changes.

Key Findings

The evidence base on DUI-related attitude and behaviour change spans four decades, revealing a patchwork of interventions whose effectiveness hinges on timing, dosage, and the population itself. From classroom curricula to ignition interlocks, the literature converges on one point: no single lever is sufficient to curb alcohol-impaired driving. Instead, programmes that embed education, counselling, policy, technology, and social support within the same ecosystem consistently outperform isolated tactics.

Educational programmes showed varying degrees of effectiveness. Sheehan (1996) evaluated a school-based drink-driving education programme rooted in the theory of planned behaviour, which resulted in a significant reduction in drink-driving behaviours over three years in both the intervention and control groups. This indicates a strong cohort effect, potentially strengthened by community-wide measures like random breath testing. Conversely, Markl (2016) assessed a road safety educational programme for pre-drivers using the same theory but found no significant impact on attitudes or TPB components related to DUI, likely because baseline safe attitudes were already high and the programme duration was short. Scheck (2013) studied Interactive Journaling, a brief intervention combining education and motivational techniques for DUI/DWI offenders. It improved knowledge and attitudes but revealed no link between the two, implying that knowledge alone may not influence behavioural change intentions.

Brief motivational interviewing (BMI), a client-centered counselling method, was studied with mixed outcomes. Utter et al. (2014) found that a single BMI conducted shortly after a first DUI arrest did not significantly reduce short-term drinking behaviour, consistent with Brown et al.'s (2012) broader conclusion that the intervention type was less influential than demographic factors. Conversely, Brown et al. (2010) suggested that BMI might be effective for DWI recidivists not in treatment, leading to longer-lasting reductions in risky

drinking. Teeters et al.'s (2015) meta-analysis showed that counselor-led BMIs, especially those incorporating descriptive normative feedback, were linked to significant decreases in alcohol-impaired driving among college students.

Policy and legislative changes had the promise of decreasing drink-driving. Bernat et al. (2004) looked at 0.08 per cent BAC laws and found a notable decrease in DUI-related deadly traffic crashes after the laws were enacted in different states. Desapriya et al.'s (2009) study in Japan identified how a 0.03 BAC limit law lowered drinking-related crashes. Loxley et al. (1992) found that random breath testing in NSW, Australia, had lower rates of drink-driving among young people than in WA, where RBT was not in place. Salzberg & Paulsruide's (1984) evaluation of Washington's DWI legislation suggested that mandatory jail time did not act as a deterrent to recidivism. Schwartz & Davaran's (2013) research found that reducing the BAC level to 0.08 per cent led to higher DUI arrests for both men and women, and targeted DUI enforcement efforts had a larger impact on women's arrest rates.

Technological and community interventions yielded mixed results. Weinrath (1997) strongly supported ignition interlock programmes for reducing repeat drink-driving offenses. Rothschild et al. (2006) found a social marketing strategy effective in launching the 'Road Crew' ride programme, which projected a decline in alcohol-related crashes without increasing drinking. Vankov et al. (2021) evaluated a VR simulation of impaired driving but found no significant impact on DUI intentions or behaviour, possibly because participants had low initial DUI involvement. Domrev-Benkovich et al. (2017) reported that paramedic students frequently engage in drink-driving despite understanding its dangers.

Psychological and social factors are essential in understanding and addressing alcohol-impaired driving. Greenberg et al. (2004) found that internal, external, and social behavioural controls were linked to lower rates of drink-driving among repeat offenders. Moon et al. (2018) showed that recovery-focused social support significantly boosts motivation to change alcohol use in DWI offenders, aligning with the optimal matching model. Additionally, Moon et al. (2025) demonstrated a complex relationship between negative alcohol expectancies and locus of control, where an internal locus of control strengthened the influence of negative expectations on motivation to change among repeat alcohol-impaired drivers. Badovinac's (1994) study indicated that victim impact panels led to short-term positive shifts in attitudes and behavioural intentions among incarcerated offenders, but did not increase empathy. Schulte et al. (2024) conducted a longitudinal study indicating that adolescents' perception of parental monitoring provided some protection against repeated driving after drinking, although this effect diminished over time. Jewell & Hupp (2005) observed that fatal vision goggles influenced immediate attitudes but did not cause lasting behavioural change. Conversely, Negi et al. (2020) showed that a mass media campaign in Addis Ababa successfully increased knowledge, improved attitudes, and changed self-reported behaviours regarding drink-driving.

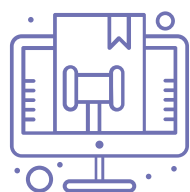
Conclusion

This systematic review emphasizes the importance of being aware that an **integrated, multi-faceted prevention approach** is needed to change the behaviour towards DUI. The evidence suggests that although separate legal enforcement, behavioural counselling, educational programming, and digital innovations can create moderate attitudinal and behavioural changes among people driving impaired, deploying intervention strategies using all or some approaches at the same time will be most successful. Drawing from established theories of attitudinal/behavioural change such as: the theory of planned behaviour (Ajzen, 1980, 1991), the health belief model (Hochbaum, 1958; Rosenstock, 1966), and cognitive dissonance theory (Festinger, 1957),

this review confirms that if sustained reduction in DUI is the goal, all the behavioural and educational and legal programmes involving alcohol-related risk should incorporate different types of interventions at the same time.



Legal and policy-related interventions (i.e., increased preventive enforcement strategies and stronger administrative consequences) will produce short-term reductions in DUI rates (Brown et al., 2012; Teeters et al., 2015). However, when integrated with behavioural, education, or digital programmes that address the cognitive and emotional factors that underlie drink-driving behaviour, their long-term effectiveness is improved. For example, behavioural counselling and motivational interviewing programmes will address cognitive dissonance and enhance self-regulation skills, while educational programming will increase awareness of personal risk factors and social risk factors of DUI behaviours.



The integration of digital innovations (i.e., virtual reality and online education modules) is a new and promising addition to DUI prevention efforts in combination with traditional methodologies (Kim & Kim, 2016). Digital innovations that provide immersive experiences can engage users more effectively and will lead to sustaining behaviour changes, though they have yet to be fully discovered. This review provides evidence that using one intervention will produce short-term changes, but only integrated programmes will offer multiple levels and will be critical for producing both immediate and sustained changes in behaviours related to DUI.

Overall, these findings will underscore the need for a broad, theoretically informed strategy to tackle the multifaceted problem of DUI. An approach that can target the immediate behavioural consequences of impaired driving and its underlying attitudinal drivers offers a better alternative and more sustainable solution to impaired driving as a public health issue.

Based on the evidence derived from this systematic review, next steps for future research need to focus on the continuing evolution of complex intervention strategies in a bid to optimize the effectiveness of DUI-related behaviour. To begin with, there is a pressing need for longitudinal study designs that thoroughly assess the sustainability of intervention impacts through long-term follow-up durations. These interventions must tap both self-report data and behavioural measures that are objective. In order to gather comprehensive data on long-term attitudinal and behavioural change. There should be a special focus on the development and standardization of measures that have the possibility of measuring effects over a variety of populations and intervention modalities.

One more avenue of possible research focus is within the augmentation of classic legal and behavioural interventions with digital innovations. Despite encouraging results demonstrated by digital innovations, such as virtual reality simulations, to increase engagement and stimulate behavioural change (Kim & Kim, 2016), their combination with traditional intervention approaches remains under-researched. Future research should consider how digital interventions can be optimally combined with policy enforcement and counselling in order to create more integrated and cost-effective DUI prevention programmes.

In addition, future research also needs to examine the socio-cultural and contextual moderators of the effectiveness of DUI interventions. Given the heterogeneity of the literature, a more nuanced understanding of how demographic variables (e.g., age, gender, socioeconomic status) and local cultural contexts influence intervention outcomes is required. Mixed-methods research designs incorporating both quantitative analyses and qualitative results may provide a more detailed understanding of these moderating effects.

Moreover, theoretical models on which contemporary interventions are based, e.g., the theory of planned behaviour, the health belief model, and the cognitive dissonance theory, need empirical research. Future studies should examine the generalizability of these models to various DUI populations and for different interventions, and examine if any other alternative or hybrid theoretical models may explain the multifaceted interaction of cognitive, emotional, and environmental influences in a clearer and better way. Such examination can ultimately lead to more advanced intervention methods that are more attuned to the subtleties of DUI activity.

Although this systematic review covers a broad scope, it has some limitations. One key issue is the reliance on self-reported data in much of the current literature, which can lead to response biases like social desirability and recall biases, as participants may misreport to appear better (Miller & Rollnick, 2013). Therefore, future studies should include more objective behavioural measures alongside self-reports.

Second, the diversity of methodologies used in the articles included in our study posed a barrier to synthesizing results. Variations in intervention designs, follow-up periods, and measurement instruments restrict the levels at which we can infer the relative efficacy of specific intervention strategies. Non-uniform evaluation metrics across studies not only complicate comparisons but may also obscure nuanced insights into the mechanisms driving behaviour change.

Third, although theoretical frameworks like the theory of planned behaviour (Ajzen, 1980, 1991), the health belief model (Hochbaum, 1958; Rosenstock, 1966), and cognitive dissonance theory (Festinger, 1957) served as useful guides for examining interventions, their application varied across different studies. This lack of consistent theoretical implementation complicates efforts to generalize findings and develop universally applicable intervention methods.

Finally, the review's inclusion criteria and data sources restricted the search to peer-reviewed articles and studies published in English. This might have excluded studies from other publication types or in languages besides English. Such language and publication biases could reduce the generalizability of the findings across different regions and cultures.





Chapter 4

Attitudinal Change Assessment Tools

4.1. Attitudinal Change Measurement Methods

As previously noted, a significant gap exists in how attitudes towards drink-driving are assessed, mainly due to the lack of a comprehensive toolkit to measure the impact of interventions on attitudinal change. This section aims to develop a toolkit for professionals and practitioners to evaluate shifts in attitudes after their interventions. Since the primary goal of DUI interventions is to reduce drink-driving, assessing attitudinal change helps determine their effectiveness. We describe the most effective tools for measuring these attitudinal shifts for each intervention type.

This section explains the common attitudinal change assessment methods, including their strengths and limitations. We will then connect assessment methods with their underlying theoretical framework and best practices in their applications, with particular emphasis on drink-driving interventions.

4.1. Attitudinal Change Measurement Methods

The term “attitude” was first introduced by psychologist Herbert Spencer in 1867 (Spencer, 1867). During the 1920s, scholars like Louis Thurstone emphasized that what set attitudes apart was their emotional or evaluative tendency directed at a particular object, concept, or topic (Peterson & Thurstone 1932).

Thurstone pioneered a structured method to study attitudes by assigning numerical values to a series of statements, allowing individuals to express how positively or negatively they viewed a particular topic. Building on this foundation, influential mid-20th-century psychologists such as Martin Fishbein and Icek Ajzen defined attitudes as evaluative judgments that influence a person’s inclination to engage, or not engage, in a specific behaviour (Ajzen & Fishbein, 1977).

Fishman and colleagues (2021) point out that in the context of implementation research, attitude refers to the extent to which an individual is inclined to adopt or support the use of a specific evidence-based practice (EBP), reflecting their general level of acceptance or approval (Fishman, Yang, & Mandell, 2021). They also add that this tendency is shaped by an individual’s perceptions of the potential results of using a particular EBP, whether they see it as beneficial or problematic, which influences their willingness to engage with it (Fishman et al., 2021).

In the twentieth century, psychologists devised various methods to quantify attitudes. However, many of these approaches were specific to individual studies and driven more by researcher preference than a strong, adaptable rationale. Consequently, this led to inconsistent results and conflicting insights about how attitudes are measured.

Since then, in psychology and social sciences, there has been a shift towards more consistent approaches for assessing attitudes, with structured tools like the Thurstone and Likert scales becoming widely accepted for their reliability and clarity (Ajzen & Fishbein, 1977). Additionally, psychologists now evaluate how favourably or unfavourably an individual perceives a particular behaviour by employing bipolar semantic differential scales, which enable a more nuanced assessment of attitudes (Valois & Godin, 1991).

People often remain unaware of their true attitudes because many cognitive processes happen unconsciously. Consequently, self-reported attitude measures can be affected by social desirability bias, prompting individuals to modify their responses to appear more socially acceptable instead of revealing their genuine feelings. Furthermore, these measures are direct and do not reflect mental processes that occur outside conscious awareness.

An alternative approach for measuring attitude change indirectly involves behavioural observations. This method aims to bypass the self-report bias by directly observing actions, which can provide more objective insight into underlying attitudes. Naturalistic observation, structured (systematic) observation, and participant observation are standard methods to assess attitudes (Angrosino, 2007).

Another indirect way to assess attitude change is through implicit measures. Unlike direct methods that depend on conscious responses, these newer techniques evaluate attitudes without requiring individuals to intentionally report them. Implicit methods involve quick response tasks that reveal how people categorize items. By analyzing their speed and accuracy, researchers can uncover unconscious or automatic attitudes (Gawronski and Hahn, 2018).

A key feature of implicit measures is their capacity to detect attitudes that are activated unconsciously, without the individual intentionally or consciously realizing it. However, a challenge with these measures is that automatic responses may not always happen consistently, leading to ambiguity about what they truly assess. The implicit association test (IAT) and the affect misattribution procedure (AMP) are among the most commonly used tools in implicit testing.

To facilitate a deeper comprehension of the various evaluation techniques and to highlight their distinct advantages and drawbacks, we have prepared concise definitions for each method and test. By outlining the specific context in which each method excels (advantages) and noting their potential limitations, practitioners can make informed decisions about which tools are most appropriate for their interventions.



4.1.1. Likert Scales

Developed in 1932 by Rensis Likert, the standard Likert scale employs a 5- or 7-point ordinal format that asks respondents to indicate their level of agreement/disagreement, frequency, importance, or likelihood towards a set of statements (Likert, 1932). Likert scales are particularly useful for measuring subjective features that are difficult to assess objectively. A Likert scale question works well for surveys focused on a single topic because it allows for straightforward analysis of people's opinions or attitudes towards specific subjects.

The Likert scale is a popular tool in interventions because of its standardized format, which facilitates straightforward comparison of responses among different participants and over time. Its versatility allows it to be used across various content domains, such as attitudes, beliefs, perceptions, intentions, and behaviours. Crucially, the responses obtained from Likert scales are quantifiable, allowing researchers to perform statistical analysis and evaluate the intervention's effectiveness with accuracy and clarity.

However, the important note here is that in an ordinal scale, answers can be ranked in order, but the gaps between them aren't precisely defined. For example, the difference between "always," "often," and "sometimes" on a Likert scale doesn't represent equal intervals.

Application of Likert Scale in Drink-Driving Interventions

1. Establishing the Objective of Measurement

When using a Likert scale in an intervention, it is crucial to first identify the specific aspect of behaviour or belief the intervention seeks to change. This can include attitudes, such as the belief that drinking and driving is risky; intentions, such as planning to use alternative transportation after drinking; perceived behavioural control, such as feeling confident in finding an alternative ride; and social norms, such as the perception that most peers avoid drinking and driving. Clearly defining these focus areas ensures that the statements created for the scale accurately represent the goals of the intervention.

2. Designing the Attitudinal Change Statements

To effectively use a Likert scale in an intervention, developing 6 to 12 clear, concise statements that align with the intervention programme's intended outcomes is essential. These statements should be constructed to reflect a range of cognitive, emotional, and behavioural attitudes related to drink-driving. Davey et al. (2005) used ten statements in their assessment of participants' attitudes towards drink-driving. An example of their statement is: "Most of my friends think it's ok to take drugs and drive". Baum (2000) used 15 attitudinal statements about drink-driving in his study of drink-driving. An example of statements used in this study was: "Imagine you are out and know you have had too much to drink. Would you leave your car where it was and not drive?" Table 4.1 provides some examples of these statements.

Table 4.1 Example Statements for a DUI Intervention

 Aspect of measure (goal)	 Statement
Attitude	"Drinking and driving puts myself and others at risk."
Intentions	"Using a rideshare is a smart choice after drinking."
Perceived behavioural control	"I feel confident in refusing to drive after drinking."
Social norms	"People important to me would disapprove of me driving drunk."

3. Selecting the appropriate scale type

Choosing the appropriate number of response points is crucial when designing a Likert scale for assessing an intervention. A 5-point scale is the most used format due to its simplicity and ease of understanding by respondents. It offers a balanced array of options, typically from “strongly disagree” to “strongly agree”, allowing participants to quickly and clearly express their opinions. However, in cases where more nuance is needed, for example, when there is a need to capture subtle differences in attitudes or feelings, a 7-point scale may be more effective. This expanded format provides greater variability in responses, which can lead to more detailed insights during data analysis. The choice between a 5-point and a 7-point scale ultimately depends on the complexity of the subject matter and the level of detail desired from the assessment. Davey et al. (2005) used a 7-point Likert scale (from “strongly agree” = 1 to “strongly disagree” = 7) in their drug and drive-drinking study by university students. Some studies, like Baum (2000), have used a ten-point Likert scale starting with “strongly disagree” (1) to “strongly agree” (10).

4. Implementation

A Likert scale should be administered both before and after the programme, known as a pre-test and post-test, to achieve a more accurate assessment of an intervention’s impact. This method enables researchers to track changes in participants’ attitudes, beliefs, or intentions resulting from the intervention. By comparing responses from these two points, practitioners can determine whether the programme has influenced specific outcomes, like increased awareness of drink-driving risks or a stronger intention to choose alternative transportation options. Jewell & Hupp (2005) evaluated attitudes and behaviours related to drinking and driving right before and after using the Fatal Vision goggles, with a follow-up at four weeks. Similarly, Mann & Lansdown (2009) examined attitudes towards driving before, during, and after their classroom-based pre-driver intervention, ‘Crash Magnets,’ by Road Safety Scotland.

Moreover, it is worth noting that Likert Scales can be distributed in various formats, depending on the context and available resources. Digital surveys are widely used for their convenience, accessibility, and ability to collect large datasets efficiently. Paper-based surveys are also effective, especially in settings without internet access. Whenever feasible, surveys ought to be conducted anonymously to minimize social desirability bias, which is the tendency of respondents to give answers they consider socially acceptable instead of revealing their true opinions. Ensuring anonymity promotes honesty and enhances the reliability of the collected data.

5. Analyzing the collected data

Once responses are collected, the next step is to analyse the data to assess the attitudinal changes caused by the intervention. A common approach is to compute the mean or total score for each participant across all items in the scale. This yields a numerical representation of their overall attitude, belief, or intention concerning the issue. These individual scores can then be averaged across the group to identify the general trend before and after the intervention.

To assess whether the changes in scores are statistically significant, researchers typically use tests such as paired t-tests or analysis of variance (ANOVA). A paired t-test compares the pre- and post-intervention scores for the same individuals to see if there has been a meaningful shift in their attitudes or intentions. ANOVA can be used when comparing across multiple groups or time points (Laura et al., 2011; Vanlaar et al., 2017; Rejali & Aghabayk, 2025). Additionally, segmenting the data by demographic factors, such as age, gender, or educational background, can provide deeper insight into how different groups responded to the intervention, which is useful to refine and target future programming.

4.1.2. Thurstone Scale

Thurstone scaling, also known as the method of equal-appearing intervals, was developed by Louis Thurstone (Thurstone 1927; 1928; 1929) to create quantitative measures of attitudes on a single or unidimensional scale. This is done by participants responding to several agree-disagree statements that aim to measure attitude towards, e.g., drink-driving (Symeonaki et al., 2024). Thurstone scaling is an interval scale. Parametric statistical analysis can be applied to interpret attitudes from the Thurstone scale. Developing and using this scale is quite time-consuming and complex. Despite this, the Thurstone scale has been key in improving rating scales (Sauser, 2010).

Thurstone scaling is a technique used to measure attitudes along a psychological continuum by assigning numerical values to the strength of opinions or attitudes. It is a lengthy process involving multiple steps, such as developing statements, consulting experts for evaluation, and carefully selecting suitable items. All these stages demand significant time and resources (Hamilton et al., 2021; Meenambigai et al., 2023).

This scale is especially valuable in intervention research where a detailed and scaled understanding of participants' attitudes is crucial (Dębicka et al., 2022). It is particularly appropriate in settings demanding high statistical accuracy and validated tools to precisely detect changes in opinions or beliefs.

This scale is also ideal for comparing subtle gradations of attitudinal change across different demographic groups or among participants exposed to various components of an intervention. By offering a more nuanced measure than simpler tools, this scale allows researchers to detect and analyse small but meaningful differences in how individuals perceive complex issues.

In regards to the difference between the Thurstone scale and Likert scale, while the former is often viewed as more detailed, complex and nuanced than the latter due to requiring experts to evaluate and assign values to statements, the latter, in contrast, was created as a simpler alternative, offering a more straightforward and efficient way to measure attitudes (Symeonaki et al., 2024).

Application of Thurstone Scale

1. Defining the Attitude Object

To begin using the Thurstone scale in an intervention, it is essential to clearly define the specific attitude or belief that will be measured. For example, in the context of DUI, this can include attitudes towards the act of DUI itself or beliefs about its personal, legal, and social consequences. Establishing a focused attitude object determines that all statements developed for the scale are relevant and aligned with the specific goals of the intervention.

2. Creating a Large Pool of Statements

The second step is to develop a wide collection of 20 to 30 declarative statements that cover a broad spectrum of attitudes towards the target issue (Jyothi & Vijayabhinandana, 2021). These statements should differ in tone and strength, ranging from very negative to moderately neutral to highly positive. For example, one statement might say, "Driving under the influence should result in immediate license revocation," showing a strongly negative view on DUI. Another could present a more moderate opinion, like, "Having one or two drinks before driving doesn't impair performance," while a neutral statement might be, "Only people with repeated DUI offenses should face strict penalties."

This variety aims to guarantee that final statements encompass the entire range of participants' beliefs. By incorporating statements from strong condemnation to moderate acceptance, the scale can more effectively differentiate subtle attitude differences. This variety also aids in assessing how participants' positions along the continuum change after encountering educational content or policy messages. Overall, creating this comprehensive set of items results in a dependable and valid tool for tracking attitude shifts.

3. Expert Judgment

Once the statements are prepared, a group of experts or judges reviews them. Each expert rates how favourable or unfavourable they believe each statement is regarding the issue, typically on a scale from 1 (very unfavourable) to 11 (very favourable). After all ratings are submitted, the median score for each statement is calculated. This median becomes the official value for that statement and is later used to assess participants' attitudes during the intervention. This process helps ensure each statement accurately represents a specific point on the attitude scale. Here's an example to clarify the process:



Example 7: Using Thurstone Scale

Step 1: Creating statements

- "Anyone caught driving under the influence should lose their license immediately."
- "Having a drink or two before driving isn't a big deal."
- "I always make a plan to get home safely if I've been drinking."

Step 2: Expert rating

A panel of 11 judges rates each statement on a scale from 1 (very unfavourable towards drink-driving) to 11 (very favourable). Below are hypothetical ratings:

Expert rating in Thurstone Scale

Statement	Judge ratings	Median score
1	1, 1, 1, 1, 2, 2, 2, 1, 2, 1, 2	1.5
2	9, 8, 8, 9, 10, 9, 9, 8, 9, 10, 9	9.0
3	3, 4, 4, 3, 4, 4, 5, 4, 3, 4, 4	4.0

Step 3: Assign to participants

Each participant in the intervention is given the final set of selected statements and asked to answer which ones they agree with. A participant who agrees with 'Statement 1' and 'Statement 3' would have an average scale value of $(1.5 + 4.0)/2 = 2.75$: indicating a generally unfavourable attitude towards drink-driving. A participant who agrees with 'Statement 2' and 'Statement 3' would average $(9.0 + 4.0)/2 = 6.5$: suggesting a more neutral to favourable stance towards drink-driving.

Step 4: Selecting final items

Once the expert panel has rated all the statements, the next step is to choose 10 to 15 statements that evenly represent the full range of attitudes towards the issue. These statements should encompass a broad spectrum of viewpoints, from highly unfavourable to highly favourable, and also show low variability in ratings, indicating strong agreement among judges on their scoring. Picking statements with high inter-rater agreement ensures the reliability of the scale and helps develop a balanced tool that accurately captures different positions along the attitudinal spectrum. This finalized set of statements becomes the Thurstone scale used to measure participants' attitudes in the intervention.

Step 5: Implementation

In this step, participants are shown the selected statements and asked to indicate whether they agree or disagree. Each statement has a pre-determined scale value set earlier by expert judges. When a participant agrees with a statement, that value is recorded. The average of all agreed-upon values is then calculated, providing a numerical score that reflects the participant's overall attitude. This score enables precise comparisons both within and across individuals, which is especially useful for measuring attitude changes before and after an intervention.

Step 6: Calculating and comparing the scores

In the final step, a participant's attitude score is calculated by averaging the scale values of the statements they agree with. This produces a single numerical score that reflects their overall position on the attitudinal spectrum, allowing for an accurate evaluation of their views.

Finally, like the Likert scale, the Thurstone Scale can be effectively utilized both before and after an intervention to assess changes in attitudes over time. Administering the scale at two different time points allows programme evaluators to observe whether participants' average scores change significantly. This pre- and post-assessment method offers straightforward, measurable evidence of the intervention's effects.

4.1.3. Semantic Differential Scales

Osgood et al. (1957) first introduced semantic differential scales as a psychometric technique for assessing the psychological distance between concepts (Hahn & Heit, 2015). Semantic differential received enormous attention among psychologists and other social and behavioural scientists soon after its introduction. Over 1000 papers were published using this technique during the 1960s (Heise, 1969). Its success was mainly due to its revival of behaviourist thinking, enabling factor analysis, and its connection with emerging linguistic debates. (Ploder & Eder, 2015).

The Semantic differential scale assesses how people interpret or emotionally respond to different things, such as ideas or objects. It uses pairs of opposite adjectives—like “pleasant” and “unpleasant”—and asks individuals to mark where their opinion falls between the two, capturing subtle attitudes or impressions. The semantic differential scale is widely used for assessing attitudes and beliefs (Haustein et al., 2022). The researcher creates a series of rating scales where respondents rate something on an ordered dimension, typically with 7 points. These ratings are bipolar, representing two opposite ends of a continuum, such as good versus bad or happy versus sad. The researcher then sums the points from all the items (DePoy & Gitlin, 2016).

The core of the semantic differential scale is the use of bipolar adjective pairs—two opposing terms that represent contrasting qualities (e.g., “pleasant–unpleasant” or “valuable–worthless”). Respondents are asked to rate their feelings or perceptions along a continuum between these two extremes. This format enables researchers to capture individuals’ nuanced attitudes towards a concept, object, or idea, allowing for more subtle distinctions than simple agree/disagree formats.

The Semantic differential scale assesses multiple aspects of a concept through several pairs of opposite adjectives, each representing a different dimension. For instance, when rating a film, the scale might feature pairs like “entertaining–boring” and “emotionally engaging–emotionally detached” to gauge diverse emotional and experiential reactions.



The main distinction between semantic differential and Thurstone scales is their approach to measuring attitudes. Semantic differential scales assess a concept's emotional or connotative meaning using pairs of opposite adjectives. In contrast, Thurstone scales rely on pre-rated statements with different levels of favourability, scoring responses based on the degree of agreement with each statement.

Application of the Semantic Differential Scale

1. Defining the Attitude Object

The first step in using the semantic differential scale in an intervention is to clearly identify the specific concept or behaviour that will be assessed. Selecting a well-defined attitude object ensures that the scale remains focused and relevant to the intervention's goals. Moreover, it would allow for more accurate insights into participants' emotional and evaluative responses.

2. Creating Bipolar Adjective Pairs

After defining the attitude object, the next step is to create 6 to 10 bipolar adjective pairs that capture various emotional, evaluative, or behavioural aspects relevant to the intervention. These pairs should accurately represent participants' perceptions of the concept being assessed, such as DUI. Examples include "Safe – Dangerous," "Smart – Foolish," "Responsible – Irresponsible," "Lawful – Illegal," "Respectable – Shameful," and "Careless – Cautious." Each pair is positioned at opposite ends of a scale, usually a 5- or 7-point continuum, where participants mark their stance between the two extremes.

These descriptors should be meaningful, culturally relevant, and distinctly oppositional to effectively evaluate participants' connotative judgments. Incorporating multiple dimensions enables the scale to uncover not only approval or disapproval of a behaviour but also how participants emotionally interpret and frame it. This approach helps researchers detect hidden associations and perceptual shifts that may be missed by direct questions or behavioural assessments, making it particularly valuable in interventions designed to alter attitudes and social norms.

3. Designing the Scale

After choosing suitable bipolar adjective pairs, the next step is to position each pair on a 5- or 7-point scale, enabling participants to indicate the strength of their attitudes. Each scale runs from one extreme to the other, such as from Responsible to Irresponsible, with evenly spaced markers or numbers in between. Participants are asked to mark the point on the scale that best reflects their feelings about the specific concept. For instance, if a participant considers drinking and driving highly irresponsible, they will select the mark closest to the irresponsible end.

This format enables the capture of subtle differences in attitudes by offering a gradation of responses, rather than forcing a binary choice. The resulting data can then be numerically coded (e.g., 1 to 7) and analysed to quantify overall attitudes or track shifts over time, especially useful in evaluating the effectiveness of educational or awareness interventions.

4. Implementation

Similar to the previous two scales, the semantic differential scale should be administered both before and after the intervention to accurately assess changes in emotional perception. This pre- and post-test method enables researchers to detect any shifts in participants' attitudes or emotional responses caused by the programme. The scale can be conveniently distributed on paper or digital platforms, depending on the context and resources available.

5. Analysing the Data

The final step involves assigning numerical values to each response on the scale, usually with one end as 1 and the other as the highest score. Researchers then calculate the average of these numeric scores for each adjective pair and determine an overall mean score for each participant. This combined score represents the participant's overall attitude towards the object or behaviour being evaluated. A lower score may indicate negative or unfavourable perceptions, while a higher score suggests a more positive or accepting attitude.



Example 8: Semantic Differential Method

Participants are asked to rate their feelings towards the behaviour of "driving after drinking" using 5 bipolar adjective pairs, each on a 7-point scale. Each point is assigned a numerical value from 1 to 7, with 1 being the most negative and 7 being the most positive.

Participant rating in Semantic Differential Scale

Adjective pair	Participant rating	Score
Responsible – irresponsible	Irresponsible (1)	1
Safe – dangerous	Dangerous (1)	1
Smart – foolish	Foolish (2)	2
Respectable – shameful	Shameful (1)	1
Acceptable – unacceptable	Unacceptable (1)	1

Step 1: Assigning numeric values

Each marked point is translated into a numeric score as shown above.

Step 2: Calculating mean score

Sum of scores = $1 + 1 + 2 + 1 + 1 = 6$; Number of items = 5; Mean score = $6 / 5 = 1.2$.

Step 3: Interpretation

A mean score of 1.2 indicates that the participant has a strongly negative emotional and evaluative attitude towards drink-driving. After the intervention, if this same participant's mean score increases (e.g., from 1.2 to 2.8), it may reflect a shift in perception, potentially recognizing that others view the behaviour as slightly less shameful or that it is more socially discouraged than previously thought. These changes, tracked across a group, help measure the intervention's effectiveness in altering attitudes.

4.1.4. The Implicit Association Test (IAT)

First introduced by Greenwald et al. (1998), the implicit association test (IAT) is now widely used to assess attitudes and changes in attitudes. The IAT is a psychological tool designed to reveal hidden biases by measuring the strength of people's associations between concepts. It records how Individuals quickly categorize different ideas and attitudes, with faster responses indicating stronger associations. Researchers frequently employ the IAT to explore subconscious attitudes and stereotypes that individuals might not even recognize they possess.

The IAT presents participants with a series of words or images that they must quickly categorize using specific keyboard keys. When participants consistently sort items faster when certain concepts are paired together—such as “good” with “flowers”—compared to other pairings like “good” with “insects,” it suggests a stronger unconscious link between those concepts, for example, between “good” and “flowers.”

Understanding the IAT results is crucial, as they do not directly indicate prejudice or conscious bias. Instead, they measure the strength of automatic associations between concepts, which are shaped by cultural exposure, personal experiences, and social influences (Payne & Zuo, 2023). These associations often operate outside of conscious awareness. Consequently, a strong implicit association revealed by the IAT does not suggest intentional bias but instead points to subconscious mental links that can subtly influence attitudes and actions (Meissner et al., 2019).

Unlike self-reported measures, which are subject to social desirability bias, the IAT assesses attitudes by analyzing the reaction times in categorizing paired stimuli, elucidating insights into participants' implicit biases that influence behaviour at a subconscious level (Greenwald et al., 1998).

Application of IAT for an Intervention

1. Define the Target Concepts and Attributes

In a DUI related intervention, the IAT can be used to assess how participants subconsciously associate DUI with either positive or negative attributes. To do this, the IAT can be structured around two target concepts, drink-driving and sober driving, and two attribute categories, positive words (like “safe,” “responsible,” “smart”) and negative words (such as “dangerous,” “reckless,” “deadly”).

2. Designing the IAT task

The goal is to create a structured sequence of categorization trials that reveal how strongly a participant implicitly associates DUI with either positive or negative concepts. After defining target concepts and attribute categories, the participant is shown words or images one at a time and must quickly categorize each by pressing one of two keys on a keyboard. In one block of trials, the participant might be asked to use the same key for both drink-driving and positive stimuli, and another key for sober driving and negative stimuli. In a different block, the pairings are reversed.

The test typically includes practice rounds to help participants get used to the categories before timed responses begin. By carefully designing the test to include both congruent (e.g., drink-driving + negative) and incongruent (e.g., drink-driving + positive) pairings, the IAT captures subconscious preferences or biases that are difficult to detect through direct questioning. This makes it especially powerful for evaluating interventions targeting risky behaviours like impaired driving, where participants might otherwise underreport or misrepresent their true attitudes due to social desirability or lack of self-awareness.

3. Implementation

During the test, participants are asked to quickly categorize words or images that flash on a screen, pairing the target and attribute categories using designated keys. For example, in one round, participants may press the same key for both “drink-driving” and “positive” words, and in another round, for “drink-driving” and “negative” words. The idea is that people will respond faster when concepts that are more strongly associated in their minds are paired together.

The IAT should be conducted both before and after the intervention to assess changes in automatic attitudes. For example, after a campaign that includes emotional videos or VR scenarios, participants may potentially show stronger negative associations with DUI, indicated by quicker response times in the drink-driving + negative condition.

4. Analysing the Data

The IAT generates a D-score, a standardized measure of the strength and direction of implicit associations. A more negative D-score post-intervention may indicate that participants now automatically associate DUI with more negative concepts, suggesting a successful attitude shift. Also, faster reaction times when DUI is paired with negative words, and slower times when paired with positive words, suggest a stronger negative implicit association with drink-driving.



Example 9: Using IAT

A participant of a DUI intervention completes the IAT before the programme. There are two target concepts: “drink-driving” and “sober Driving”, and two types of words: positive (like “smart,” “safe,” “fun”) and negative (like “reckless,” “deadly,” “stupid”). During the test, the participant is asked to quickly sort words into matching pairs. In one part of the test, the participant uses the same key to categorize both “drink-driving” and “positive” words. In another part, they use the same key for “drink-driving” and “negative” words.

Before the intervention the participant takes 600 milliseconds (ms) on average to categorize “drink-driving + negative”, but takes 750 ms to categorize “drink-driving + positive”. This difference suggests the student implicitly links drink-driving more with negative ideas. The test software calculates a D-score (e.g., +0.40, showing a moderate negative association).

After the intervention, the participant takes 550 ms to categorize “drink-driving + negative” and 850 ms for “drink-driving + positive.” This larger gap indicates a stronger negative automatic association with drink-driving, and the D-score rises to +0.60.

4.1.5. The Affect Misattribution Procedure (AMP)

AMP can be widely used to assess implicit attitudes by surveying the way emotional reactions to a stimulus (the prime) have the potential to determine how participants judge the following neutral image unintentionally. It is based on the idea that individuals often unknowingly transfer the emotional tone of the prime, for instance, a happy face, onto a neutral object, like a foreign symbol, even without realizing it.

AMP is mainly employed as an implicit attitude metric, especially in social psychology, to evaluate attitudes that people may be unwilling or unable to verbalize consciously. It functions by analyzing how positive or negative emotions (affect) triggered by a “prime” (such as an image) subtly affect subsequent judgments of neutral stimuli. In simple terms, participants are told to disregard the prime, but their emotional response to it influences their assessment of the neutral symbol residually.

AMP can be particularly useful in measuring attitude change in DUI interventions since it measures automatic emotional responses indirectly, where individuals may be reluctant to express their true feelings due to social desirability or lack of self-awareness.

Application of the Affect Misattribution Procedure

1. Defining the Objective

The first step in using the AMP in an intervention is to clearly define the objective of the assessment. These objectives should clarify what specific aspect(s) of the interventions is going to be measured.

Some appropriate examples are listed below:

- To assess whether participants implicitly associate “drink-driving” images with negative emotions after a VR-based crash simulation.
- To measure changes in participants’ automatic emotional responses to DUI scenarios before and after a community-led awareness campaign using interactive vs instructor-based training method.



2. Selecting the Prime Images

The second step involves carefully selecting a set of emotionally charged prime images that are directly related to the topic, for instance DUI. These images are designed to trigger automatic emotional responses in participants, which are later misattributed to neutral targets. Appropriate negative primes might include photographs of car crash scenes caused by drink-driving, individuals being arrested for DUI offenses, or social settings where underage drinking is occurring. These visuals evoke fear, discomfort, or concern, which are key to measuring negative emotional associations.

In addition to these, the test should include a balanced selection of positive or neutral images, like sober driving scenarios, safe family transportation, or everyday street scenes, to serve as baseline or control conditions. This combination of emotional and neutral primes enables the intervention to detect shifts in affective response patterns, providing insight into how strongly participants unconsciously associate drink-driving with negative outcomes.

3. Choosing Neutral Target Stimuli

The third step is to select appropriate neutral target stimuli that are images that hold no inherent emotional or cultural meaning for the participants. These are typically abstract symbols such as Chinese pictographs or unfamiliar geometric patterns. After each emotionally charged prime image (e.g., a photo of a DUI arrest or crash), one of these neutral symbols is quickly displayed. Participants are then asked to judge whether the symbol is “pleasant” or “unpleasant.” Because the target image itself carries no meaning, their evaluation reflects the emotional response evoked by the preceding prime. This allows researchers to indirectly assess how strongly participants associate drink-driving with negative or positive feelings.

4. Designing the Trial Sequence

In the AMP, each trial follows a carefully timed sequence designed to capture participants’ automatic emotional responses. First, a fixation cross appears on the screen for about 500 milliseconds to focus the participant’s attention. This is followed by the rapid presentation of a prime image, either emotionally charged (such as a drink-driving crash scene) or neutral, for a very brief period, usually between 75 to 125 milliseconds. Immediately afterward, a neutral target image, such as an unfamiliar symbol or pictograph, is shown for another short duration, typically 100 milliseconds. To ensure that participants cannot continue to process the target image consciously, a mask or random visual pattern follows the target to block any lingering mental image. This sequence keeps the participant’s focus quick and automatic, limiting the opportunity for deliberate reflection.

The participant is then prompted to respond to the neutral target by judging whether it appeared “pleasant” or “unpleasant.” Although they are instructed to ignore the prime, their emotional response to it often influences their perception of the neutral symbol, which is actually the essence of misattribution (Roscher & Neumann 2025). This indirect measurement allows researchers to assess implicit attitudes, especially towards sensitive topics like drink-driving, without relying on self-reporting.

5. Repeating Across Many Trials

To ensure the reliability and validity of AMP, it is essential to run multiple trials, typically between 80 to 120. These trials should include a balanced mix of negative primes, positive primes, and neutral primes. This diversity in stimuli helps capture a wide range of automatic emotional responses and prevents participants from anticipating patterns or becoming desensitized. The repetition also enables researchers to identify consistent trends in how these primes influence participants’ evaluations of neutral target images, providing a more profound measure of their implicit attitudes towards the issue being assessed.

6. Analyzing the Data

AMP should be implemented both before and after the intervention to be able to realize the change in affective responses that indicates the success of the programme in shifting implicit emotional attitudes. By analyzing response patterns across many such trials, intervention designers can determine whether participants hold automatic negative associations with drink-driving and whether these associations become stronger after an educational or prevention programme.

After the AMP trials, researchers analyse how often participants judge neutral images as “unpleasant” following different types of prime images. If participants consistently rate more neutral images as unpleasant after viewing drink-driving primes, it suggests a negative implicit attitude towards drink-driving. In contrast, higher pleasant ratings after safe driving primes indicate positive associations. This comparison helps determine the emotional impact of each prime type and whether the intervention influenced participants’ unconscious attitudes.



Example 10: Affect Misattribution Procedure

A group of 100 participants takes part in a drink-driving prevention programme. They complete an AMP test before and after the intervention. Before the intervention and after being shown drink-driving crash images, they rate the following neutral pictographs as: unpleasant: 62 per cent of the time, pleasant: 38 per cent of the time. Also, after safe driving primes, they rate neutral symbols as: pleasant: 59 per cent of the time, unpleasant: 41 per cent of the time.

Then, after the intervention (e.g., peer-led workshop or VR simulation), after drink-driving primes: unpleasant ratings increase to 78 per cent, and pleasant drops to 22 per cent. Also, after safe driving primes: pleasant ratings increase to 72 per cent, and unpleasant ratings drop to 28 per cent.

Prime types and Scoring in AMP test

Prime type	Response type	Before intervention	After intervention
Drink-driving primes (negative)	Unpleasant	62 per cent	78 per cent
	Pleasant	38 per cent	22 per cent
Safe driving primes (positive)	Pleasant	59 per cent	72 per cent
	Unpleasant	41 per cent	28 per cent

This pattern shows that after the intervention, students developed stronger negative emotional responses towards drink-driving and more positive associations with safe driving, indicating that the intervention successfully influenced their implicit attitudes.

4.1.6. Interviews

Using interviews as a method of assessment in interventions offers a decisive advantage by allowing researchers and practitioners to explore the depth and complexity of participants' attitudes, beliefs, and emotional responses differently, which is challenging for standardized methods to assess (Creswell & Poth, 2018). Interviews enable open-ended dialogue, providing qualitative insights into how individuals process information, internalize message(s), and navigate changes in behaviour within an intervention. Moreover, interviews can uncover underlying motivations, social influences, and emotional shifts, offering a more holistic understanding of the intervention's effectiveness (Ayala & Elder, 2011). Many studies in the drink-driving realm have employed interviews as their data collection and attitude change detection method (Baum, 2000, Nygaard et al., 2003; Fynbo & Järvinen, 2011; Watling & Armstrong, 2015; Liu, Chui, & Deng, 2021).

Application of Interviews

The following are a few tips grounded in qualitative research best practices regarding using interviews to measure attitude change in interventions:

1. Begin Broad, Then Narrow

One of the key strategies in using interviews for assessing attitude change during an intervention is to begin with broad, general questions. This technique helps participants feel more at ease, allowing them to speak naturally and without pressure (Kvale & Brinkmann, 2009). For example, asking a question like "Can you describe your general thoughts about drink-driving?" creates an open and non-threatening entry point into the conversation. Such questions serve as warm-ups, establishing trust and encouraging participants to reflect openly on their experiences and beliefs, rather than feeling interrogated or judged. This initial openness is crucial, especially when dealing with sensitive topics like alcohol-impaired driving, where defensiveness or social desirability bias can easily distort responses.

As the interview progresses, it's vital to steer the participant towards more targeted, specific questions aligned with the intervention's goals. For example, asking "How has your understanding of its risks changed since the programme?" shifts focus from general opinions to personal changes. This approach allows interviewers to examine whether and how the intervention affected the participants' thoughts and emotional outlooks. By gradually narrowing the scope from broad to detailed, the interview can reveal both conscious reflections and deeper, sometimes subconscious, perception shifts. This provides valuable insights into the intervention's effectiveness in altering attitudes and possibly influencing future behaviours (Kvale & Brinkmann, 2009).

2. Using Probing to Uncover Underlying Motivations

A noticeable technique in interview-based assessments is the use of follow-up or probing questions to explore the deeper reasons behind participants' attitudes and behaviours. While initial responses provide surface-level information, probing allows interviewers to uncover the "why" behind those statements (Rubin & Rubin, 2012). For example, if a participant says, "I'm more cautious now," a meaningful follow-up like, "What event or part of the intervention led you to feel that way?" encourages reflection on specific experiences that triggered the change. These insights are especially valuable as they can reveal which elements of the programme, such as personal stories, visuals, or interactive activities, were most impactful. Probing questions help uncover the underlying motivations and contextual factors influencing behaviour (Kvale & Brinkmann, 2009). For example, asking, "Can you share a time when you chose a sober ride over

driving after drinking? What influenced that decision?” not only highlights behavioural change but also reveals influences such as peer support, family expectations, or emotional responses. Prompts like “What makes you say that?” or “Can you tell me more?” encourage the participant to elaborate naturally and thoughtfully. These questions are vital for uncovering unconscious attitudes or internal conflicts, providing a deeper, more accurate understanding of how and why the intervention may have shifted perspectives or motivated new actions.

3. Challenging Contradictions

Exploring inconsistencies between participants’ attitudes and behaviours is a crucial aspect of interview-based assessments (Kvale & Brinkmann, 2009). Individuals might express awareness of the dangers of impaired driving, yet their actions may not always align with these beliefs. By asking reflective questions like, “You agree that drink-driving is dangerous, yet you mentioned a time you drove after one drink, what happened there?” or “What prevents you from always planning a safe ride home?”, interviewers can uncover internal conflicts, emotional justifications, or practical barriers such as lack of transportation options. This method reveals the complexity of decision-making and helps identify gaps between knowledge and practice, offering critical insights for improving the design and targeting of future interventions.

4. Focusing on Emotions Equal to Knowledge

To gain a deeper understanding of how an intervention affects participants, it’s essential to move beyond simply assessing knowledge and explore emotional engagement. Emotions such as fear, guilt, shame, or a sense of responsibility often play a pivotal role in shaping long-term behavioural change (Nurhasanah & Karman 2025). By asking questions like “How did seeing the crash simulation make you feel?” or “Tell me about the moment you realized drink-driving could personally affect your family or friends,” interviewers can access the emotional resonance of the experience. These types of questions help uncover whether participants were not just informed but genuinely moved by the intervention.

Emotional reactions often indicate the internalization of risk and a stronger likelihood of attitude change (Nurhasanah & Karman 2025), making this kind of probing critical for evaluating which components of the intervention were most impactful. Understanding these emotional shifts allows for the refinement of future programmes to include content that is not only educational but also emotionally compelling and personally relevant.

5. Identifying Social and Normative Influences

In evaluating the effectiveness of an intervention, it is essential to explore how social influences, including peers, family, and community norms, affect participants’ attitudes and decisions (Ajzen, 1991). Individuals, especially youth, are often shaped by the behaviours and expectations of those around them. Asking questions like “How have your friends or family responded to your choice not to drive after drinking?” or “Do you think most people your age now see drink-driving differently? Why?” can uncover shifts not just in individual beliefs but in broader social environments.

These questions help assess whether the intervention has contributed to a collective change in attitude, where safer behaviours become more socially accepted or even expected. Understanding how peer dynamics, family discussions, or community standards influence decision-making provides valuable insight into the social ripple effects of an intervention, highlighting its potential to promote lasting social/cultural change beyond the individual level.

6. Eliciting Suggestions and Reflection

An essential part of interview-based evaluation involves asking participants to reflect on which aspects of the intervention were most and least effective. This offers practical, user-centered feedback for refining future programmes. Questions like “What part of the intervention impacted you most?” and “What would make you less likely to drink and drive in the future?” prompt participants to share their personal experiences and suggest meaningful improvements. Such reflections help identify which messages or strategies resonated well, reveal unmet needs, overlooked barriers, or preferred formats (such as digital or in-person). This kind of feedback is crucial for making interventions more relevant, engaging, and impactful, ultimately leading to better adaptation to the target audience’s lived experiences, motivations, and social contexts.

4.1.7. Behavioural Observations

Behavioural observation entails systematically monitoring and recording individuals’ actions in real-world or structured settings to infer their underlying attitudes and behavioural changes. This approach provides an objective perspective, capturing real-time behaviours that reveal internal attitudes or responses to interventions without depending on participants’ self-reports (Creswell & Creswell, 2018). Behavioural observations have been frequently used in the study of attitudes and attitudinal change in the drink-driving context (Saltz, 1987; Clapp et al., 2009; Fillmore & Jude, 2011).

Behavioural observation studies help detect and analyse how often specific road user behaviours occur in various situations (van Haperen et al. 2019). Behavioural studies involve observing road user behaviour directly in real-world settings, making them a form of naturalistic, on-site observation where actions are studied in their actual context (Eby 2011).

Behavioural observation studies aimed at diagnostic purposes are typically tailored to the specific behaviour or situation being examined. Methodologically, these studies are generally classified into two types: structured and unstructured observations.

In unstructured behavioural observation studies, researchers observe road users without a predefined framework, noting any actions or behaviours that appear noteworthy or unusual. This approach allows researchers to become familiar with the study environment and gain initial insights.

Conversely, structured behavioural observations are carefully planned and build upon findings from unstructured studies. They involve systematic and focused monitoring of clearly defined safety-related behaviours. In the case of DUI, since it specifically focuses on impaired driving behaviour, it should be considered as a type of structured behavioural observation.

Application of Structured Behavioural Observation

1. Defining Observable Behaviours

In interventions aimed at reducing drink-driving, behavioural observation can effectively assess attitude change by identifying and tracking specific, observable actions that reflect safer decision-making. For example, behaviours such as choosing a designated driver, refusing alcohol when planning to drive, or using a ride-hailing service are concrete indicators of internalized awareness and risk perception. By clearly defining these target behaviours in advance, researchers and practitioners can develop structured observation protocols with consistent coding criteria.

This clarity ensures that the observations are reliable and replicable, allowing for meaningful comparisons over time or between groups. Ultimately, observing such real-world actions provides a direct, unbiased measure of whether an intervention has successfully translated attitudinal shifts into actual behavioural change.

2. Choosing Observation Context

Structured Behavioural Observation is a method used in interventions to systematically assess how individuals behave in controlled scenarios such as role-plays, simulations, or training sessions. This approach allows researchers to evaluate specific behaviours, like refusing a drink or choosing a safe ride, by using predefined checklists and standardized criteria.

Because the setting is controlled, all participants face the same conditions, making it easier to compare results and identify patterns across individuals or groups. This consistency enhances the reliability of the data and helps determine whether the intervention effectively improves the targeted skills or decision-making processes. Structured observation is particularly valuable in assessing the immediate, observable impact of educational or behavioural interventions.

3. Training Observers and Using Clear Coding Systems

To reduce observer bias in behavioural observation during interventions, it is essential to establish clear, standardized definitions for each behaviour being assessed and to use structured observation forms that guide what observers should look for and how to record it. These tools ensure that all observers interpret and categorize behaviours consistently, minimizing subjective judgments. Moreover, involving multiple observers and calibrating them through training sessions, where they practice coding the same scenarios and resolve discrepancies, enhances reliability, meaning the consistency of ratings across different observers.

High inter-rater reliability enhances the credibility of collected data by confirming that observed behaviour changes are due to the intervention rather than observer inconsistencies. It measures how well two or more independent raters agree when evaluating the same phenomenon or data. This is especially important for interventions involving nuanced or complex behavioural cues, like peer refusal tactics or decision-making in simulated drink-driving situations.



4. Conducting Pilot Observations

Pilot testing observation protocols on a small sample before full implementation is a crucial step in ensuring the effectiveness and accuracy of behavioural assessments. By conducting a trial run, researchers can identify practical challenges, including unclear behaviour definitions, ambiguous coding criteria, or logistical issues, that might compromise data quality.

Furthermore, this process allows for refining the observation checklist, clarifying instructions, and adjusting the environment or timing to better capture the target behaviours. It also helps observers gain familiarity with the process, improving their consistency and confidence in recording data. Ultimately, pilot testing enhances the feasibility, reliability, and validity of the behavioural observation method, ensuring that the final protocol is well-suited for broader use in evaluating the intervention's impact.

5. Collecting Baseline and Follow-up Data

Observing participant behaviour both before and after an intervention in the same environment is essential for accurately assessing the programme's impact on behaviour change. This pre-post observational design allows researchers to establish a baseline of typical behaviours and then identify any meaningful changes that occur following the intervention.

By keeping the environment constant, for instance observing in the same school or community event, it reduces the influence of external variables and ensures that differences in behaviour are more likely due to the intervention rather than situational factors. This approach provides strong evidence of the intervention's effectiveness in shifting attitudes into observable actions, such as increased use of designated drivers or refusal to drink before driving.

6. Analyzing Frequencies, Durations and Patterns

In behavioural observation, analyzing patterns such as counts, durations, and sequences provides valuable quantitative data to evaluate attitude and behaviour change. Counts track how often a target behaviour occurs, while durations measure how long a behaviour lasts. Sequences, on the other hand, examine the order and context in which behaviours unfold, such as observing whether peer encouragement precedes a safe decision.

Key Findings

Together, these metrics help identify trends, measure the intensity or frequency of change, and build statistical models that link interventions to specific behavioural outcomes. This structured analysis enhances the reliability and depth of behavioural assessments in drink-driving prevention programmes.

As for concluding the first section of the toolkit, Table 4.2 outlines the attitude change measurement methods, along with their strengths and limitations:

This section examines how various attitude measurement methods correspond to different DUI intervention categories. By analyzing the strengths and weaknesses of each technique, we can select the most suitable tools for assessing each type of DUI intervention discussed earlier. Matching each intervention's characteristics with the appropriate assessment method enhances our understanding of how these strategies impact attitudes and behaviours.

Table 4.2 Attitude Change Measurement Methods

 Method	 Strengths	 Limitations
A. Likert scales	✓ Easy to design and administer ✓ Quantitative and comparable ✓ Good for measuring explicit attitudes	- x Vulnerable to social desirability bias - x May not capture the complexity of attitudes
B. Thurstone scales	✓ Measures intensity and favourability ✓ Offers precise interval-level data	- x Time-consuming to develop - x Requires expert judgment for item scaling
C. Semantic differential scales	✓ Measures attitude across multiple dimensions ✓ Useful for evaluating affective responses	- x Can be confusing if bipolar adjectives are unclear - x Relies on self-reporting
D. The implicit association test (IAT)	✓ Captures unconscious or automatic attitudes ✓ Reduces self-report bias	- x Requires computer access- Interpretation can be complex - x Limited to binary associations
E. The affect misattribution procedure (AMP)	✓ Detects implicit attitudes without requiring direct responses ✓ Simple and fast to administer	- x May be affected by participants misunderstanding instructions - x Interpretation requires expertise
F. Interviews	✓ Rich, in-depth data ✓ Allows exploration of reasoning, emotions, and context	- x Time-consuming to conduct and analyse - x Potential interviewer bias and participant reactivity
G. Behavioural observations	✓ Objective, real-time behaviour data ✓ Useful for assessing actual change, not just reported change	- x Requires trained observers and structured environment - x May be influenced by observer presence

It is important to note that some intervention categories have been combined due to their conceptual and functional similarities. For example, legal/policy/enforcement and enforcement/checkpoint interventions are merged under the legal/policy/enforcement category because they aim for similar objectives and use comparable evaluation methods. Furthermore, the social norms/attitude change category has been excluded from this analysis, as this section concentrates specifically on applying direct and indirect (including implicit) methods to measure attitude shifts.



Chapter 5

Attitudinal Change Assessment Tools and Drink-Driving Interventions

- 5.1. Legal, Policy and Enforcement Programmes
- 5.2. Awareness Campaigns and Advertising
- 5.3. Educational and Training Programmes
- 5.4. Behaviour Counselling Interventions
- 5.5. Rehabilitation and Treatment Programmes
- 5.6. Alternative Transportation and Support Services
- 5.7. Digital and Virtual Interventions
- 5.8. Community and Multifaceted Programmes
- 5.9. Judicial and Treatment Court
- 5.10. Family-based Interventions
- 5.11. Elucidating Appropriate Assessment Methods for DUI Interventions

5.1. Legal, Policy and Enforcement Programmes

Because these interventions rely on regulations and law enforcement, the most reliable way to assess their effectiveness is by observing driver behaviour after implementation. However, drivers may follow the rules just to avoid fines or penalties, which might hide their true attitudes about the laws. To examine these hidden beliefs, the implicit association test (IAT) can be used to reveal unconscious biases connected to the policies.

When used alongside data from Likert scale surveys, this method enables practitioners to obtain a more comprehensive and nuanced understanding of drivers' perspectives. Table 5.1 shows how effective various attitude measurement methods are for legal, policy, and enforcement-related interventions.

Table 5.1 Effectiveness of Different Attitude Measure Methods for Legal/Policy/Enforcement Interventions

 Method	 Effectiveness	 Rationale
A. Likert scales	 Moderate – tracks public attitudes and behavioural intentions	Captures deterrence beliefs and law acceptance
B. Thurstone scale	 Low-complex	Redundant in presence of Likert and less practical, adds complexity
C. Semantic differential scale	 Low-moderate – measures feelings towards concepts	Not specific enough to assess legal deterrent attitudes
D. The implicit association test (IAT)	 Moderate-high – uncovers unconscious deterrence-related attitudes	Reveals hidden biases or skepticism towards legal risk
E. The affect misattribution procedure (AMP)	 Low-moderate – emotion-driven, indirect	Hard to link emotional response directly to policy compliance
F. Interviews	 Low-moderate – distraction	Responses are possible to be irrelevant, hard to stay focused to the topic
G. Behavioural observations	 High – measures real-world DUI behaviour and compliance	Objectively evaluates impact of enforcement

5.2. Awareness Campaigns and Advertising

A major difference between these interventions and those centered on legal enforcement is that awareness campaigns and advertising appeal to participants' emotions. Consequently, attitude measurement tools that examine the connection between emotions and attitudes are generally more effective for assessing their impact.

Additionally, because these interventions frequently include transferring knowledge, using indirect measures and more advanced direct assessment methods can give practitioners a better understanding of how effectively the message is understood and if the desired changes in awareness or behaviour are taking place.

Table 5.2 The Effectiveness of Different Attitude Measure Methods for Awareness Campaigns/Advertising Interventions

 Method	 Effectiveness	 Rationale
A. Likert scales	 Low	Gives superficial information
B. Thurstone scale	 Low	less flexible than Likert and harder to apply across large, diverse audiences typically targeted by public campaigns.
C. Semantic differential scale	 Low-moderate	Measures emotional and affective response to campaign content (e.g., safe driving = responsible vs. reckless); good for assessing tone, credibility, and memorability.
D. The implicit association test (IAT)	 Low-moderate	Captures implicit associations triggered by repeated messaging (e.g., linking "alcohol" with "danger" unconsciously). Useful for measuring subconscious norm shifts.
E. The affect misattribution procedure (AMP)	 Low-moderate	Good for measuring emotional reaction/misattribution to ad imagery (e.g., fear appeals), but difficult to link clearly to behaviour change.
F. Interviews	 High	Effectively captures self-reported changes in knowledge, beliefs, and attitudes in response to campaign messaging.
G. Behavioural observations	 Moderate-high	Can track behavioural shifts like fewer DUIs post-campaign, but doesn't isolate impact of awareness alone.



5.3. Educational and Training Programmes

Educational interventions share common goals with awareness campaigns by aiming to increase participants' understanding of key issues. However, they go a step further by facilitating deeper learning and skill development. Because of this emphasis on substantive knowledge acquisition, direct assessment techniques are particularly valuable for gauging the true effectiveness of these programmes.

Moreover, although educational interventions may not directly measure changes in behaviour, incorporating implicit assessment tools can uncover the depth of participants' learning. Techniques like the IAT test reveal how much new concepts and values have been internalized, offering a more nuanced picture of what participants have truly learned.

Table 5.3 The Effectiveness of Different Attitude Measure Methods for Educational Programmes/Workshops/Training Interventions

 Method	 Effectiveness	 Rationale
A. Likert scales	 High	Captures explicit, measurable changes in attitudes, perceived norms, intentions, and self-efficacy — key constructs in attitude change theories.
B. Thurstone scale	 Moderate	less practical than Likert for tracking nuanced learning or attitude shifts in modern structured settings.
C. Semantic differential scale	 Moderate	Assesses emotional tone or affective shifts towards concepts like alcohol use or intervention skills (e.g., “driving after drinking = irresponsible”).
D. The implicit association test (IAT)	 Moderate	Detects whether unconscious associations with alcohol or risk shift post-training. Valuable when deeper biases may affect actual behaviour.
E. The affect misattribution procedure (AMP)	 Low-moderate	Can assess subtle emotional changes to stimuli (e.g., reaction to crash images), but limited in measuring behavioural strategy uptake.
F. Interviews	 Moderate-high	Offers qualitative insights into how and why participants' thinking changed (or didn't). Useful for refining educational design based on real feedback.
G. Behavioural observation	 Low	Can't observe if participants apply learned behaviours Useful for post comparisons.

5.4. Behaviour Counselling Interventions

The focus area of these interventions is Brief Motivational Interviewing (BMI), individualized behavioural interventions, and counselling techniques. Thus, the assessment methods should be able to accurately evaluate individuals' psychological patterns to uncover root causes and promote self-control and responsible drinking habits.

Table 5.4 The Effectiveness of Different Attitude Measure Methods for Behaviour/Counselling Interventions

 Method	 Effectiveness	 Rationale
A. Likert scales	 High	Ideal for assessing shifts in readiness to change, intentions, confidence, and self-efficacy—core MI targets.
B. Thurstone scale	 Low	Not commonly used in individualized counselling.
C. Semantic differential scale	 Low-moderate	Can assess emotional perceptions about alcohol use or DUI (e.g., “alcohol = calming vs. dangerous”), but not detailed enough for motivational constructs.
D. The implicit association test (IAT)	 Moderate	Can reveal shifts in unconscious associations with alcohol, driving, or punishment, especially important when clients are ambivalent or resistant.
E. The affect misattribution procedure (AMP)	 Low	Less relevant—MI is cognitive-behavioural and goal-oriented, not based on emotional priming. AMP has low predictive value in this therapeutic context.
F. Interviews	 High	Offers deep, personalized insight into motivational shifts, perceived barriers, and how MI impacted behaviour or cognition.
G. Behavioural observation	 Moderate-high	Useful for measuring real-life drinking and driving behaviour habits. Can be highly effective when combined with session fidelity or follow-up outcomes.



5.5. Rehabilitation and Treatment Programmes

Research indicates that sustained engagement is the critical factor of success in these interventions. That is, the longer participants remain involved, the more pronounced and lasting the outcomes. Consequently, assessment strategies that capture both overt behaviours and underlying, implicit responses are particularly noticeable to evaluate shifts in attitudes over extended periods. By monitoring how participants' actions evolve throughout the intervention, practitioners can obtain a more accurate understanding of the intervention's impact.

What's more, another important factor is the active involvement of alumni in the development of future programmes. Individuals who have previously completed the intervention possess firsthand knowledge of its strengths and limitations and can offer invaluable perspectives on how to enhance engagement and effectiveness. Eliciting their feedback allows practitioners to tailor subsequent iterations. This collaborative approach not only enriches programme design but also creates a sustainable feedback loop that continually refines and strengthens the intervention's efficacy.

Table 5.5 The Effectiveness of Different Attitude Measure Methods for Rehabilitation/Treatment Programmes

 Method	 Effectiveness	 Rationale
A. Likert scales	 Moderate	Captures shifts in self-efficacy, readiness to change, and attitudes towards alcohol use and behaviour. Useful only throughout treatment stages.
B. Thurstone scale	 Low	Not practical or adaptive for multi-phase rehabilitation programmes.
C. Semantic differential scale	 Moderate	Can assess changes in emotional associations with alcohol or driving behaviour but limited in tracking the impact of complex recovery processes.
D. The implicit association test (IAT)	 Moderate-high	Detects unconscious relapse risk (e.g., implicit positive bias towards alcohol), especially useful in early/mid treatment to supplement self-report.
E. The Affect Misattribution Procedure (AMP)	 Low-moderate	Might detect emotional responses to alcohol-related cues but offers limited actionable insight in treatment settings.
F. Interviews	 High	Offers in-depth insight into emotional, psychological, and motivational change. Key for understanding treatment engagement and relapse triggers.
G. Behavioural observation	 High	Essential for evaluating actual DUI behaviour post-treatment (e.g., rearrest rates, sobriety checks). Validates real-world behaviour change.

5.6. Alternative Transportation and Support Services

Effective evaluation of these interventions requires considering two perspectives. The first perspective involves collecting direct feedback from participants to determine which alternative transportation options—such as taxis, buses, or rideshare services—are most appealing and likely to deter instances of DUI. Comprehensive feedback methods can capture participants’ preferences, perceived convenience, cost considerations, and safety perceptions for each alternative. By systematically analyzing this feedback, practitioners can identify the most favoured options and base future interventions on achieving results to promote those services more prominently, thereby maximizing user uptake and enhancing overall programme efficacy.

The second perspective centers on behavioural observation to mark how effectively the interventions translate into real-world changes in transportation choices. This involves tracking participants’ actual use of alternative services and comparing their behaviour before and after the intervention. Such longitudinal monitoring not only reveals whether participants are substituting DUI with safer options but also highlights patterns, barriers, and enablers influencing their decisions. Overall, integrating these behavioural insights with attitudinal feedback provides a comprehensive evaluation framework, enabling continuous refinement of intervention strategies to ensure sustained reductions in DUI.

Table 5.6 The Effectiveness of Different Attitude Measure Methods for Alternative Transportation/Support Services Programmes

 Method	 Effectiveness	 Rationale
A. Likert scales	 High	Measures perceived convenience, cost, safety, and intention to use alternative transport, vital for evaluating appeal and accessibility.
B. Thurstone scale	 High	Practical for transport preference comparisons; however, lacks flexibility and interpretive ease for assessment.
C. Semantic differential scale	 Low-moderate	Captures only emotional tone associated with transport options.
D. The implicit association test (IAT)	 Low-Moderate	May reveal implicit associations, but less relevant in practical service-focused interventions.
E. The affect misattribution procedure (AMP)	 Low	Not practical for this is decision-making and infrastructure-oriented intervention, potential to be distracting.
F. Interviews	 High	Provides qualitative insights into user choices, barriers (e.g., cost, availability), and factors motivating or deterring behaviour change.
G. Behavioural observation	 High	Tracks actual changes in transport use, like increased ride-share use or reduced DUI arrests.

5.7. Digital and Virtual Interventions

These interventions fall under education-based practices because they focus on teaching participants without directly assessing their behaviours, making direct assessment methods both impactful and straightforward. However, the remote delivery of these interventions, while enhancing accessibility and convenience, introduces challenges in monitoring the learning process. The lack of in-person engagement can reduce accountability and may lead to distractions that impede the lesson learning process.

Consequently, assessment strategies must account for this potential distraction by integrating nuance feedback elicitation system, interactive assignments, and self-reporting tools to ensure that remote participants remain focused and actively involved throughout the learning experience.

Table 5.7 The Effectiveness of Different Attitude Measure Methods for Digital/Virtual Interventions

 Method	 Effectiveness	 Rationale
A. Likert scales	 High	Captures immediate learning outcomes, knowledge gain, perceived risk, and self-reported intentions. Works well in digital pre/post surveys. Suitable for structured educational testing environments.
B. Thurstone scale	 Low	Complex and not effective in quantifying agreement levels on DUI-related value statements. Redundant in the presence of Likert scales.
C. Semantic differential scale	 Moderate-high	Useful for evaluating emotional tone or perception change (e.g., DUI = smart/dumb, safe/risky) after virtual experiences.
D. The implicit association test (IAT)	 Low-moderate	Reveals underlying biases that may not be necessarily the goal of such interventions.
E. The affect misattribution procedure (AMP)	 Low-moderate	Can assess subconscious emotional reactions to digital stimuli but is complex to administer digitally and offers less actionable insight for virtual training.
F. Interviews	 Moderate	Provides in-depth feedback, but logistically difficult to conduct at scale for participants.
G. Behavioural observation	 Low	Not feasible in digital settings due to lack of direct supervision or observable real-world actions during digital sessions.

5.8. Community and Multifaceted Programmes

These interventions integrate a multifaceted approach that includes educational initiatives, law enforcement efforts, media campaigns, and collaboration with local stakeholders. By addressing DUI from multiple angles, they create a more comprehensive and effective response. The involvement of community members and organizations not only enhances the relevance of the strategies but also promotes greater acceptance, long-term engagement, and sustainability of the intervention outcomes. Thus, as these interventions are basically considered focus on education, direct measurement methods can be more appropriate to assess the attitude change.

Table 5.8 The Effectiveness of Different Attitude Measure Methods for Community/Multifaceted Programmes

 Method	 Effectiveness	 Rationale
A. Likert scales	 High	Useful for tracking attitude shifts across sectors (e.g., youth, parents, police, community leaders) on DUI norms, deterrence beliefs, and safety.
B. Thurstone scale	 High	Can be flexible, and effective for multi-audience, multi-channel interventions like these.
C. Semantic differential scale	 Moderate	Can measure public emotional associations with DUI prevention efforts.
D. The implicit association test (IAT)	 Low-moderate	May offer some value when targeting unconscious norms or cultural biases around drinking, but harder to apply to community-wide analysis.
E. The affect misattribution procedure (AMP)	 Low	Not useful, community programmes are complex and not emotion-primed in ways AMP can effectively capture.
F. Interviews	 Moderate	Provides insight into community perceptions, barriers, inter-agency collaboration effectiveness, and participant engagement. However, interviews can mislead practitioners due to their self-report nature.
G. Behavioural observation	 Low	Measures real-world behavioural outcomes, which are not key goal of such interventions.

5.9. Judicial and Treatment Court

These are specialized DUI courts designed for repeat or high-risk offenders, integrating legal oversight with treatment plans. They involve structured support, frequent monitoring (e.g., alcohol testing, court check-ins), and focus on long-term rehabilitation and accountability. The goal is not just punishment but sustained behaviour change. Thus, such interventions are tracking behaviours.

Table 5.9 Assessment Methods for Judicial/Treatment Court Interventions

 Method	 Effectiveness	 Rationale
A. Likert scales	 Low	Not suitable for longitudinal monitoring or multi-dimensional assessments required in court interventions.
B. Thurstone scale	 High	Useful for measuring participant motivation, perceptions of court fairness, and confidence in behaviour change over time.
C. Semantic differential scale	 Moderate	May detect underlying attitudes towards authority or alcohol that are not expressed openly, though not commonly used in legal contexts.
D. The implicit association test (IAT)	 Moderate	May capture shifts in how participants emotionally perceive court/treatment (e.g., “helpful vs. punitive”), but limited in behavioural utility.
E. The affect misattribution procedure (AMP)	 Low	Emotional priming is not a central mechanism in court interventions; AMP has low interpretive value in structured legal/treatment environments.
F. Interviews	 Moderate	Enables insight into participant experience and court environment impact. Can be distracting.
G. Behavioural observation	 High	Essential to track compliance behaviours (e.g., attendance, sobriety, recidivism) and post-programme DUI incidents.



5.10. Family-Based Interventions

These interventions involve parents or caregivers in the education and support of youth to prevent harmful behaviours like DUI. They promote communication, supervision, shared values, and collective accountability. Often used with at-risk youth, especially where parental guidance is a key influence on behaviour.

Table 5.10 Assessment Methods for Family-Based Interventions

 Method	 Effectiveness	 Rationale
A. Likert scales	 High	Captures changes in parent-child communication quality, parental monitoring, and youth perceived norms, all key indicators in family programmes.
B. Thurstone scale	 Moderate	Can capture nuanced, dynamic nature of family interaction and attitude change, though time-consuming.
C. Semantic differential scale	 Moderate-high	Assesses emotional shifts in family relationships or views towards drinking behaviour.
D. The implicit association test (IAT)	 Moderate	May be used with youth to assess implicit attitudes towards alcohol, but less useful for evaluating family interactions.
E. The affect misattribution procedure (AMP)	 Low	Does not align with the educational and relational focus of these programmes; emotions are not primary drivers.
F. Interviews	 High	Provides insight into family dynamics, role of culture, perceived behaviour change, and how parents interpret and reinforce programme content.
G. Behavioural observation	 Moderate	Tracks observable changes in parenting behaviour and youth alcohol use patterns, though limited for complex behaviour tracking.

5.11. Elucidating Appropriate Assessment Methods for DUI Interventions

To effectively assess attitudinal and behavioural changes, practitioners must select assessment methods that are appropriate for their intervention's specific features. These methods should be compatible with the intervention's theoretical foundation, the target audience, and practical objectives. Considering the variety and complexity of DUI intervention strategies, we have developed a comprehensive tool guide to support informed decision-making during the evaluation process.

This guide merges empirical evidence with methodological insights to help practitioners confidently choose and implement the most suitable assessment methods, customized to their interventions' specifics and objectives. Our aim is to enhance the accuracy and validity of evaluations, resulting in more effective and evidence-based DUI programme outcomes.

The tool guide includes four main criteria to help practitioners identify the most appropriate assessment methods for their interventions.

Table 5.11 Assessment Method Selection Table

Criteria	Intervention	Sustainable assessment methods
Aim of the intervention	Education-based	Likert scale, semantic differential scale, Thurstone scale, AMP, interviews.
	Emotion-focused	IAT, AMP, Semantic differential scale, interviews.
	Behaviour-oriented	Behavioural observation, IAT, AMP, Thurstone scale.
Type of data sought	Quantitative	Likert scale, semantic differential scale, IAT, AMP, Thurstone scale.
	Qualitative	Interviews, behavioural observation.
Thurstone scale	Individual-based	Interviews, IAT, behavioural observation.
	Group-based	Likert scale, semantic differential scale, thurstone scale, AMP.
Assessment approach	Direct (self-report)	Likert scale, semantic differential scale, Thurstone scale, interviews.
	Indirect (behavioural/implicit)	Behavioural observation, IAT, AMP.

5.11.1. Aim of the Intervention

Assessment tools should align with the underlying measurement purpose of the intervention. These purposes typically fall into three main categories. The first category is education-based interventions. These types of interventions aim to increase knowledge, reshape attitudes, or inform the decision-making process.

For **education-based DUI interventions**, where the primary goal is to raise awareness and influence attitudes or beliefs, structured self-report tools are particularly useful. Likert scales allow practitioners to track changes in participants' perspectives on alcohol use and driving over time, while semantic differential scales help measure how individuals perceive related concepts such as risk, responsibility, or legal consequences. These tools are easy to implement, offer quantifiable data, and provide valuable insight into how effectively educational efforts shape participants' understanding and intentions related to DUI.

The second category is **emotion-focused interventions** that aim to trigger affective responses to shift individuals' perceptions and reduce risky behaviours. These interventions are commonly delivered through media campaigns and community-based interventions, like peer-led or family-based programmes. Because emotional responses often occur at a subconscious level, traditional self-report tools may fail to fully capture their impact. As such, IAT and the AMP are considered valuable methods for measuring unconscious shifts in attitudes.

In addition to implicit measures, semantic differential scales can be used to measure how participants emotionally perceive DUI before and after exposure to emotionally charged content. Meanwhile, in-depth interviews offer a complementary qualitative approach, allowing researchers to explore how specific emotional messages resonate with individuals, especially across diverse cultural or social contexts. Combining these methods enables practitioners to evaluate both the cognitive and affective impact of emotion-driven interventions. It would ultimately provide a comprehensive understanding of their influence on attitude and behaviour change.

The third category is **behaviour-oriented interventions** that specifically focus on tracking the behaviour of participants. Behaviour-oriented DUI interventions are designed to directly influence individuals' actions and decision-making processes, often by implementing external structures or systems that discourage drink-driving. These include measures such as DUI checkpoints, alternative transportation services (like rideshare partnerships), and legally mandated programmes.

Because these interventions aim to alter tangible behaviours rather than simply shift attitudes or knowledge, they are best evaluated using behavioural observation methods that track real-world actions, such as changes in DUI arrest rates, transportation choices, or service usage patterns. While traditional self-report methods like surveys may be used to gather complementary data on participants' intentions or perceived barriers, they are often subject to social desirability bias and should be interpreted alongside objective behavioural data.

5.11.2. Type of Data Sought: Quantitative vs. Qualitative

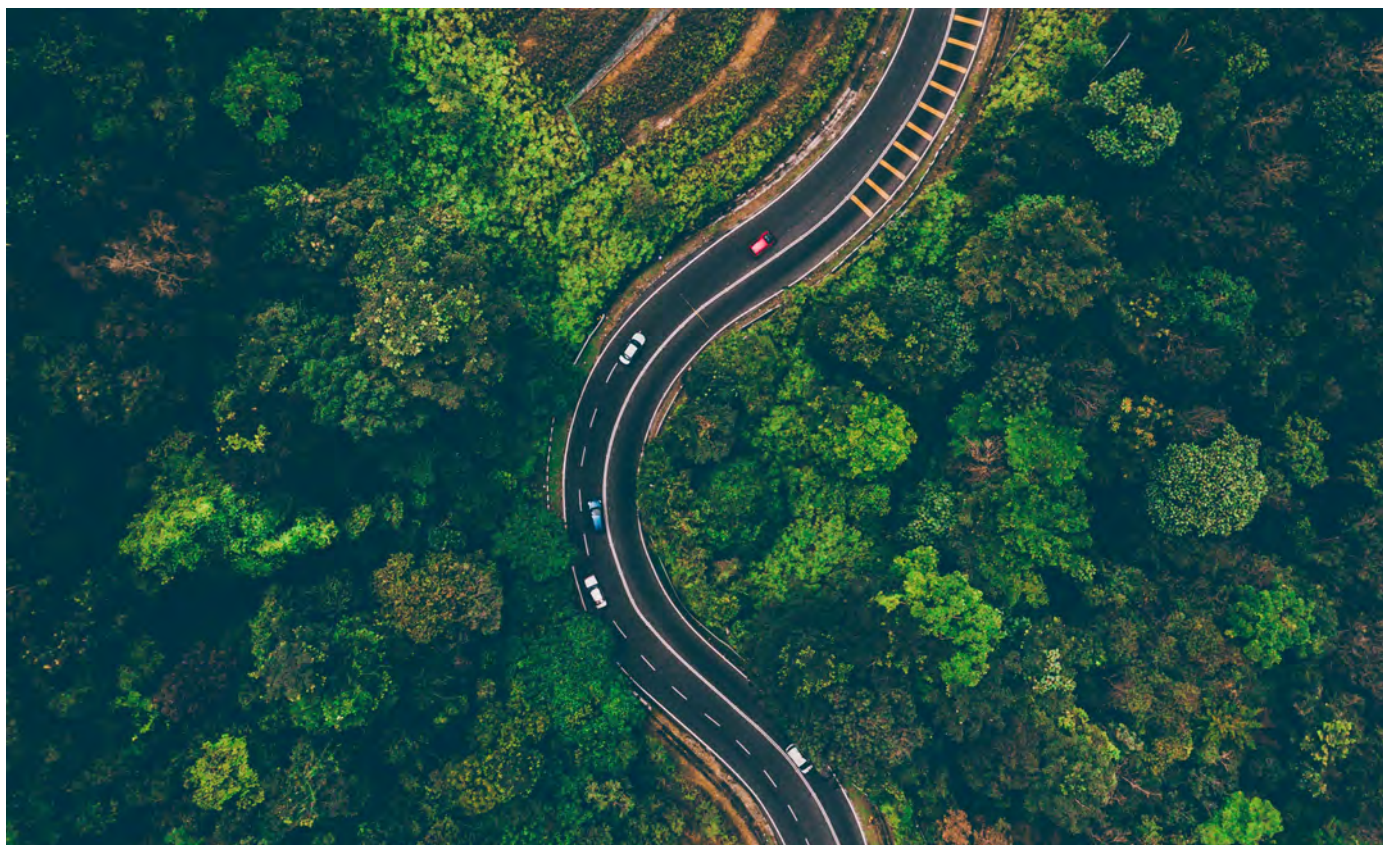
When selecting assessment methods for DUI interventions, one key consideration is whether the data required is quantitative or qualitative. Quantitative methods, such as Likert scales and semantic differential scales, provide measurable, standardized data that can be easily compared across populations and time. These tools are ideal for evaluating large-scale interventions where statistical trends are important, such as measuring shifts in public attitudes before and after awareness campaigns or analyzing the effectiveness of policy changes through pre/post surveys.

In contrast, qualitative methods, including interviews and behavioural observation, offer rich, in-depth insights into the nuanced personal experiences, cultural factors, and motivations that support behaviour. These are particularly useful in community-based or family oriented interventions where understanding context, emotional response, and interpersonal dynamics is crucial. While qualitative data is not easily generalizable, it can reveal why certain interventions succeed or fail, providing valuable direction for tailoring future programmes to specific audiences.

5.11.3. Participant Format: Individual vs. Group-Based

In the process of evaluating DUI interventions, it is important to consider the structure of participant involvement since it influences the choice of assessment methods. In individual-based interventions, such as one-on-one counselling, court-mandated programmes, or motivational interviewing sessions, methods that capture nuanced personal insights are most effective. These include in-depth interviews, IAT, and behavioural observation, which can reveal subconscious beliefs, personal change processes, and individual compliance patterns. Such personalized tools allow practitioners to tailor feedback, identify personal barriers, and assess deep attitude or behaviour shifts.

On the other hand, group-based interventions, such as educational programmes, peer-led workshops, or family group sessions, require scalable, structured tools that can assess multiple participants efficiently and consistently. Likert scales and semantic differential scales are particularly useful in these contexts since they enable facilitators to measure group-level attitude changes, knowledge gains, or behavioural intentions. While these tools may not capture as much personal depth as individual assessments, they are critical for analyzing broader programme effectiveness, identifying trends across subgroups, and informing the development of interventions that address group norms and shared behaviours.



5.11.4. Assessment Approach: Direct vs. Indirect

A key factor in choosing suitable assessment tools for a DUI intervention is distinguishing between direct (self-report) and indirect methods. Direct tools, like Thurstone scales and interviews, are popular because they are simple to administer, economical, and scalable. They enable participants to consciously consider their attitudes, beliefs, and behaviours. However, they are prone to social desirability bias, where individuals might modify their answers to seem more socially acceptable instead of honestly revealing their true feelings or actions.

In contrast, indirect methods such as Behavioural observations, IAT, and the AMP bypass conscious reflection, capturing more automatic, subconscious attitudes or real-world behaviours. These techniques are especially useful for identifying discrepancies between participants' stated beliefs and their actual behaviours or reactions under pressure. However, they can be more complex, time-consuming, and resource-intensive to design, implement, and interpret, often requiring specialized equipment, training, or expertise in data analysis.

Table 5.11 outlines recommended assessment methods corresponding to each intervention category. These recommendations are grounded in empirical research and are intended to enhance the accuracy of attitude change measurement within various intervention contexts. However, it is worth noting that these suggestions are not prescriptive. Practitioners may identify additional value in applying certain methods across multiple categories beyond those indicated, depending on the specific design and objectives of their intervention.

To use the assessment method selection table effectively, practitioners should begin by answering four key questions related to their DUI intervention:

1. What is the primary aim of the intervention? (e.g., education, emotional influence, behaviour change)
2. Do we need quantitative or qualitative data?
3. Is the intervention delivered to individuals or groups?
4. Are we seeking self-reported (direct) or behavioural/implicit (indirect) assessments?

Once these questions are answered, practitioners should examine the table and identify which assessment methods appear across all, or most of, their selected categories. The methods that are repeated consistently across the chosen rows will potentially be the most appropriate and effective tools for their specific intervention context.

For example, if an intervention is emotion-focused, seeks qualitative data, targets individual participants, and uses indirect assessment, methods like the IAT and interviews may appear in multiple relevant cells. This structured approach ensures the assessment method aligns with the intervention's goals, structure, and evaluation needs, leading to more accurate, reliable, and meaningful assessment results.



Example 11: Using Generative AI for Attitudinal Assessment Tools

As generative artificial intelligence becomes more prominent, researchers are increasingly leveraging this technology to evaluate attitudinal changes. For example, Symeonaki et al. (2024) employed generative AI to develop attitude measurement scales, integrating traditional psychometric techniques with advanced AI tools to tackle longstanding issues like subjectivity and bias in scale creation. Utilizing modern AI's computational and analytical capabilities, they effectively addressed the challenges of measuring attitudes, opening new possibilities for future research. GenAI can also be used to design tailored measures for attitude changes related to drink-driving interventions. Additionally, new scales for assessing attitude shifts can be generated through GenAI, which also facilitates more sophisticated analysis of qualitative data collected via qualitative methods. For these applications to succeed, existing large language models need to be fine-tuned using relevant knowledge about attitudinal change assessment.



Chapter 6

Conclusion

This report addresses a persistent and significant gap in road safety research: the lack of a structured, evidence-informed framework for selecting appropriate attitudinal and behavioural assessment methods across drink-driving interventions. By combining a PRISMA-aligned systematic review of four decades of literature with a comprehensive mapping of theoretical frameworks and measurement tools, the study makes two key contributions.

First, it synthesises the evidence on which intervention types produce attitudinal and behavioural change, and under what conditions. Second, it introduces a practical resource, the attitudinal change assessment toolkit, designed to help practitioners, evaluators, and policymakers align assessment methods with the specific characteristics of their interventions.

The review covers 45 high-quality studies involving more than 63,000 participants across multiple continents. The findings converge on a clear conclusion: no single intervention is sufficient on its own. Legal and policy measures can reduce DUI rates in the short term when consistently enforced, but their impact declines without complementary behavioural and educational components. Counselling approaches, particularly motivational interviewing, are effective for high-risk individuals but depend on sufficient intensity and participant readiness. Rehabilitation programmes show the strongest results when sustained for at least 12 months. Digital and virtual interventions, while increasingly sophisticated, often struggle to translate knowledge gains into lasting behavioural change. Overall, integrated, multi-component strategies that combine enforcement, rehabilitation, emotional engagement, and skills development consistently outperform isolated approaches.

The attitudinal change assessment toolkit operationalises these insights. It spans nine intervention categories and identifies the most suitable measurement methods based on intervention goals, data requirements, participant format, and the need for direct or indirect assessment. Explicit measures such as Likert scales and semantic differential scales remain essential for capturing conscious attitudes at scale. Implicit tools, including the implicit Association Test and the Affect Misattribution Procedure, provide insight into automatic associations that influence spontaneous behaviour and cannot be captured through self-report. Behavioural observation, although resource-intensive, remains the only method that directly measures real-world actions. The toolkit therefore recommends mixed-method approaches in high-stakes contexts, particularly in court-mandated and long-term rehabilitation programmes, where discrepancies between reported attitudes and actual behaviour are most pronounced.

Looking ahead, the integration of generative AI and large language models into attitudinal assessment presents a new frontier. Recent advances in scale development and qualitative analysis suggest these tools could reduce the cost and time of psychometric validation, support culturally adaptive instruments, and enable large-scale analysis of qualitative data. However, their application to drink-driving contexts remains limited and will require targeted fine-tuning on domain-specific data before they can be reliably deployed. This represents a promising direction for future research.

Several limitations affect the generalisability of this work. The review is restricted to peer-reviewed, English-language studies, which may underrepresent contexts from low- and middle-income countries and non-English-speaking populations, where the burden of drink-driving is often greatest. In addition, variability in methodologies, outcome measures, and theoretical approaches across studies limits the precision of cross-study comparisons. These gaps highlight the need for longitudinal, standardised, and culturally validated measurement tools, a need the toolkit aims to address.

Ultimately, the purpose of this work is both practical and ethical. Drink-driving continues to cause hundreds of thousands of deaths and injuries each year, often affecting individuals who bear no responsibility for the risk. The UN Decade of Action for Road Safety 2021–2030 has set a target to halve alcohol-related road deaths. Achieving this goal requires not only more effective interventions but also stronger evidence of their impact. By providing a clear, theoretically grounded, and empirically informed framework for assessment, this report seeks to improve that evidence base and contribute to making drink-driving not just illegal, but culturally unthinkable.



Chapter 7

References

- AAA Foundation for Traffic Safety. (2013). *2013 traffic safety culture index* (Technical report). AAA Foundation for Traffic Safety.
- Aiken, L. (2002). *Attitudes and related psychosocial constructs: Theories, assessment, and research*. Sage.
- Ajzen, I. (1980). *Understanding attitudes and predicting social behaviour*. Prentice-Hall.
- Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes*, 50(2), 179–211.
- Ajzen, I. (2020). The theory of planned behaviour: Frequently asked questions. *Human Behaviour and Emerging Technologies*, 2(4), 314–324.
- Ajzen, I., & Fishbein, M. (1977). Attitude–behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin*, 84(5), 888–918. <https://doi.org/10.1037/0033-2909.84.5.888>
- Albarracín, D., Fayaz-Farkhad, B., & Granados Samayoa, J. A. (2024). Determinants of behaviour and their efficacy as targets of behavioural change interventions. *Nature Reviews Psychology*, 3(6), 377–392.
- Allport, G. W. (1935). Attitudes. In C. Murchison (Ed.), *A handbook of social psychology* (pp. 798–844). Clark University Press.
- Angrosino, Michael V. (2007). "What Is Naturalistic Observation?" In *Naturalistic Observation*. Routledge.
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology*, 40(4), 471–499. <https://doi.org/10.1348/014466601164939>
- Assailly, J. P., & Cestac, J. (2014). Alcohol interlocks and prevention of drink-driving recidivism. *Revue Européenne de Psychologie Appliquée/European Review of Applied Psychology*, 64(3), 141–149. <https://doi.org/10.1016/j.erap.2014.03.002>
- Ayala, G. X., & Elder, J. P. (2011). Qualitative methods to ensure acceptability of behavioral and social interventions to the target population. *Journal of Public Health Dentistry*, 71(Suppl. 1), S69–S79. <https://doi.org/10.1111/j.1752-7325.2011.00241.x>
- Badovinac, K. (1994). The effects of victim impact panels on attitudes and intentions regarding impaired driving. *Journal of Alcohol and Drug Education*, 39(3), 113–118.
- Baird, J., Yang, E., Strezsak, V., & Mello, M. J. (2017). Examining motor vehicle crash involvement and readiness to change on drinking and driving behaviours among injured emergency department patients. *Traffic Injury Prevention*, 18(5), 463–469. <https://doi.org/10.1080/15389588.2016.1265953>
- Ballegeer, A. M., Ferrari E., Corrochano, D., C., & Ruiz, C. (2024). The role of knowledge, attitude, and emotions in Spanish pre-service teachers' willingness to engage in climate change education. *European Journal of Teacher Education*, 1–19. <https://doi.org/10.1080/02619768.2024.2370885>
- Bandura, A. (1986). The explanatory and predictive scope of self-efficacy theory. *Journal of Social and Clinical Psychology*, 4(3), 359–373.
- Bandura, A. (1997). *Self-efficacy: The exercise of control*. W. H. Freeman.
- Bandura, A., & Walters, R. H. (1977). *Social learning theory*. Prentice-Hall.

- Bandura, A., & Wessels, S. (1997). *Self-efficacy*. Psychology Press.
- Baum, S. (2000). Drink-driving as a social problem: comparing the attitudes and knowledge of drink-driving offenders and the general community. *Accident Analysis & Prevention*, 32(5), 689–694.
- Becker, M. H. (1974). The health belief model and sick role behaviour. *Health Education Monographs*, 2(4), 409–419.
- Bem, D. J. (1972). Self-perception theory. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 6, pp. 1–62). Elsevier.
- Bernat, D. H., Dunsmuir, W. T. M., & Wagenaar, A. C. (2004). Effects of lowering the legal BAC to 0.08 on single-vehicle-nighttime fatal traffic crashes in 19 jurisdictions. *Accident Analysis & Prevention*, 36(6), 1089–1097. <https://doi.org/10.1016/j.aap.2004.04.001>
- Bingham, C. R., Barretto, A. I., Walton, M. A., Bryant, C. M., Shope, J. T., & Raghunathan, T. E. (2010). Efficacy of a web-based, tailored, alcohol prevention/intervention program for college students: Initial findings. *Journal of American College Health*, 58(4), 349–356. <https://doi.org/10.1080/07448480903501178>
- Bingham, C. R., Elliott, M. R., & Shope, J. T. (2007). Social and behavioral characteristics of young adult drink/drivers adjusted for level of alcohol use. *Alcoholism: Clinical and Experimental Research*, 31(4), 655–664.
- Bonar, E. E., Bauermeister, J. A., Blow, F. C., Bohnert, A. S. B., Bourque, C., Coughlin, L. N., Davis, A. K., Florimbio, A. R., Goldstick, J. E., Wisniewski, D. M., Young, S. D., & Walton, M. A. (2022). A randomized controlled trial of social media interventions for risky drinking among adolescents and emerging adults. *Drug and Alcohol Dependence*, 237, Article 109532. <https://doi.org/10.1016/j.drugalcdep.2022.109532>
- Bowers, J. W. (1963). Language intensity, social introversion, and attitude change. *Communications Monographs*, 30(4), 345–352.
- Brown, T. G., Dongier, M., Ouimet, M. C., Tremblay, J., Chanut, F., Legault, L., & Ying Kin, N. M. K. N. (2012). The role of demographic characteristics and readiness to change in 12-month outcome from two distinct brief interventions for impaired drivers. *Journal of Substance Abuse Treatment*, 42(4), 383–391. <https://doi.org/10.1016/j.jsat.2011.09.009>
- Brown, T. G., Dongier, M., Ouimet, M. C., Tremblay, J., Chanut, F., Legault, L., & Kin, N. M. K. N. (2010). Brief motivational interviewing for DWI recidivists who abuse alcohol and are not participating in DWI intervention: A randomized controlled trial. *Alcoholism: Clinical and Experimental Research*, 34(2), 292–301. <https://doi.org/10.1111/j.1530-0277.2009.01092.x>
- Cambridge University Press. (2026). Word Attitude in Cambridge Dictionary. Retrieved August 31, 2026, from <https://dictionary.cambridge.org/dictionary/english/attitude>
- Carey, S. M., Allen, T. H., Einspruch, E. L., Mackin, J. R., & Marlowe, D. (2015). Using behavioural triage in court-supervised treatment of DUI offenders. *Alcoholism Treatment Quarterly*, 33(1), 44–63. <https://doi.org/10.1080/07347324.2015.982455>
- Carpenter, C. J. (2010). A meta-analysis of the effectiveness of health belief model variables in predicting behavior. *Health Communication*, 25(8), 661–669. <https://doi.org/10.1080/10410236.2010.521906>

- Cavaiola, A. (2013). The challenges of screening DUI offenders. *Criminology & Public Policy*, 12, 173–177.
- Chaiken, S., & Baldwin, M. W. (1981). Affective-cognitive consistency and the effect of salient behavioural information on the self-perception of attitudes. *Journal of Personality and Social Psychology*, 41(1), 1–12.
- Champion, V. L., & Skinner, C. S. (2008). The health belief model. *Health behaviour and health education: Theory, research, and practice*, 4, 45–65.
- Cheng, W. J., Chen, L. Y., Fang, S. C., Chang, H. M., Yang, T. W., Chang, R. C., Hsing, T. C., & Huang, M. C. (2021). Examining factors associated with postintervention recidivism in DUI repeat offenders after alcohol treatment: One-year follow-up study. *Journal of Substance Abuse Treatment*, 130, Article 108426. <https://doi.org/10.1016/j.jsat.2021.108426>
- Clapp, J. D., Johnson, M., Voas, R. B., Lange, J. E., Shillington, A., & Russell, C. (2005). Reducing DUI among US college students: Results of an environmental prevention trial. *Addiction*, 100(3), 327–334. <https://doi.org/10.1111/j.1360-0443.2004.00917.x>
- Clapp, J. D., Reed, M. B., Shillington, A. M., & Holmes, M. R. (2009). Blood alcohol concentrations among bar patrons: A multi-level study of drinking behaviour. *Drug and Alcohol Dependence*, 99(1–3), 89–95.
- Conner, M., & Norman, P. (2017). Health behaviour : Current issues and challenges. *Psychology & Health*, 32(8), 895–906.
- Connors, G. J., Maisto, S. A., & Ersner-Hershfield, S. M. (1986). Behavioural treatment of drink-driving recidivists: Short-term and long-term effects. *Behavioural Psychotherapy*, 14(1), 34–45. <https://doi.org/10.1017/S0141347300012477>
- Cooper, J. M. (2007). *Cognitive dissonance: Fifty years of a classic theory*. SAGE Publications.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications, Inc.
- Creswell, J. W., & Poth, C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). SAGE Publications, Inc.
- Davey, J. D., Davey, T., & Obst, P. L. (2005). Drug and drink-driving by university students: an exploration of the influence of attitudes. *Traffic Injury Prevention*, 6(1), 44–52.
- De Ribaupierre, A. (2015). Piaget's Theory of Cognitive Development. In J. D. Wright (Ed.), *International Encyclopedia of the Social & Behavioural Sciences: Second Edition* (pp. 120–124). Elsevier Inc. <https://doi.org/10.1016/B978-0-08-097086-8.23093-6>
- De Houwer, J., Teige-Mocigemba, S., Spruyt, A., & Moors, A. (2009). Implicit measures: A normative analysis and review. *Psychological Bulletin*, 135(3), 347–368. <https://doi.org/10.1037/a0014211>
- Dębicka, J., Mazurek, E., & Ostasiewicz, K. (2022). Methodological aspects of measuring preferences using the rank and Thurstone scale. *Statistika: Statistics & Economy Journal*, 102(3), 236–248.
- Deci, E. L., & Ryan, R. M. (2013). The importance of autonomy for development and well-being. In B. W. Sokol, F. M. E. Grouzet, & U. Müller (Eds.), *Self-Regulation and Autonomy: Social and Developmental Dimensions of Human Conduct* (pp. 19–46). Cambridge University Press. <https://doi.org/10.1017/CBO9781139152198.005>

- DePoy, E., & Gitlin, L. N. (2016). Collecting data through measurement in experimental-type research. In E. DePoy & L. N. Gitlin (Eds.), *Introduction to research: Understanding and applying multiple strategies*. 5th ed (pp. 227–247). Mosby.
- Desapriya, E., Fujiwara, T., & Scime, G. (2009). Are 1994 alcohol production and the sales deregulation policy in Japan associated with an increase the road traffic fatalities among adult and teenage males and females in Japan? *Japanese Journal of Alcohol & Drug Dependence*, 44(5).
- Desapriya, E., Pike, I., & Raina, P. (2006). Severity of alcohol-related motor vehicle crashes in British Columbia: Case–control study. *International Journal of Injury Control and Safety Promotion*, 13(2), 89–94. <https://doi.org/10.1080/17457300500172685>
- Domrev-Benkovich, A., Ronen, A., & Grinstein-Cohen, O. (2017). Does experience change anything? Attitudes of paramedic students regarding drinking and driving. *Journal of Public Health*, 25(5), 465–472. <https://doi.org/10.1007/s10389-017-0814-3>
- Dowling, A. M., Macdonald, R., & Carpenter, K. H. (2011). Frequency of alcohol-impaired driving in New York State. *Traffic Injury Prevention*, 12(2), 120–127, Article Pii 935985329. <https://doi.org/10.1080/15389588.2010.540275>
- Dunkel, A., von Storch, K., Hochheim, M., Zank, S., Polidori, M. C., & Woopen, C. (2025). Long-term effects of transtheoretical model-based lifestyle intervention on self-efficacy and self-management in patients with type 2 diabetes - Randomised controlled trial. *International Journal of Behavioral Medicine*, 32(1), 45–57.
- Dweck, C. S. (2006). *Mindset: The new psychology of success*. Random House.
- Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Harcourt Brace Jovanovich College Publishers.
- Eby, D. W. (2011). Naturalistic observational field techniques for traffic psychology research. In B. E. Porter (Ed.), *Handbook of traffic psychology* (pp. 61–72). Academic Press. <https://doi.org/10.1016/B978-0-12-381984-0.10005-0>
- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford University Press.
- Fillmore, M. T., & Jude, R. (2011). Alcohol effects on simulated driving performance and self-perceptions of impairment in DUI offenders and non-offenders. *Psychopharmacology*, 218(2), 403–412.
- Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Addison-Wesley.
- Fishman, J., Yang, C., & Mandell, D. (2021). Attitude theory and measurement in implementation science: a secondary review of empirical studies and opportunities for advancement. *Implementation Science*, 16, 1–10.
- Freeman, J., Liossis, P., Schonfeld, C., Sheehan, M., Siskind, V., & Watson, B. (2005). Self-reported motivations to change and self-efficacy levels for a group of recidivist drink drivers. *Addictive Behaviours*, 30(6), 1230–1235. <https://doi.org/10.1016/j.addbeh.2004.10.007>
- Fromme, K., Wetherill, R. R., & Neal, D. J. (2010). Turning 21 and the associated changes in drinking and driving after drinking among college students. *Journal of American College Health*, 59(1), 21–27.

- Fry, M. L. (2008). Understanding young adult drink-driving behaviour: A value benefit perspective. *International Journal of Nonprofit and Voluntary Sector Marketing*, 13(3), 227–235.
- Fynbo, L., & Järvinen, M. (2011). 'The best drivers in the world': Drink-driving and risk assessment. *The British Journal of Criminology*, 51(5), 773–788.
- Gawronski, B., & Hahn, A. (2019). Implicit measures: Procedures, use, and interpretation. In H. Blanton, J. M. LaCroix, & G. D. Webster (Eds.), *Measurement in social psychology* (pp. 29–55). Routledge. <https://doi.org/10.4324/9780429452925-2>
- Gerrard, M., Gibbons, F. X., & Bushman, B. J. (1996). Relation between perceived vulnerability to HIV and precautionary sexual behavior. *Psychological Bulletin*, 119(3), 390–409.
- González-Iglesias, B., Gómez-Fraguela, J. A., & Sobral, J. (2015). Potential determinants of drink-driving in young adults. *Traffic Injury Prevention*, 16(4), 345–352.
- Gössling, S. (2025). Reducing resistance to urban transport system change. *Urban Transitions*, 1, Article 100001.
- Greenberg, M. D., Morral, A. R., & Jain, A. K. (2004). How can repeat drunk drivers be influenced to change? Analysis of the association between drink-driving and DUI recidivists' attitudes and beliefs. *Journal of Studies on Alcohol*, 65(4), 460–463. <https://doi.org/10.15288/jsa.2004.65.460>
- Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The implicit association test. *Journal of Personality and Social Psychology*, 74(6), 1464–1480.
- Hahn, U., & Heit, E. (2015). Semantic similarity. In J. D. Wright (Ed.), *International encyclopedia of the social & behavioral sciences* (2nd ed.). Elsevier.
- Hamilton, J. A., Kemper, K. A., Bridges, W. C., Jr., & Condrasky, M. D. (2021). The Hamilton Healthy Eating Attitudes Thurstone Scale. *Journal of Food & Nutritional Sciences*, 3(1), 7–17.
- Harmon-Jones, E., & Mills, J. (2019). An introduction to cognitive dissonance theory and an overview of current perspectives on the theory. In E. Harmon-Jones (Ed.), *Cognitive dissonance: Reexamining a pivotal theory in psychology* (2nd ed., pp. 3–24). American Psychological Association.
- Harré, N., & Sibley, C. G. (2007). Explicit and implicit self-enhancement biases in drivers and their relationship to driving violations and crash-risk optimism. *Accident Analysis & Prevention*, 39(6), 1155–1161.
- Haugtvedt, C. P. (1988). *Persistence and resistance of attitude change: Individual and situational approaches*. [Doctoral dissertation, University of Missouri-Columbia].
- Haustein, S., Humpe, A., & Gössling, S. (2022). Risky and anxious-aggressive drivers: A key barrier to traffic safety legislation in Germany. *Transportation Research Part F: Traffic Psychology and Behaviour*, 89, 84–96.
- Heise, D. R. (1969). Some methodological issues in semantic differential research. *Psychological Bulletin*, 72(6), 406–422.
- Hochbaum, G. M. (1958). *Public participation in medical screening programs: a socio-psychological study*. U.S. Department of Health, Education, and Welfare, Public Health Service.

- Hogg, M. A., & Vaughan, G. M. (2008). *Social psychology*. Pearson Education.
- Homel, R., Carseldine, D., & Kearns, I. (1988). Drink-driving countermeasures in Australia. *Alcohol, Drugs & Driving*, 4(2), 113–144.
- Hong, J. M., & Lee, W. N. (2021). The stages-of-change approach for prosocial behaviour: Message tailoring to encourage blood donation. *Journal of Applied Social Psychology*, 51(3), 219–236.
- Huang, C. Y., Chou, S. E., Su, W. T., Liu, H. T., Hsieh, T. M., Hsu, S. Y., Hsieh, H. Y., & Hsieh, C. H. (2020). Effect of lowering the blood alcohol concentration limit to 0.03 among hospitalized trauma patients in southern Taiwan: A cross-sectional analysis. *Risk Management and Healthcare Policy*, 13, 571–581. <https://doi.org/10.2147/RMHP.S250734>
- Huang, M. C., Fang, S. C., Chang, H. M., Yang, T. W., Tu, H. Y., Chang, Y. T., & Cheng, W. J. (2023). Postintervention reoffense in DUI repeat offenders receiving alcohol treatment as a diversion intervention: A 2-year follow-up study. *Transportation Research Part F: Traffic Psychology and Behaviour*, 94, 413–421. <https://doi.org/10.1016/j.trf.2023.03.006>
- Jewell, J. D., Hupp, S. D. A., & Segrist, D. J. (2008). Assessing DUI risk: Examination of the behaviours & attitudes drinking & driving scale (BADDS). *Addictive Behaviours*, 33(7), 853–865.
- Jewell, J. D., & Hupp, S. D. A. (2005). Examining the effects of Fatal Vision goggles on changing attitudes and behaviors related to drinking and driving. *The Journal of Primary Prevention*, 26(6), 553–565. <https://doi.org/10.1007/s10935-005-0013-9>
- Jie-Ling, J., & Yuan-Chang, D. (2021). Analysis of drink-driving behavior: Considering the subjective and objective factors of drivers. *Traffic Injury Prevention*, 22(3), 183–188.
- Jyothi, V., & Vijayabhinandana, B. (2021). A scale to measure the attitude of students towards online learning. *Indian Research Journal of Extension Education*, 21(2&3), 37–42.
- Kagawa, R. M. C., McCort, C. D., Schleimer, J., Pear, V. A., Charbonneau, A., Buggs, S. A. L., Wintemute, G. J., & Laqueur, H. S. (2021). Racial bias and DUI enforcement: Comparing conviction rates with frequency of behavior. *Criminology & Public Policy*, 20(4), 645–663. <https://doi.org/10.1111/1745-9133.12558>
- Kegeles, S. S., & Lund, A. K. (1982). Adolescents' health beliefs and acceptance of a novel preventive dental activity: Replication and extension. *Health Education Quarterly*, 9(2–3), 96–112.
- Khalil, J., Horgan, J., & Zeuthen, M. (2022). The ABC model: Clarifications and elaborations. *Terrorism and Political Violence*, 34(3), 460–467.
- Kim, H. K., & Kim, S. H. (2016). Understanding emotional bond between the creator and the avatar: Change in behavioural intentions to engage in alcohol-related traffic risk behaviours. *Computers in Human Behaviour*, 62, 186–200. <https://doi.org/10.1016/j.chb.2016.03.092>
- Kopel, S., & Arkowitz, H. (1975). The role of attribution and self-perception in behavior change: Implications for behavior therapy. *Genetic Psychology Monographs*, 92(2), 175–212.
- Kvale, S., & Brinkmann, S. (2009). *Interviews: Learning the craft of qualitative research interviewing* (2nd ed.). SAGE Publications, Inc.

- LaBrie, J. W., Napper, L. E., & Ghaidarov, T. M. (2012). Predicting driving after drinking over time among college students: The emerging role of injunctive normative perceptions. *Journal of Studies on Alcohol and Drugs*, 73(5), 726–730.
- Laird, J. D. (1974). Self-attribution of emotion: The effects of expressive behavior on the quality of emotional experience. *Journal of Personality and Social Psychology*, 29(4), 475–486.
- Lang, E., Stockwell, T., Rydon, P., & Beel, A. (1998). Can training bar staff in responsible serving practices reduce alcohol-related harm? *Drug and Alcohol Review*, 17(1), 39–50. <https://doi.org/10.1080/09595239800187581>
- Lange, J. E., Reed, M. B., Johnson, M. B., & Voas, R. B. (2006). The efficacy of experimental interventions designed to reduce drinking among designated drivers. *Journal of Studies on Alcohol*, 67(2), 261–268. <https://doi.org/10.15288/jsa.2006.67.261>
- Laura, A. S., Gemma, F. G., Merce, J. G., & Josep, M. C. (2011). Evaluation of a programme for changing attitudes in pre-drivers to prevent road accidents related to drink-driving in Catalonia. *Adicciones*, 23(3), 257–265.
- Lee, K. H., & Kwon, Y. M. (2015). Influence of sociopsychological aspects, smoking habit, exercise habit on the intentions of drink-driving. *Journal of the Korean Data and Information Science Society*, 26(1), 21–29.
- Leventhal, H., & Cameron, L. (1987). Behavioural theories and the problem of compliance. *Patient Education and Counselling*, 10(2), 117–138.
- Lewis, M. A., & Neighbors, C. (2006). Social norms approaches using descriptive drinking norms education: A review of the research on personalized normative feedback. *Journal of American College Health*, 54(4), 213–218.
- Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology*, 22(140), 5–55.
- Liu, L., Chui, W. H., & Deng, Y. (2021). Driving after alcohol consumption: A qualitative analysis among Chinese male drunk drivers. *International Journal of Drug Policy*, 90, Article 103058.
- Louviere, J. J. (2021). Attitudes, attitudinal measurement and the relationship between attitudes and behaviour. In D. A. Hensher & P. R. Stopher (Eds.), *Behavioural Travel Modelling* (pp. 782–794). Routledge.
- Love, S., Larue, G. S., Rowland, B., & Davey, J. (2024). What influences intentions to offend? A systematic review and meta-analysis on the factors associated with the deterrence of drink-driving. *Transportation Research Part F: Traffic Psychology and Behaviour*, 100, 154–168.
- Loxley, W., Lo, S. K., Homel, R., Berger, D. E., & Snortum, J. R. (1992). Young people, alcohol, and driving in two Australian states. *International Journal of the Addictions*, 27(9), 1119–1129. <https://doi.org/10.3109/10826089209047338>
- Luchini, C., Stubbs, B., Solmi, M., & Veronese, N. (2017). Assessing the quality of studies in meta-analyses: Advantages and limitations of the Newcastle Ottawa Scale. *World Journal of Meta-Analysis*, 5(4), 80–84.
- MacKenzie, J. E., Watling, C. N., & Leal, N. L. (2015). What aspects of demographic, personality, attitudes and perceptions of law enforcement influence self-reported likelihood of drink-driving?. *Journal of Risk Research*, 18(9), 1203–1219.

- Maio, G. R., Verplanken, B., & Haddock, G. (2018). *The psychology of attitudes and attitude change*. Sage Publications, Inc.
- Mann, H. N., & Lansdown, T. (2009). Pre-driving adolescent attitudes: Can they change?. *Transportation Research Part F: Traffic Psychology and Behaviour*, 12(5), 395–403.
- Markl, M. (2016). Effectiveness of road safety educational program for pre-drivers about DUI: Practical implication of the TPB in developing new preventive program in Slovenia. *Transportation Research Procedia*, 14, 3829–3838. <https://doi.org/10.1016/j.trpro.2016.05.468>
- Martin, E. S., Dobson, F., Hall, M., Marshall, C., & Egerton, T. (2019). The effects of behavioural counselling on the determinants of health behaviour change in adults with chronic musculoskeletal conditions making lifestyle changes: A systematic review and meta-analysis. *Musculoskeletal Care*, 17(3), 170–197.
- Martinussen, L. M., & Sømhovd, M. J. (2019). Avoiding drink-driving with a push. *European Transport Research Review*, 11(1), Article 16. <https://doi.org/10.1186/s12544-019-0354-8>
- Martinussen, L. M., Petranca, L., & Sømhovd, M. J. (2018). The relationship between explicit and implicit attitudes towards drink-driving. *PLoS ONE*, 13(10), e0206124.
- McCarthy, D. M., Pedersen, S. L., & Leuty, M. E. (2005). Negative consequences and cognitions about drinking and driving. *Journal of Studies on Alcohol*, 66(4), 567–570.
- McDougall, W. (1919). *An introduction to social psychology*. Methuen.
- Meenambigai, J., Lokeshwaran, D., & Durairaj, S. (2023). Attitude scale construction methodology in extension education research. In R. Arunkumar, N. Manivannan, V. Kalirajan & M. Natarajan (Eds.), *Recent trends in agricultural extension research*. JPS Scientific Publications.
- Meissner, F., Grigutsch, L. A., Koranyi, N., Müller, F., & Rothermund, K. (2019). Predicting behavior with implicit measures: Disillusioning findings, reasonable explanations, and sophisticated solutions. *Frontiers in Psychology*, 10, Article 2483. <https://doi.org/10.3389/fpsyg.2019.02483>
- Michie, S., van Stralen, M. M., & West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6(1), 42. <https://doi.org/10.1186/1748-5908-6-42>
- Miller, W. R., & Rollnick, S. (2013). *Motivational interviewing: Helping people change*, 3rd edition. Guilford Press.
- Moon, T. J., Hill-Kapturczak, N., Mathias, C. W., Wasserman, A. M., Wood, E. E., Roache, J. D., & Dougherty, D. M. (2025). The interplay between negative alcohol expectancies and locus of control and its association with motivation to change alcohol use among repeat alcohol-impaired drivers. *Substance Use & Misuse*, 60(6), 854–862. <https://doi.org/10.1080/10826084.2025.2454665>
- Moon, T. J., Mathias, C. W., Mullen, J., Karns-Wright, T. E., Hill-Kapturczak, N., Roache, J. D., & Dougherty, D. M. (2019). The role of social support in motivating reductions in alcohol use: A test of three models of social support in alcohol-impaired drivers. *Alcoholism: Clinical and Experimental Research*, 43(1), 123–134. <https://doi.org/10.1111/acer.13911>

- Moon, T. J., Mathias, C. W., Mullen, J., Karns-Wright, T. E., Hill-Kapturczak, N., Roache, J. D., & Dougherty, D. M. (2021). Social support and the rehabilitation of alcohol-impaired drivers: Drinking motives as moderators. *Health Communication, 36*(5), 540–550. <https://doi.org/10.1080/10410236.2020.1731914>
- Moore, K. A., Harrison, M., Young, M. S., & Ochshorn, E. (2008). A cognitive therapy treatment programme for repeat DUI offenders. *Journal of Criminal Justice, 36*(6), 539–545. <https://doi.org/10.1016/j.jcrimjus.2008.09.004>
- Murphy, G., & Murphy, L. B. (1931). *Experimental social psychology*. Harper & Brothers.
- Negi, N. S., Schmidt, K., Morozova, I., Addis, T., Kidane, S., Nigus, A., Kumar, N., Mullin, S., & Murukutla, N. (2020). Effectiveness of a drinking and driving campaign on knowledge, attitudes, and behaviour among drivers in Addis Ababa. *Frontiers in Sustainable Cities, 2*, Article 563350.
- Nikolaou, A., Schwabe, A., & Boomgaarden, H. (2022). Changing social attitudes with virtual reality: A systematic review and meta-analysis. *Annals of the International Communication Association, 46*(1), 30–61.
- Nurhasanah, S., & Karman. (2025). Transforming non-formal education: Pedagogical innovations and character development in assessment. *Proceedings of the International Conference on Education, 3*(1), 111–117. <https://doi.org/10.32672/pice.v3i1.3446>
- Nygaard, P., Waiters, E. D., Grube, J. W., & Keefe, D. (2003). Why do they do it? A qualitative study of adolescent drinking and driving. *Substance Use & Misuse, 38*(7), 835–863.
- Olsson, D., Gericke, N., Sass, W., & Boeve-de Pauw, J. (2020). Self-perceived action competence for sustainability: The theoretical grounding and empirical validation of a novel research instrument. *Environmental Education Research, 26*(5), 742–760. <https://doi.org/10.1080/13504622.2020.1736991>
- Osgood, C. E., Suci, G. J., & Tannenbaum, P. H. (1957). *The measurement of meaning* (No. 47). University of Illinois Press.
- Ouzzani, M., Hammady, H., Fedorowicz, Z., & Elmagarmid, A. (2016). Rayyan—a web and mobile app for systematic reviews. *Systematic Reviews, 5*, 1–10.
- Özkan, T., Lajunen, T., Chliaoutakis, J. E., Parker, D., & Summala, H. (2006). Cross-cultural differences in driving behaviours: A comparison of six countries. *Transportation Research Part F: Traffic Psychology and Behaviour, 9*(3), 227–242.
- Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., . . . Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ, 372*, n71. <https://doi.org/10.1136/bmj.n71>
- Payne, B. K., & Zuo, S. (2023). Implicit bias and the dual process of stereotyping. In R. J. Sternberg & S. T. Fiske (Eds.), *The Cambridge handbook of wisdom* (pp. 513–532). Cambridge University Press.
- Peterson, R. C., & Thurstone, L. L. (1932). The effect of a motion picture film on children's attitudes toward Germans. *Journal of Educational Psychology, 23*(4), 241–246. <https://doi.org/10.1037/h0071389>

- Petty, R. E., & Cacioppo, J. T. (1984). Source factors and the elaboration likelihood model of persuasion. *Advances in Consumer Research*, 11(1), 668–672.
- Petty, R. E., & Cacioppo, J. T. (2012). *Communication and persuasion: Central and peripheral routes to attitude change*. Springer Science & Business Media.
- Petty, R. E., Cacioppo, J. T., & Goldman, R. (1981). Personal involvement as a determinant of argument-based persuasion. *Journal of personality and social psychology*, 41(5), 847–855.
- Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 19, pp. 123–205). Academic Press.
- Petty, R. E., Wegener, D. T., & Fabrigar, L. R. (1997). Attitudes and attitude change. *Annual Review of Psychology*, 48(1), 609–647.
- Piaget, J. (1972). Intellectual evolution from adolescence to adulthood. *Human Development*, 15(1), 1–12.
- Ploder, A., & Eder, A. (2015). Semantic differential. In J. D. Wright (Ed.), *International Encyclopedia of the Social & Behavioral Sciences* (2nd ed., Vol. 21, pp. 563–571). Elsevier.
- Plotnikoff, R. C., Hotz, S. B., Birkett, N. J., & Courneya, K. S. (2001). Exercise and the transtheoretical model: A longitudinal test of a population sample. *Preventive Medicine*, 33(5), 441–452.
- Polacsek, M., Rogers, E. M., Woodall, W. G., Delaney, H., Wheeler, D., & Rao, N. (2001). MADD victim impact panels and stages-of-change in drink-driving prevention. *Journal of Studies on Alcohol*, 62(3), 344–350. <https://doi.org/10.15288/jsa.2001.62.344>
- Politis, I., Basbas, S., & Papaioannou, P. (2013). Exploring the effects of attitudinal and perception characteristics on drinking and driving non-compliant behaviour. *Accident Analysis & Prevention*, 60, 316–323.
- Prochaska, J. O., & DiClemente, C. C. (1982). Transtheoretical therapy: Towards a more integrative model of change. *Psychotherapy: Theory, Research & Practice*, 19(3), 276–288.
- Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion*, 12(1), 38–48. <https://doi.org/10.4278/0890-1171-12.1.38>
- Rejali, S., & Aghabayk, K. (2025). A mixed methods approach to investigate factors influencing young drivers' intention to drink and drive: A case study from an alcohol-prohibited country. *Transportation Research Part F: Traffic Psychology and Behaviour*, 108, 152–167.
- Reznik, R., Morey, S., & Best, J. B. (1984). Evaluation of the Australian Medical Association drink-driving campaign in Wollongong. *The Medical Journal of Australia*, 141(12–13), 818–821. <https://doi.org/10.5694/j.1326-5377.1984.tb132958.x>
- Roscher, O. M., & Neumann, R. (2025). The AMP reflects gradual differences in attitude extremity, not intensity. *Social Psychology*, 56(2), 98–110. Advance online publication. <https://doi.org/10.1027/1864-9335/a000576>
- Rosenstock, I. M. (1966). Why people use health services. *The Milbank Memorial Fund Quarterly*, 44(3), 94–124.

- Rosenstock, I. M. (1974). The health belief model and preventive health behaviour. *Health Education Monographs*, 2(4), 354–386.
- Rothschild, M. L., Mastin, B., & Miller, T. W. (2006). Reducing alcohol-impaired driving crashes through the use of social marketing. *Accident Analysis & Prevention*, 38(6), 1218–1230. <https://doi.org/10.1016/j.aap.2006.05.010>
- Rozin, P. (2006). Domain denigration and process preference in academic psychology. *Perspectives on Psychological Science*, 1(4), 365–376.
- Rubin, H. J., & Rubin, I. S. (2012). *Qualitative interviewing: The art of hearing data* (3rd ed.). SAGE Publications, Inc.
- Salancik, G. R., & Conway, M. (1975). Attitude inferences from salient and relevant cognitive content about behavior. *Journal of Personality and Social Psychology*, 32(5), 829–840.
- Saltz, R. F. (1987). The roles of bars and restaurants in preventing alcohol-impaired driving: An evaluation of server intervention. *Evaluation and the Health Professions*, 10(1), 5–27.
- Salzberg, P. M., & Paulsruide, S. P. (1984). An evaluation of Washington's driving while intoxicated law: Effect on drink-driving recidivism. *Journal of Safety Research*, 15(3), 117–124. [https://doi.org/10.1016/0022-4375\(84\)90022-7](https://doi.org/10.1016/0022-4375(84)90022-7)
- Sauser, W. I. (2010). Thurstone scaling. In I. B. Weiner & W. E. Craighead (Eds.), *The Corsini encyclopedia of psychology*. Wiley. <https://doi.org/10.1002/9780470479216.corpsy0996>
- Sawyer, A. G., & Howard, D. J. (1991). Effects of omitting conclusions in advertisements to involved and uninvolved audiences. *Journal of Marketing Research*, 28(4), 467–474.
- Scheck, A. M., Hoffmann, N. G., Proctor, S. L., & Couillou, R. J. (2013). Interactive journaling as a brief intervention for Level-II DUI and DWI offenders. *Journal of Alcohol and Drug Education*, 57(3), 66–85.
- Schell, T. L., Chan, K. S., & Morral, A. R. (2006). Predicting DUI recidivism: Personality, attitudinal, and behavioural risk factors. *Drug and Alcohol Dependence*, 82(1), 33–40.
- Schulte, R., Vaca, F. E., & Li, K. (2024). Adolescent parental monitoring offers protection against later recurrent driving after drinking. *Journal of Adolescent Health*, 75(2), 242–248. <https://doi.org/10.1016/j.jadohealth.2024.03.011>
- Schunk, D. H., & DiBenedetto, M. K. (2020). Motivation and social cognitive theory. *Contemporary Educational Psychology*, 60, Article 101832. <https://doi.org/10.1016/j.cedpsych.2019.101832>
- Schwartz, J., & Davaran, A. (2013). Enforcement following 0.08% BAC law change: Sex-specific consequences of changing arrest practices? *Addictive Behaviors*, 38(10), 2506–2512. <https://doi.org/10.1016/j.addbeh.2013.04.004>
- Sheehan, M., Schonfeld, C., Ballard, R., Schofield, F., Najman, J., & Siskind, V. (1996). A three-year outcome evaluation of a theory-based drink-driving education programme. *Journal of Drug Education*, 26(3), 295–312. <https://doi.org/10.2190/RPRV-7GP1-XH7F-3LHN>

- Sherif, C. W., Sherif, M., & Nebergall, R. E. (1965). *Attitude and attitude change: The social judgment-involvement approach*. Saunders.
- Sherif, M., & Hovland, C. I. (1961). *Social judgment: Assimilation and contrast effects in communication and attitude change*. Yale University Press.
- Shmueli, L. (2021). Predicting intention to receive COVID-19 vaccine among the general population using the health belief model and the theory of planned behaviour model. *BMC Public Health*, 21, 1–13.
- Shore, E. R., & Maguin, E. (1988). Deterrence of drinking-driving: The effect of changes in the Kansas driving under the influence law. *Evaluation and Programme Planning*, 11(3), 245–254. [https://doi.org/10.1016/0149-7189\(88\)90020-1](https://doi.org/10.1016/0149-7189(88)90020-1)
- Slater, M. D., Karan, D., Rouner, D., Murphy, K., & Beauvais, F. (1998). Developing and assessing alcohol warning content: Responses to quantitative information and behavioural recommendations in warnings with television beer advertisements. *Journal of Public Policy & Marketing*, 17(1), 48–60. <https://doi.org/10.1177/074391569801700106>
- Sloan, F. A., McCutchan, S. A., & Eldred, L. M. (2017). Alcohol-impaired driving and perceived risks of legal consequences. *Alcoholism: Clinical and Experimental Research*, 41(2), 432–442.
- Spencer, H. (1867). *First principles* (2nd ed.). Williams and Norgate.
- Stacy, A. W., Bentler, P. M., & Flay, B. R. (1994). Attitudes and health behavior in diverse populations: Drunk driving, alcohol use, binge eating, marijuana use, and cigarette use. *Health Psychology*, 13(1), 73–77.
- Stephens, A. N., Bishop, C. A., Liu, S., & Fitzharris, M. (2017). Alcohol consumption patterns and attitudes towards drink-driving behaviour and road safety enforcement strategies. *Accident Analysis & Prevention*, 98, 241–251.
- Strauss, A. (1945). The concept of attitude in social psychology. *The Journal of Psychology*, 19(2), 329–339.
- Stringer, R. J. (2024). Policing the drinking community: An exploration of community alcohol norms and driving under the influence enforcement (1985–2014). *American Journal of Criminal Justice*, 49(2), 255–273.
- Swenson, P. R., & Clay, T. R. (1980). Effects of short-term rehabilitation on alcohol consumption and drinking-related behaviours: An eight-month follow-up study of drunken drivers. *International Journal of the Addictions*, 15(6), 821–838. <https://doi.org/10.3109/10826088009040059>
- Symeonaki, M., Stamou, G., Kazani, A., Tsouparopoulou, E., & Stamatopoulou, G. (2024). Examining the development of attitude scales using large language models (LLMs). *arXiv*. <https://doi.org/10.48550/arXiv.2405.19011>
- Tatch, A. (2022). I did it, but...: Exploring DUI offender deviance rationalization in the digital age. *Deviant Behavior*, 43(10), 1193–1208.
- Teeters, J. B., Borsari, B., Martens, M. P., & Murphy, J. G. (2015). Brief motivational interventions are associated with reductions in alcohol-impaired driving among college drinkers. *Journal of Studies on Alcohol and Drugs*, 76(5), 700–709. <https://doi.org/10.15288/jsad.2015.76.700>
- Thurstone, L. L. (1927). A law of comparative judgment. *Psychological Review*, 34, 273–286.

- Thurstone, L. L. (1928). Attitudes can be measured. *American Journal of Sociology*, 33, 529–554.
- Thurstone, L. L. (1929). Theory of attitude measurement. *Psychological Review*, 36, 222–241.
- Utter, G. H., Young, J. B., Theard, L. A., Cropp, D. M., Mohar, C. J., Eisenberg, D., Schermer, C. R., & Owens, L. J. (2014). The effect on problematic drinking behaviour of a brief motivational interview shortly after a first arrest for driving under the influence of alcohol: A randomized trial. *Journal of Trauma and Acute Care Surgery*, 76(3), 661–670. <https://doi.org/10.1097/TA.0000000000000144>
- Valois, P., & Godin, G. (1991). The importance of selecting appropriate adjective pairs for measuring attitude based on the semantic differential method. *Quality & Quantity*, 25(1), 57–68. <https://doi.org/10.1007/BF00138756>
- Van Haperen, W., Riaz, M. S., Daniels, S., Saunier, N., Brijs, T., & Wets, G. (2019). Observing the observation of (vulnerable) road user behavior and traffic safety: A scoping review. *Accident Analysis & Prevention*, 123, 211–221. <https://doi.org/10.1016/j.aap.2018.11.021>
- Vankov, D., Schroeter, R., & Twisk, D. (2021). Can't simply roll it out: Evaluating a real-world virtual reality intervention to reduce driving under the influence. *PLoS ONE*, 16(4), Article e0250273. <https://doi.org/10.1371/journal.pone.0250273>
- Vanlaar, W., Nadeau, L., McKiernan, A., Hing, M. M., Ouimet, M. C., & Brown, T. G. (2017). Canadian drivers' attitudes regarding preventative responses to driving while impaired by alcohol. *Accident Analysis & Prevention*, 106, 160–165.
- Verplanken, B., & Orbell, S. (2022). Attitudes, habits, and behavior change. *Annual Review of Psychology*, 73(1), 327–352.
- Watling, H., & Armstrong, K. (2015). Exploring the influences of country-level factors on mature-aged women's drink driving attitudes. *Transportation Research Part F: Traffic Psychology and Behaviour*, 30, 57–65.
- Watling, H., Hooijer, J., Armstrong, K., & Watling, C. N. (2018). The influence of social factors and personality constructs on drink driving among young licenced drivers. *Transportation Research Part F: Traffic Psychology and Behaviour*, 52, 210–221.
- Weinrath, M. (1997). The ignition interlock program for drunk drivers: A multivariate test. *Crime & Delinquency*, 43(1), 42–59. <https://doi.org/10.1177/0011128797043001003>
- Wells, G. A., Shea, B., O'Connell, D., Peterson, J., Welch, V., Losos, M., & Tugwell, P. (2000). The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses.
- Wells-Parker, E., Mann, R. E., Dill, P. L., Stoduto, G., Shuggi, R., & Cross, G. W. (2009). Negative affect and drinking drivers: A review and conceptual model linking dissonance, efficacy and negative affect to risk and motivation for change. *Current Drug Abuse Reviews*, 2(2), 115–126. <https://doi.org/10.2174/1874473710902020115>
- Wells-Parker, E., Williams, M., Dill, P., & Kenne, D. (1998). Stages of change and self-efficacy for controlling drinking and driving: A psychometric analysis. *Addictive Behaviours*, 23(3), 351–363. [https://doi.org/10.1016/S0306-4603\(97\)00077-4](https://doi.org/10.1016/S0306-4603(97)00077-4)

- West, R. (2005). What does it take for a theory to be abandoned? The transtheoretical model of behaviour change as a test case. *Addiction*, 100(8), 1048–1050.
- James, W. (1897). *The will to believe and other essays in popular philosophy*. B&R Samizdat Express
- Williamson, D., Roe, S., Ferguson, D., & Dooley, N. (2018). Measuring attitudinal change: An action research project. *Irish Probation Journal*, 15, 179–195.
- World Health Organization. (n.d.). *Drink-driving*. Retrieved July 16, 2025, from <https://www.who.int/initiatives/SAFER/drink-driving>
- World Health Organization. (2004). *World report on road traffic injury prevention*. World Health Organization and World Bank. <https://www.who.int/publications/i/item/9241562609>
- World Health Organization. (2018). *Global status report on road safety 2018*. <https://www.who.int/publications/i/item/9789241565684>
- World Health Organization. (2022). *Drink-Driving: A road safety manual for decision-makers and practitioners* (2nd ed.). Global Road Safety Partnership, International Federation of Red Cross and Red Crescent Societies. <https://www.who.int/publications/m/item/drink-driving--a-road-safety-manual-for-decision-makers-and-practitioners-2022>
- Yu, J., & Shackel, R. W. (1998). Long-term change in underage drinking and impaired driving after the establishment of drinking age laws in New York State. *Alcoholism: Clinical and Experimental Research*, 22(7), 1443–1449. <https://doi.org/10.1111/j.1530-0277.1998.tb03933.x>
- Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational Psychology*, 25(1), 82–91. <https://doi.org/10.1006/ceps.1999.1016>



Chapter 8

Appendices

Systematic Literature Review

- 8.1. Search Strategy
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- 8.7. Characteristics of Included Studies
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Systematic Literature Review

The systematic review was conducted based on the principles of preferred reporting items for systematic reviews and meta-analyses (PRISMA) 2021 statement (Page et al., 2021). This review discussed attitudinal change and measurement in general, and more specifically for drink-driving. Further, available guidelines and toolkits for measurement of attitudinal change in similar fields, such as drink-driving, were reviewed. To address our research questions, we conducted a systematic content analysis of the selected articles also and incorporated thematic analysis and analysed the data.

8.1. Search Strategy

We performed a comprehensive search, concentrating on studies about DUI and related changes in attitudes and behaviours based on the PRISMA guidelines. To ensure a thorough search of recent literature related to the topic, we conducted various searches for DUI-related keywords, such as driving under the influence, impaired driving, drink-driving, drinking and driving, alcohol-impaired driving, and drink-driving. Moreover, words related to attitude/behaviour change, including terms such as attitude change, behaviour change, attitude adjustment, behaviour adjustment, behaviour modification, attitude shift, attitude transformation, and behaviour transformation, were incorporated. We also included broad change-related words like adjustment, modification, shift, and transformation to limit the search. This method helped identify diverse studies exploring changes in impaired driving attitudes and behaviours. We searched for English articles published without any time frame for publication in the following databases: PubMed, Scopus, and ISI Web of Science. The details of this search are presented in Table A.1, which presents a summary of database searches for studies on attitudinal change and drink-driving conducted on February 6, 2025.

Table A.1 Summary of Database Searches for Studies on Attitudinal and Behavioural Change and Drink-driving, conducted on 6 February 2025

Database	N° of articles
PubMed/Medline: ((“DUI” OR “driving under the influence” OR “impaired driv*” OR “drink-driving” OR “driving while intoxicated” OR “alcohol-impaired driving” OR “drink driv*”) AND (“attitud* change” OR “behaviour* change” OR “attitud* adjust*” OR “behaviour* adjust*” OR “behaviour* modification” OR “attitud* shift*” OR “behavi* shift*” OR “attitud* transformation” OR “behaviour* transformation” OR “attitude” OR “behaviour” OR “behaviour”) AND (“change” OR “adjust*” OR “modificat*” OR “shift*” OR “transformat*”))	223
Scopus: (TITLE-ABS-KEY (“attitud* change” OR “behaviour* change” OR “attitud* adjust*” OR “behaviour* adjust*” OR “behaviour* modification” OR “attitud* shift*” OR “behavi* shift*” OR “attitud* transformation” OR “behaviour* transformation” OR “attitude” OR “behaviour*”)) AND (TITLE-ABS-KEY (“DUI” OR “driving under the influence” OR “impaired driv*” OR “drink-driving” OR “driving while intoxicated” OR “alcohol-impaired driving” OR “drink driv*”)) AND (TITLE (“change” OR “adjust*” OR “modificat*” OR “shift*” OR “transformat*”)))	105
ISI Web of Science: TS= (“DUI” OR “driving under the influence” OR “impaired driv*” OR “drink-driving” OR “driving while intoxicated” OR “alcohol-impaired driving” OR “drink driv*”) AND ALL=((“attitud* change” OR “behaviour* change” OR “attitud* adjust*” OR “behaviour* adjust*” OR “behaviour* modification” OR “attitud* shift*” OR “behavi* shift*” OR “attitud* transformation” OR “behaviour* transformation” OR “attitud” OR “behavio*”)) AND TS=((“change” OR “adjust*” OR “modificat*” OR “shift*” OR “transformat*”))	385

8.2. Eligibility Criteria

Studies were eligible for inclusion in this systematic review if they met the following conditions: (1) represented primary research articles reporting original results; (2) employed quantitative approaches to assess the impact of a variable on another, an example being risk assessment studies; (3) encompassed interventional studies that examined the effect of a policy, programme, or intervention on a specific outcome; (4) were published in peer-reviewed journals, thus guaranteeing their credibility and academic integrity; (5) explicitly examined the impact of a variable on another; (6) dealt with drinking and driving or DUI; (7) clearly stated how behaviour or attitudes were changed as a consequence of an intervention or programme; (8) mentioned a concrete intervention and its impact on behaviour or attitude changes; and (9) presented considerable evidence on the methods used to change behaviour or attitudes towards DUI, including an assessment of the effectiveness of the intervention as determined by the individuals who implemented it.

Papers were excluded based on the fulfillment of at least one of the following: (1) review papers, which lack original data or new experimental findings; (2) theoretical or conceptual papers that do not present empirical data or quantifiable evidence; (3) research conducted purely based on qualitative data with no material outcomes or impact evaluations; (4) documents that were not published in peer-reviewed journals, such as editorials, and opinion pieces; (5) duplicate publications, and (6) publications whose data was used in another study; or (7) theoretical papers with no practical empirical analysis.

8.3. Data Collection

Two reviewers (IMN and AA) used standardized forms to extract data from the included studies. Any differences during data extraction were sorted out by discussion in meetings, and where required, a third reviewer was consulted to reach a consensus. The data extracted represented a broad scope of study information, such as authorship, publication year, study design, sample size, characteristics of the participants, comparison groups, and geographical location. Additionally, the reviewers recorded the particular tools and interventions employed to reduce DUI and the theoretical orientations underlying these approaches. Moreover, we extracted the data available in papers on research design, outcome measures, main findings, and policy implications, to facilitate detailed analysis and be able to see the big picture of how the tools and the interventions implemented in these studies assessed the change in behaviour and attitude towards DUI in different settings.

8.4. Screening and Selection of Records

The articles were retrieved using Rayyan QCRI and screened for inclusion into the resources of this platform (Ouzzani et al., 2016). After removing duplicates, one researcher (IMN) screened the titles and abstracts, excluding off-topic ones and including relevant ones to be screened further for eligibility. The entire publication of all the chosen studies was then thoroughly examined by two researchers (AA and IMN), and both independently decided on inclusion or exclusion. Differences between the reviewers were resolved through subsequent discussions between AA and IMN. Before resolving discrepancies, the inter-rater reliability between the two reviewers, measured using Cohen's kappa, was 0.82, indicating substantial agreement.

8.5. Quality Assessment for Individual Studies

Two reviewers (IMN and AA) applied the Newcastle-Ottawa Scale independently to determine the quality of each selected study, which is a tool for quantifying the methodological quality of observational studies. The Newcastle-Ottawa scale awards a maximum of 9 stars for each survey, four stars for correct participant and control selection, two stars for comparability of groups based on study design and analysis, and three stars for correct identification of exposure in the case and control groups. Studies with 9 stars were graded as high quality, and those with seven or eight stars were graded as medium quality. Any discrepancy regarding the quality grade was resolved by discussion between the reviewers. The grading was conducted on February 15, 2025, and the results are presented in Table 1 (Luchini et al., 2017; Wells et al., 2000).

8.6. Study Selection

Our search of three databases resulted in 713 records from PubMed (223), Web of Science (385), and Scopus (105). We removed 213 duplicate records, screened 500, and excluded 344 on relevance. We subsequently gathered and assessed the complete texts of 156 studies for inclusion and excluded 111 based on some criteria: 18 for lacking attitudinal or behavioural change as a subject, 25 for lacking any connection to alcohol DUI, 21 for not being original research, 25 for not mentioning DUI interventions, 15 for their purely about health sides of alcohol consumption, and 7 for covering general traffic safety rather than DUI. This led us to the final data set of 45 studies to be included in the final review. Some studies employed a variety of interventions. Since our primary concern in the survey was attitudinal and behavioural changes following drink-driving incidents, we identified and chose the relevant measurement tools and intervention tools to be further analysed.

8.7. Characteristics of Included Studies

Studies chosen for designs, observational studies, cross-sectional studies, mixed-methods studies, and cohort analyses. They were conducted in various geographic locations and settings, including universities, correctional facilities, emergency departments, college settings, and nationwide programmes across different regions such as the USA, Canada, Israel, Japan, and Taiwan (Clapp et al., 2005; Domrev-Benkovich et al., 2017). Data sources ranged from police reports, official reports of DUI, hospital records, and court records to self-reported behaviour questionnaires, psychological assessments, and standardized screening tools such as the alcohol use disorders identification test (AUDIT), CAGE questionnaire, and ASSIST (Bernat et al., 2004; Huang et al., 2020). Many studies integrated theoretical frameworks such as behavioural change theories, social norms theory, social learning theory, the theory of planned behaviour, and behavioural economics to assess the impact of interventions (Baird et al., 2017; Carey et al., 2015).

Interventions in the studies were categorized based on the tools used. Educational and training tools included prevention workshops, home study courses, public education campaigns, victim impact panels, responsible service training programmes, and social media interventions (Badovinac, 1994; Bonar et al., 2022; Swenson & Clay, 1980). These interventions were designed to heighten awareness of the risks of DUI and promote more responsible driving habits, particularly among young or first-time offenders. They were conducted in various geographic locations and motivational counselling tools focused on individual psychological assessments, motivational interviewing, counselling techniques that encouraged self-regulation and responsible alcohol consumption, and family based interventions (Brown et al., 2012; Teeters et al., 2015; Schulte et al., 2024).

Legal and policy enforcement tools encompassed changes in DUI laws, reductions in blood alcohol concentration (BAC) limits, administrative license revocation (ALR) policies, and enhanced DUI checkpoints (Brown et al., 2012; Teeters et al., 2015). Screening and assessment tools included validated instruments like the AUDIT, the CAGE questionnaire, and behavioural triage systems designed to assess an individual's risk level and inform appropriate interventions (Cheng et al., 2021; Moore et al., 2008). Furthermore, technology-based interventions, including alcohol interlock devices and virtual reality driving courses, were adopted to modify the driving behaviour and minimize cases of DUI (Assailly & Cestac, 2014; Vankov et al., 2021; Nikolaou et al., 2022).

8.8. Risk of Bias Assessment

Newcastle-Ottawa quality assessment scale (NOS) quality assessments of the studies being examined demonstrated broad variability in methodology, specifically regarding study design rigor, selection criteria, and outcome assessment. More rigorous studies featured well defined processes for participant selection, sufficient comparability between intervention and control groups, and strong outcome measures, resulting in more credible findings (Assailly & Cestac, 2014; Bingham et al., 2010; Bonar et al., 2022). These studies utilized controlled interventions, including short motivational interviewing (Brown et al., 2010; Brown et al., 2012), computerized resources individualized for behaviour change (Kim & Kim, 2016), and guaranteed lengthy follow-up intervals to consider durable changes in DUI behaviour. Conversely, moderate-quality studies had drawbacks such as poor exposure characterization, very high non-response rates, or failure to control sufficiently for confounding effects, thus increasing the risk of bias (Polacsek et al., 2001; Rothschild et al., 2006).

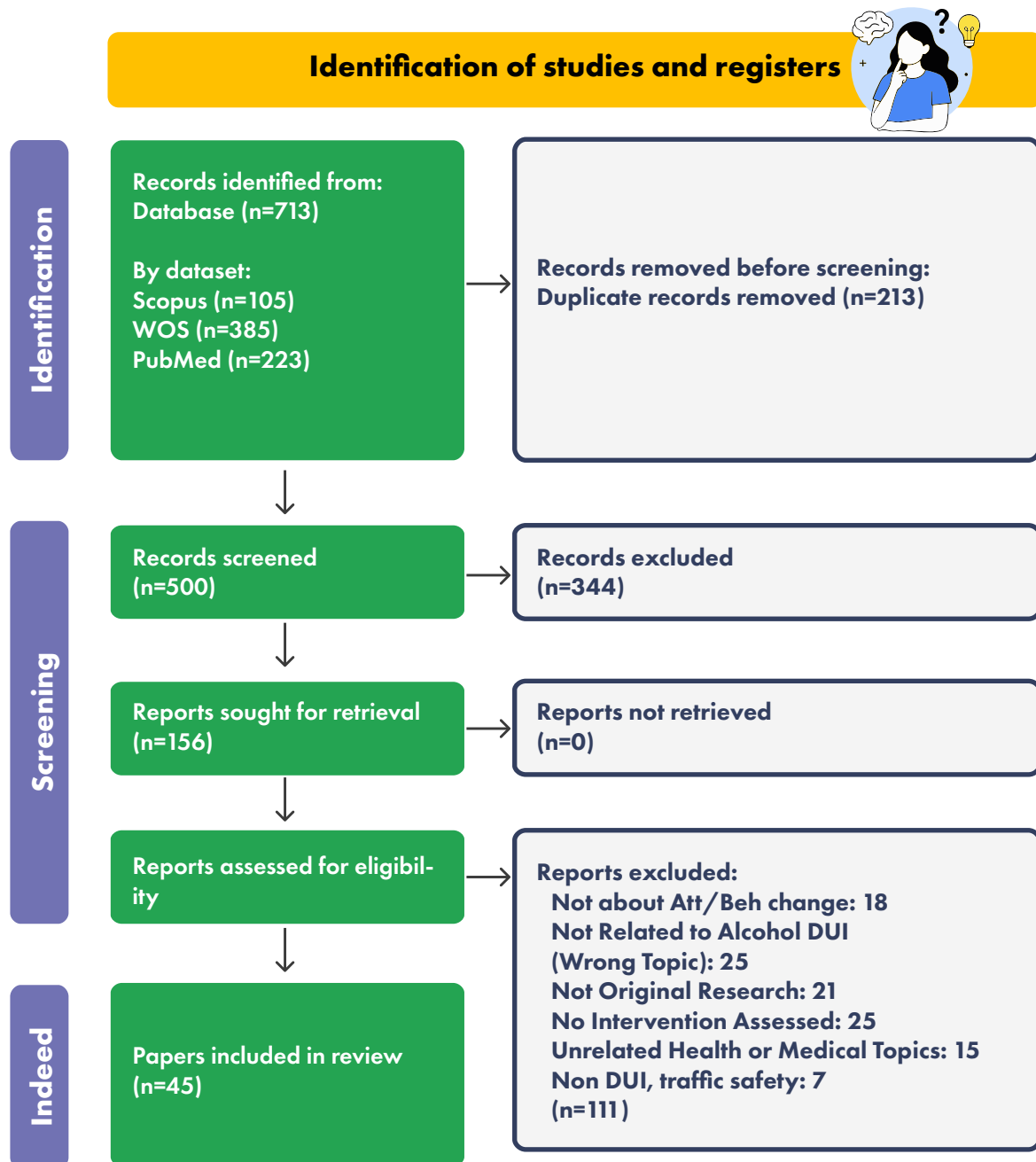
The risk of bias was especially evident in research based primarily on self-report measures with no objective validation and could most likely lead to social desirability bias (Jewell & Hupp, 2005; Moon et al., 2019). Furthermore, research with brief follow-up durations exhibited less reliability in credibly reporting long-term changes in behaviour following the intervention (Markl, 2016; Negi et al., 2020). Research designs that lacked proper statistical controls manifested a high likelihood of bias and therefore had limited generalizability of their results (Clapp et al., 2005; Reznik et al., 1984). The NOS rating indicates the weight assigned to methodological rigor in evaluating DUI interventions and the priority assigned to standardized, validated measures to increase reliability and comparability across studies.

A total of 45 studies were selected for the final analysis. The overall total sample size (N) of the studies that reported exact numbers of participants was 63,656, with women representing around 36.35 per cent of the overall sample. The weighted mean age of the participants is 28.096. Having this extensive dataset allowed the use of thematic analysis and systematic review, which guided the formulation of answers to research questions (Figure 9).

The selected studies span four decades from 1980 to 2025 and show continued scholarly interest in drink-driving (DUI) interventions. The earliest study by Swenson & Clay was in 1980, and the most recent study by Moon et al. (2025). The time period confirms shifting societal norms towards DUI and the development of intervention approaches with time.

The duration of publication time indicates ongoing scholarly and policy interest in DUI interventions. The period between 1984 and 2025 mixes the initial research with some recent developments, which indicates an evolving field receptive to technological advancement and changes in social norms. The variation in study designs, measurements, and theory models also indicates the multifaceted approaches in solving the problems on DUI. The systematic review provides a solid foundation for effectiveness evaluation of the interventions and policy formulation.

Figure A.1 PRISMA Flow Diagram Illustrating Study Selection Process for Systematic Review on Assessing Attitudinal and Behavioural Change in Drink-Driving, Based on (Page et al., 2021)



The data collected and the final article are presented in a table 1, where each column addresses a component of the studies. The table starts with the name of the authors, and the year of publication, study design and tools used. Additionally, the table identifies the interventions implemented to prevent DUI.

The other columns indicate sample size, characteristics, and comparison groups, with information on participant numbers, demographics, and control groups, along with where each study took place. The analytic or statistical methods are indicated in the methodology column, and theoretical approaches from which the interventions were derived are indicated in the theories used to reduce DUI column. The table also shows the outcome measures used to determine the effectiveness of the interventions, summarizes the key findings, and states the policy implications derived from the findings. Finally, the NOS Score gives the methodological quality of each study.

Table A.2 Details of Included Articles and Their Newcastle-Ottawa (NOS) Score, N=Number of participants (Women %); Mean age=Mean of age years; Subgroup Analysis: G =(Gender): The difference (p=Number) or NS (No Significant differences); Age: difference (p=Number) or NS

Authors	Publication year	Study design	Tools used to reduce DUI	Interventions used to reduce DUI	Sample size, characteristics, comparison groups	Location (geographic and region)	Methodology	Theories used to reduce DUI	Outcome measures	Key findings	Policy implications	NOS score
Swenson & Clay	1980	Follow-up study	Prevention workshops, home study	Therapy workshops, home study course	N = 436 (15%); 36.5 years; G = NS; Age = NS	Phoenix, Arizona	Repeated measures ANOVA analysis	Behavioural change, social learning	No significant improvement in drinking behaviours	Alcohol consumption, drinking-related behaviours	Need for longer-term rehabilitation programmes	6
Reznik et al.	1984	Non-randomized cohort Study	Public education campaign	Awareness campaigns	N=443 (43%); 19.4 years; G = NS; Age = NS N = 454 (45%); 20.1 years; G = NS; Age = NS	Wollongong, New South Wales, Australia	Surveys, traffic data analysis	Behavioural change theory	Traffic accidents, DUI convictions, surveys	Significant reduction in accidents; mixed survey results on attitudes (more effect on heavy drinkers)	Increased awareness; support future interventions	7
Salzberg & Paulsruide	1984	2x3 factorial evaluation	Random sampling of DWI offender records	New legal provisions for DWI offenses	Different studies rounded up to: N=13,752 (21%); 32.5 years; G = NS; Age = p < 0.05	Washington State, USA	Cohort comparison, statistical analysis	Behavioural change, deterrence theories	Alcohol-related violations, accidents	Increased DWI violations post-law, suggests lack of deterrent effect	Reevaluate legal provisions to ensure deterrence effectiveness	6
Connors et al.	1986	Randomized controlled trial	Behavioural self-control techniques	Individualized vs. standard behavioural	N=67 (7.5%); 32 years; G = NS; Age = NS	Urban community mental health center	Randomized assignment, factorial design, follow-up.	Self-control principles	Recidivism rates, knowledge, attitudes	Individualized treatment improves DUI avoidance.	Tailored interventions may reduce DUI recidivism effectively.	8
Shore & Maguin	1988	Time-series analysis	Legal changes, media campaigns	DUI law reform, penalties, media awareness	N = 63 (22%); Mean age = 39.2 years; Gender = NS; Age = NS	Kansas, USA	ARIMA modeling, economic adjustments	Deterrence theory	Fatal accident rates	20.1% reduction in fatal DUI crashes	Stricter DUI laws reduce fatal accidents	7
Loxley et al.	1992	Cross-sectional survey	Random breath testing (RBT)	Public education campaigns	N=832; 19.6 years; 50%; G = NS; Age = NS, total respondents; 499 WA, 333 NSW, 119 under 25	New South Wales and Western Australia	Surveys conducted in homes; structured interviews	Deterrence theory	Self-reported drinking and driving behaviour	NSW drivers more deterred than WA drivers	Implement RBT; enhance education initiatives	7
Badovinac	1994	Quasi-experimental	Panel presentations	Alcohol and drug awareness programmes	N=108 (0%); 30.5; G = NS; Age = NS	Canada, correctional facilities	Nonparametric statistics, SPSS used	Behavioural change theories	Attitudes, intentions, empathy assessed	Positive shifts in attitudes, intentions seen	Suggest further education on drinking-driving prevention	8
Sheehan et al.	1996	Longitudinal evaluation of program	Twelve lesson program	Training on alternative driving strategies	N=1774 (59%);17.0 years; G: NS; Age: NS	Queensland, Australia	Randomly assigned control and intervention schools with follow-ups.	Ajzen and Madden's planned behaviour	Drink driving behaviour changes	Reduction in drink driving behaviours across both groups; passenger behaviour improved in intervention group.	Emphasizes early intervention in education for drink driving among youth.	9
Weinrath	1997	Non-randomized study	Educational programmes	Community outreach, law enforcement initiatives	N = 200 (50%); 34.5 years; Gender: G = p < 0.05; Age = NS	Urban areas in the Midwest USA	Qualitative and quantitative analysis	Behavioural change theories, social learning theory	DUI rates, recidivism	Increased awareness decreased DUIs	Support for stricter DUI laws	6
Lang et al.	1998	Quasi-experimental	Training, matching	Responsible service training	N=3191 (71%); Mean age = 27.1 years; G = p < 0.001; Age = p < 0.01	Fremantle, Western Australia	Surveys, observational methods	Social learning theory	Blood alcohol levels, surveys	Improved service practices, reduced drunkenness	Need for ongoing training and policy integration	8
Slater et al.	1998	Experimental study	Alcohol warnings in beer ads	Behavioural recommendations, quantitative information in warnings	N = 432 (50%); 35.1 years; G = NS; Age = p < .01 stratified by drinking level	Larimer County, Colorado, USA	Randomized exposure to warning types	Risk perception, persuasion theories	Recall, risk perception, believability	Quantitative warnings lowered believability but improved recall; DUI warning best received	Supports targeted warnings in ads but questions believability	7

Wells-Parker et al.	1998	Cohort study	Education, counselling, legal actions Self-efficacy and motivation to change (stage of change)	Rehabilitation, probation, treatment programmes	N = 210 (16%); 34.2 years; G = NS; Age = NS	Mississippi, USA	Quantitative analysis, factor analysis, reliability analysis, regression analysis, correlational analysis.	Behavioural change theories	Recidivism, behaviour change	Effective: mandatory intervention programmes, motivational interviewing, behavioural interventions Less effective: general education, non-specific counselling.	Support for combined interventions	5
Yu & Shacket	1998	Longitudinal survey	Youth alcohol surveys	Legal drinking age laws	N = 1811 (46.9%); 18.5 years; G = p < 0.01; Age = p < 0.01	New York State, USA	Five surveys conducted over 14 years	Social norms theory	Alcohol use, impaired driving rates	Significant decrease in underage drinking rates	Support for maintaining and enforcing laws	9
Polacsek et al.	2001	Quasi-experimental study	DWI school, victim impact panels	DWI education and emotional support	N=813 (25%); 31 years; G = NS; Age = NS	Bernalillo County, NM	Follow-up interviews and records analysis	Stages-of-change model	Recidivism rates, stages of change	No significant difference in outcomes	Adoption of combined intervention approaches	6
Bernat et al.	2004	Pooled analysis of 18 states	0.08 BAC laws and ALR policies	Lowered BAC limit from 0.10 to 0.08	N=NS (19 states fatal crashes rates)(NS%); Mean age = Not specified; G = NS; Age = NS	United States, multiple regions	Poisson regression modeling	Deterrence Theory, social norms theory, theories of social influence, health belief model, theory of planned behaviour	Fatal traffic crash rates	5.2% reduction in fatal crashes	Support for implementing BAC laws and ALR policies	8
Greenberg et al.	2004	Cohort study	Public information campaigns	Therapeutic (Clapp et al., 2005) treatment court	N=273 (NS); Mean age = Not provided; G = NS; Age = NS 273 repeat DUI offenders	Los Angeles, California	Cumulative logit regression analysis	Behavioural control theories	Frequency of alcohol-impaired driving	Higher risk perceptions reduce impaired driving	Enhance moral and social norms against DUI	8
Clapp et al.	2005	Quasi-experimental comparison	Social marketing, media advocacy	Increased law enforcement and DUI checkpoints	N=4832 (53%); 22 years; G = p < 0.01; Age = p < 0.01 students from two universities	US/Mexico border region	Interviews, comparison of pre/post data	Deterrence theory	Self-reported DUI incidents, perceived risk	Significant reduction in DUI at intervention university	Enhance DUI prevention in college settings	8
Jewell & Hupp	2005	Experimental, with control groups	Fatal vision goggles, videos	Video presentations, experiential learning	N=251 (76%); 19.5 years; G = p = .03; Age = NS College students, various drinking statuses	University campuses, USA	Optimize funding to maximize impact in prevention programmes	Social norms, behaviour change	Attitudes and behaviours on drinking and driving	Random assignment, comparisons of groups	Optimize funding for effective prevention programmes and interventions.	7
Lange et al.	2006	Nonrandomized study	Group messaging, rewards	Attitude change, driver cues, support norms	N=1,412 (57.8%); 20.37 years; G = NS; Age = NS	San Diego, California	Logistic regression; stratified analyses	Social norms, behavioural economics	BrAC levels, perceptions of designated drivers	Drivers had lower BrACs; norms affected drinking behaviour	Promote designated driver initiatives; enhance group support	8
Rothschild et al.	2006	Field experiment	Discount coupons	Road crew ride service	N=710 (34%); 21-34 years; G = p < 0.01; Age = NS	Wisconsin, USA	Pre- and post-test analyses conducted.	Social marketing and community engagement	Number of rides taken, self-reported behaviour	Reduced alcohol-impaired driving incidents noted.	Promote community-based interventions for DUI.	6
Moore et al.	2008	Quasi-experimental	MAST (michigan alcoholism screening test), CAGE (a four-item screening tool), Readiness to change questionnaire	Cognitive-behavioural therapy	N=63; 39.2 years; 22%; G = NS; Age = NS Repeat DUI offenders, court-ordered	Florida, USA	Surveys, statistical analysis, follow-ups	Stages of change, self-efficacy	MAST scores, self-efficacy, readiness to change	High alcohol problems among participants; treatment effective	Supports treatment programmes for repeat offenders	7
Desapriya et al.	2009	Quantitative analysis	Lowered BAC limits	Legislative changes	N=16,354 (35%); 30.7 years; G = p<0.01; Age = p<0.05	Japan, Nationwide	Logistic regression analysis	Deterrence theory	Alcohol-related crashes	Significant reduction in alcohol-related crashes	Support stricter BAC laws	8
Bingham et al.	2010	Efficacy study	Web-based, computerized feedback	Four tailored online sessions targeting alcohol use	N=1,137 (59%); 18.1 years; G = p < .052; Age = NS	University of Michigan, USA	Randomized control trial; surveys and tests	Motivational Interviewing and personal normative feedback	Change in drinking attitudes and behaviours	Positive change in drinking attitudes; reduced consumption	Support for digital interventions in preventing DUI	9
Brown	2010	Randomized controlled trial	Brief motivational interviewing (BMI)	Alcohol intervention sessions	N=197 (14%); 45.0 years; G = NS; Age = NS	Quebec, Canada	Randomization, statistical analysis, follow-ups	Motivational interviewing	Risky drinking days, biomarkers	BMI reduced risky drinking significantly	Supports BMI as DWI intervention strategy	9

Dowling et al.	2011	Mixed-methods study	Telephone surveys and focus group discussions	Education, enforcement, community programmes	N=865 (ages 18–24); Mean age = not provided; G = NS; Age = NS	New York State, diverse regions	Surveys across various demographics, focus groups	General deterrence, behavioural change	Incidents of drinking and driving, driver behaviour	High prevalence of drinking and driving among participants	Innovative strategies needed to address modern DUI challenges.	8
Brown et al.	2012	Randomized controlled trial	Brief motivational interviewing	Brief motivational interviewing (BMI), information-advice control	N=184 (10.3%); 40.3 years; G = NS; Age = p < .001	Quebec, Canada	Double-blind; three follow-ups	Motivational interviewing	% risky drinking days; alcohol biomarkers	Younger, ambivalent participants improved significantly	Target interventions for specific demographics	7
Scheck	2013	Non-randomized study	Interactive journaling, educational programmes, combined treatment approaches, assessment tools (e.g., driver risk inventory-II), anonymous evaluation	Behavioural strategies, educational content, interactive journaling, group sessions, comprehensive treatment plans, feedback and assessment	N=872 (17.3%); Mean age = 36.5 years; G = NS; Age = p < .0001	USA, various states	Pre- and post-test assessment	Social learning, behaviour change	Knowledge & attitudes, behaviour	Significant increase in knowledge and attitudes	Expand interactive journaling in DUI education programmes	7
Schwartz & Davaran	2013	Panel data analysis	Specialized DUI enforcement units	0.08% BAC law implementation	N=24 states (NS); 21 – 64 years; G = NS; Age = NS	United States, 24 states	Fixed-effects regression models	Social control theory	DUI arrest rates, self-reported behaviour	Increased DUI arrests for both genders; more for females	Stricter BAC laws and targeted enforcement needed	7
Assailly & Cestac	2014	Observational study	Alcohol interlock devices Diamond of change model	Six-month rehabilitation program	N=409 (12%); 36.9 years; G = NS; Age = NS	Haute-Savoie, France	Comparison of two groups	Trans-theoretical model (TTM)	Recidivism rates, BAC levels	Interlock programmes reduce recidivism	Supports interlock program expansion	8
Utter et al.	2014	Randomized controlled trial	Motivational interviewing	Brief intervention counselling	N = 200 (50%); Mean age = 30 years; Gender: G = NS; Age = NS	Sacramento County, California	High follow-up rate, intention-to-treat analysis	Motivational interviewing	AUDIT scores, treatment-seeking	No significant difference in drinking behaviour between groups	Need for effective DUI interventions in the justice system	8
Carey et al.	2015	Quasi-experimental	Behavioural triage system	Track 1 and track 2 interventions	N=1,861 (15%); 36.6 years; G = p < .001; Age = p < .001	San Joaquin County, CA	Longitudinal analysis	Behavioural economics	New DUI convictions, accidents, compliance	Participants showed lower conviction rates than controls	Enhance DUI programmes using robust treatment methods	7
Teeters et al.	2015	Randomized controlled trial	Brief motivational interventions brief young adult alcohol consequences questionnaire (BYAACQ)	Personalized feedback, education	N = 84 (67.1%); 23 years; G = NS; Age = NS	Various U.S. colleges	Repeated-measures mixed modeling analyses	Motivational interviewing	Alcohol-impaired driving rates	Mobile phone–based BMIs significantly reduce DUI incidents among students.	Support for implementing BMIs in college settings.	8
Kim & Kim	2016	Experimental study	Customizable avatars	Virtual simulations and scenarios	N=111 (15.3% women); Mean age = 19.4 years; G = NS; Age = NS	University setting, USA	Pre-post design with questionnaires	Social cognitive theory	Behavioural intention, self-reported measures	Virtual environments impact drinking decisions	Encourage avatar use in DUI prevention	8
Markl	2016	Quasi-experimental	Self-report questionnaires	Educational program focused on DUI awareness	N=269 (43.5%); 16.99 years; G = NS; Age = NS	Slovenia	Repeated measures ANOVA; surveys pre/post	Theory of planned behaviour (TPB)	Attitudes, intentions, self-reports	Program improved attitudes toward DUI	Recommend similar programmes in schools	7
Baird et al.	2017	Randomized controlled trial	Alcohol, smoking and substance Involvement screening test (ASSIST), Impaired driving scale (AID)	Telephone-based counselling (brief intervention BI)	N=407 (36.6%); 29 years; G = NS; Age = NS mostly injured individuals; BI vs. HS (Health services) groups	Emergency departments, USA	Generalized linear mixed effect	Motivational interviewing	Changes in drinking and driving behaviours	Reported decreased DUI behaviours in both groups	Target EDs for DUI interventions	5
Domrev-Benkovich et al.	2017	Cross-sectional survey	Educational campaigns	Designated driver promotions	N=59 (34%); 23.37 years; G = NS; Age = NS health science students; research and review groups	Ben-Gurion University, Israel	Quantitative data analysis	Public health theory	DUI events, drinking habits	42% drank and drove; no major differences between groups	Enhance driving laws; promote education campaigns	7
Moon et al.	2019	Cross-sectional analysis	Alcohol consumption surveys	Social support interventions	N=119 (28%); 36 years; G = NS; Age = NS DWI history; 59 correctional facility, 60 community	Bexar County, Texas, USA	Hierarchical regression analysis	Main-Effects, buffering, optimal matching models	Motivation to change scales (visual analog)	Social support boosts motivation; recovery-specific is effective	Promote tailored social support in treatment programmes	7
Martinussen & Sørhøvd	2019	Experimental study	Go/no-go association task (GNAT)	Approach/avoidance training	N=57 (0%); 22.6 years; G = NS; Age = NS	Denmark (University Campus)	Pre-test and post-test with GNAT and AAT	Implicit attitude change theory	Implicit attitudes toward DUI	Implicit attitudes towards DUI became more negative	Enhance implicit attitude training tools	7
Negi et al.	2020	Pre- and post-campaign survey	Mass media campaigns, checkpoints	Public awareness, educational ads	N=1442; 34.5; 15%; G = NS; Age = p < 0.05. pre- and post-campaign	Addis Ababa, Ethiopia	Weighted data analysis, logistic regression	Social cognitive theory	Knowledge, attitudes, behaviour changes	Significant improvement in knowledge and attitudes	Strengthen public health campaigns to reduce DUI	7

Cheng et al.	2021	Observational study	Screening, brief Intervention, and referral to treatment SBIRT, alcohol use disorders identification test (AUDIT)	SBIRT-based intervention	N=231 (2.2%); 45.7 years; G = NS; Age = NS DUI repeat offenders	Taipei City, Taiwan	Cox regression, follow-up assessment	SBIRT, behavioural theories	DUI recidivism, psychological symptoms	Longer intervention duration reduces recidivism	SBIRT interventions for DUI offenders to effectively reduce recidivism	9
Vankov et al.	2021	Quasi-experiment	Virtual reality (VR) software	VR driving simulation	N = 137 (72% Women); 20.93 years; G = NS; Age = NS	Australia, Queensland	Pre and post-test design	Behaviour change theories	Self-reported DUI behaviour and intention	No significant change in DUI behaviour or intention	Need for evidence-based VR interventions	8
Bonar et al.	2022	Randomized controlled trial	Social media interventions	Social media + incentives, social media only, control	N=955 (54.5%); 20.4 years; G = NS; Age = NS	United States, college settings	Randomized trial, online surveys, participant incentives, data analysis techniques.	Behavioural change theories	AUDIT-C score, alcohol consequences	Group interventions reduced drug use but not alcohol	Encourage scalable social media for DUI interventions	9
Huang et al.	2023	Cohort study	Cutting down, annoyance by criticism, guilty feeling (CAGE) , and eye-openers Visual analog scale (VAS)	6-month vs. 12-month treatment	N=259 (2.3%); 46.7 years; G = NS; Age = NS	Taipei, Taiwan	Statistical analysis with hazard ratios and models	Behavioural change, recidivism theories	Re-offense rates, psychological assessments	12-month treatment reduced re-offense rates compared to 6-month.	Encourage longer alcohol treatment programmes for effective DUI prevention.	8
Schulte et al.	2024	Longitudinal study	Parental monitoring knowledge	Family-based interventions	N=5,261 (48.5%); 19.09 years; G = p < .001; Age = p = .003.	United States, national	Data from NLSY97, logistic regression analysis	Social learning theory	Recurrent driving after drinking	Higher PMK linked to lower DUI in young adults	Enhance parental monitoring to reduce DUI rates	9
Moon et al.	2025	Quantitative study	DRIE LoC questionnaire	IRC rulers for motivation	N=59 (16.9%); Mean age = 39.95 years; Gender = NS; Age = NS	Community and correctional facilities, USA	Hierarchical regression analysis	Motivation and control theories	Motivation to change; LoC scores	Higher motivation in correctional group; LoC impacts change	Enhance motivation-based interventions for DUI offenders	5



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