

Environmental, Developmental and Informational Interventions: A Novel Prevention Taxonomy to Better Organise and Understand Substance Misuse Prevention

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Abstract

Descriptions of prevention as primary or secondary, or universal, selective and indicated, set out the different forms that drug misuse prevention can take. However, these classifications are limited, as they do not consider how prevention interventions work. For example, the function of some prevention programmes is to improve the developmental trajectory of young people through the enhancement of social competence and social skills. In this paper I set out a framework for describing prevention that brings together both form and function into a novel prevention taxonomy. It is argued that a re-appraisal of mainstream prevention theories leads to a prediction of the relative effectiveness of functional types of prevention. This prediction specifies that environmental prevention is generally more effective than developmental prevention, which in turn is generally more effective than informational prevention. The main advantage of this new taxonomy is that a matrix combining the form and function dimensions of prevention can be used to: identify and map out prevention strategies, consider where research evidence is present and where more is needed, and evaluate the relative effectiveness of different categories and components of prevention for specific health and social issues. Such evaluations would provide empirical evidence as to whether the different categories of prevention are related to outcomes or processes of prevention in ways that suggest the value of the taxonomy for understanding and increasing the impact of prevention science.

Keywords: Prevention • Classification • Taxonomy

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The field of drug prevention sits within the new field of prevention science, a multi-disciplinary endeavour to consider aetiology, epidemiology, intervention design, effectiveness and implementation for the prevention of a variety of health and social problems. These include, but are not limited to, substance misuse, sexual health and teenage pregnancy, HIV/AIDS, violence, accidents, suicide, mental illness, delinquency, obesity, diet/nutrition, exercise, and chronic illness. A common characteristic is the importance of behaviour as a determinant of ill-health and health inequality.

Prevention science is a new and growing multidisciplinary scientific field, with strong coverage in the United States, including a scientific society, methodology groups and networks, and a growing impact journal. The recent establishment of the European Society for Prevention Research (EUSPR; www.euspr.org) and the European Commission funded Science for Prevention Academic Network (SPAN; www.span-europe.eu) is seeking to emulate this strong coverage across Europe. In line with the categories of prevention set out by the European Monitoring Centre for Drugs and Drug Addiction (EMCDDA), the EUSPR aims to “*advance the science base of environmental, universal, selective and indicated prevention aimed at improving human health and well-being and addressing health inequalities.*”

If we are to undertake systematic and coherent research for prevention, covering environmental, universal, selective and indicated aspects, then it is important to have a strong organising framework, or classification system, for prevention science. However, my personal view is that in following the EMCDDA in listing environmental alongside universal, selective and indicated prevention, we risk conflating two important dimensions: the form and function of prevention (Foxcroft, 2014). As demonstrated by American architect, Louis Sullivan (Sullivan, 1896), in the original use of the phrase ‘form and function’, form was specified to follow function:

It is the pervading law of all things organic and inorganic, of all things physical and metaphysical, of all things human and all things superhuman, of all true manifestations of the head, of the heart, of the soul, that the life is recognizable in its expression, that form ever follows function. This is the law (p. 408).

Sullivan's maxim perseveres, and is just as relevant to prevention in the 21st century as it was to design in the 19th century. Accordingly, I propose that prevention is best conceived and classified from a functional perspective.

The Development of Prevention Classification

In 1983, Robert Gordon, in his role as the Special Assistant to the Director at the United States National Institutes for Health, wrote a letter to the journal *Public Health Reports* (Gordon, 1983) challenging the categories of primary and secondary prevention that had been widely used since the 1957 report of the Commission on Chronic Illness (Commission on Chronic Illness, 1957). Gordon recognised that the categories of primary and secondary prevention, whilst still useful in the context of infectious disease with a clear biological origin, were less useful when considering chronic conditions that lacked a distinct biological manifestation. Primary prevention was defined as "...*practised prior to the biologic origin of disease...*" and secondary prevention as "...*practised after the disease can be recognised, but before it has caused suffering and disability...*" (p. 107). Given that epidemiological research was drawing out links between behavioural and social risk factors and health problems, Gordon wrote that it was time to move on from the biomedically based categories of primary and secondary prevention: "*As more is learned about multifactorial chronic diseases with long periods of latency, the concept of biologic origins of disease becomes progressively more diffuse.*" (p. 107).

Instead, Gordon suggested that prevention should be classified according to the population groups in which there is optimal application. The most applicable type of universal prevention is a preventive measure that is desirable for everyone and can be advocated confidently for the general public. On the other hand, where groups of people are known to be at higher risk, and where the balance of risk against benefits and costs from prevention indicate that universal approaches are not attractive, selective prevention, which target preventive measures to higher risk groups, is more appropriate. Indicated prevention is further along the continuum toward treatment, and is defined as prevention targeted at individuals who have been personally identified as being at increased risk for poor health.

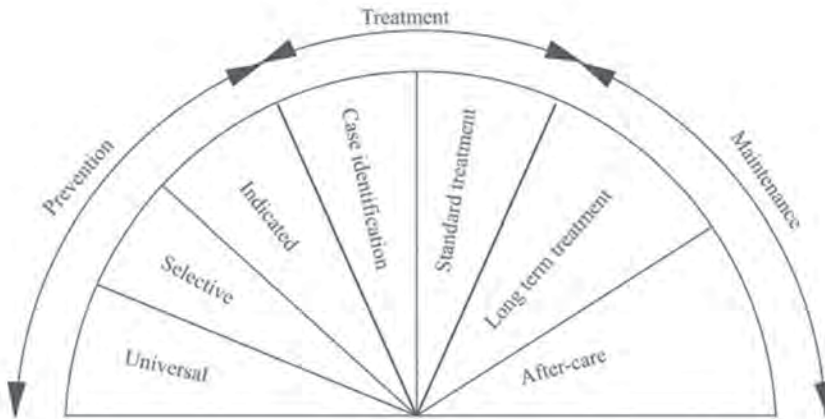


Figure 1: Intervention forms within prevention, treatment and maintenance of disorders (Mrazek & Haggerty, 1994).

In 1994, the United States Institute of Medicine (IoM) of the National Academies adopted the classification system proposed by Gordon (Gordon, 1983), namely universal, selective and indicated prevention (see Figure 1) (Mrazek & Haggerty, 1994). More recently, in 2009, the IoM looked again at the definition and classification of prevention, this time for a report titled Preventing Mental, Emotional and Behavioural Disorders in Young People (National Research Council and Institute of Medicine, 2009). In this report, the authors considered alternative prevention classification systems, including the older notions of primary and secondary prevention, as well as more recent developments, such as personalised medicine, that identify risk to individuals based on genomic analysis. The report concludes that the original 1994 IoM classification system (Mrazek & Haggerty, 1994), largely based on Gordon's 1983 proposed categories of universal, selective, and indicated prevention (Gordon, 1983), provides the best available system for classifying preventive interventions prior to the onset of disorders.

Prevention Forms and Functions

Classifying prevention according to the population level in which there is optimal application, namely universal, selective or indicated prevention, provides a useful clarification on the form or configuration that prevention takes. Universal prevention takes the form of a whole population approach, where risk of developing a disease or disorder is typically diffuse and preventive interventions are not based on level of risk. Selective prevention measures are targeted toward sub-groups whose risk is significantly higher than average, and indicated prevention measures are targeted to high-risk individuals who are identified as having minimal but detectable signs, symptoms or markers foreshadowing a disorder.

However, there remains some conceptual confusion regarding particular prevention approaches, specifically where these approaches fit within the universal/selective/indicated classification system (Foxcroft, 2014). For example, environmental prevention is often distinguished as a separate class of prevention pertaining to public policies, such as laws, regulations, rules and taxation levels. Prohibiting drugs, restricting advertising of potentially harmful substances, gun control laws, enforcing laws regarding the sale of alcohol to minors, or increasing excise taxes on alcohol or tobacco are all environmental prevention. Similarly, water fluoridation or adding folic acid to bread flour are also environmental prevention measures.

Environmental prevention, however, overlaps significantly with universal prevention. Laws, regulations, rules and taxation levels typically apply at a whole population level, and are not usually targeted towards higher risk groups or individuals. Consequently, can environmental prevention be regarded as universal prevention? Is environmental prevention always provided at a universal level without due consideration of the risks? The answer is no, because although environmental prevention often takes a universal form, it is not always necessary for environmental prevention to be universal; it can be more targeted towards particular sub-populations, sub-groups or individuals at higher risk. For example, restricting the sale of alcohol to people 21 years and under (as in the United States) targets a more vulnerable group (children and adolescents) with the aim of preventing purchase and consumption of alcohol before their bodies are physically mature. Also, reducing neighbourhood alcohol retail

outlet density in high density, high risk neighbourhoods, targets a sub-group at higher risk because of higher alcohol availability in their neighbourhood. Similarly, gun control laws may dictate that higher risk individuals should not be allowed to access firearms. Therefore, although environmental prevention is typically universal, it can also take the form of selective or indicated prevention.

A possible way to overcome this conceptual confusion is to classify prevention according to its function or purpose within the universal-selective-indicated scheme. Proposed functional types of prevention are environmental, developmental or informational preventive measures. In this typology, clear definitions should emphasise distinctive functional characteristics:

- Environmental prevention comprises interventions that aim to limit the availability of maladaptive behaviour opportunities through policies, restrictions and actions. For example, legal requirements, economic (dis)incentives or situational crime prevention.
- Developmental preventive interventions aim to promote adaptive behaviours and prevent maladaptive behaviours by supporting the development of skills that are key in the socialization and social development of appropriate behaviours. For example, parental monitoring practices, teacher behaviour management strategies, and individual social or life skills.
- Informational prevention interventions aim to manipulate attention given to adaptive or maladaptive behaviours. For example, focusing on attentional processes via communications that increase knowledge and raise awareness about specific risk behaviours. This could include mass media campaigns to raise awareness or social normative feedback to challenge preconceptions.

These functions of prevention can be considered alongside the different forms of prevention, in a grid or matrix. This prevention matrix, it is suggested, provides an improved classification system for preventive interventions; see Table 1 for an illustration for youth alcohol misuse prevention with example prevention interventions at each intersection of form and function. Harm reduction interventions can also be considered within this matrix. For example, needle exchange (Wodak & Cooney, 2004) (a classic harm reduction approach) limits the availability and use of dirty needles by providing the opportunity of accessing and using clean needles. Similarly, some school-based drug and alcohol prevention

programmes have been called ‘harm reduction’ because they aim to reduce drug-related harms rather than incidence or prevalence (McBride, Farrington, Midford, Meuleners, & Phillips, 2004); however, in such programmes, the interventions can still be informational or developmental prevention. That the intended outcome of the intervention is reduced harm rather than reduced use is not especially relevant to the proposed typology; generally speaking, it is still a preventive approach regardless of the intended outcome.

The prevention matrix shown in Table 1 also prompts consideration of the profiling of prevention planning or activities across a range of forms and functions. Rose (1981) generally advocated population-based universal prevention strategies as a means of improving the distribution of behaviour across the population; however, Frolich and Potvin (2008) have pointed out that such universal strategies can have the unfortunate consequence of increasing health inequalities, as they are generally more impactful on better off, lower risk, population groups. In fact, this was acknowledged by Rose (1981) (see also Allebeck, 2008); in addition, Marmot (2010) suggested that, an optimal strategy is one that combines universal with targeted approaches in a progressive universalism. Similarly, organising prevention activities across informational, developmental and environmental functions of prevention should promote optimal coverage, based on the expectation that ‘one size does not fit all’. However, this assumption should, in the future, be checked

Table 1

Prevention Forms and Functions: Illustrative Examples for Substance Misuse Prevention

	Universal	Selective	Indicated
Environmental	Legislation to prohibit substance use; suppression of international supply routes	Targeted enforcement and actions to deal with drug dealing in high risk neighbourhoods; athlete drug testing programmes	Legal orders to prevent high-risk individuals from accessing alcohol; imprisonment
Developmental	Social/life skills programmes, for school students that provide young people with skills to cope with social influences	Family/parenting programmes with families in the most deprived areas in a region or country; or home visiting programmes with vulnerable pregnant women	Individual counselling programmes with adolescent males with impulse control problems
Informational	Mass media campaigns to raise awareness of the danger of drugs	Informational interventions targeted at young males in deprived neighbourhoods with strong gang cultures	Normative feedback or motivational interviewing interventions for individuals who screen positive for substance misuse

against theoretical analysis and empirical evidence reviews that weigh up the relative benefits and disadvantages of investment in the different functional types of prevention.

Theory and Evidence

One of the major disappointments for policy makers and prevention scientists has been the generally poor success of health promotion messaging and information campaigns in the face of commercial and cultural influences on risk behaviours; for example diet, smoking, exercise and drinking (the four major risk behaviours for non-communicable diseases). The same applies to social cognition interventions based on well-established psychological theories, such as the theory of reasoned action and planned behaviour, and derivatives such as the theory of triadic influences, which propose that behaviour is mediated through cognitive intentions to engage in behaviour. The idea is that if you can change intentions then you can change behaviour, as behaviour follows intentions (or more broadly put, “behaviour follows brain”). Cognitive psychologists and social cognitive psychologists have traditionally suggested that behaviour (or action) is mediated through internal representations of the outside world that are held in our heads (brains). In other words, brains receive inputs via perception and process these inputs via a representational heuristic, which produces outputs from the brain; these outputs are typically behaviour of one form or another. Preventive interventions based on such theories have had limited success; moreover, these theories are increasingly being challenged (Sniehotta, Presseau, & Araujo-Soares, 2014).

An alternative perspective, and one that deserves much more attention within the prevention science community, is the idea that behaviour is largely triggered by environmental aspects and that cognitive processing is mostly secondary to behaviour, which emerges from the transaction between an individual and objects in their environment. Simply put, the notion that “behaviour follows brain”). (Marsh, Johnston, Richardson, & Schmidt, 2009) is arguably a more compelling basis for prevention science and action. One leading theorist has proposed that behaviour typically results from “action-oriented predictive processing” (Clark, 2013); essentially the idea is that individuals respond

instinctively and automatically to their environment, without any higher-level cognitive mediation of action. The exception to this typical pattern occurs when action, or opportunities for action, within a particular environmental context is inconsistent with prior expectations, in which case individuals are motivated to change their behaviour or their expectations to reduce this inconsistency. Daniel Dennett (2013) has linked this theory to the *Umwelt* concept and to Gibson's (Gibson, 1979) notion of affordances.

Importantly for the proposed functional types of prevention, there is a clear theoretical link between (i) environmental context and environmental prevention, where limiting opportunities for action can lead to changes in behaviour and changes in attitudes, norms, values, habits etc.; and (ii) prior expectations and developmental prevention, where attitudes, norms, values, habits etc. are internalised over months and years of socialization and make a significant contribution to prior expectations. By contrast, it is not clear how informational prevention, which focuses on attentional processes and typically aims to change knowledge and awareness, can have a direct and strong impact on the largely automatic, unconscious, action-oriented predictive processing that drives much of our behaviour. Accordingly, a theoretically informed prediction of the relative effectiveness of different functional types of

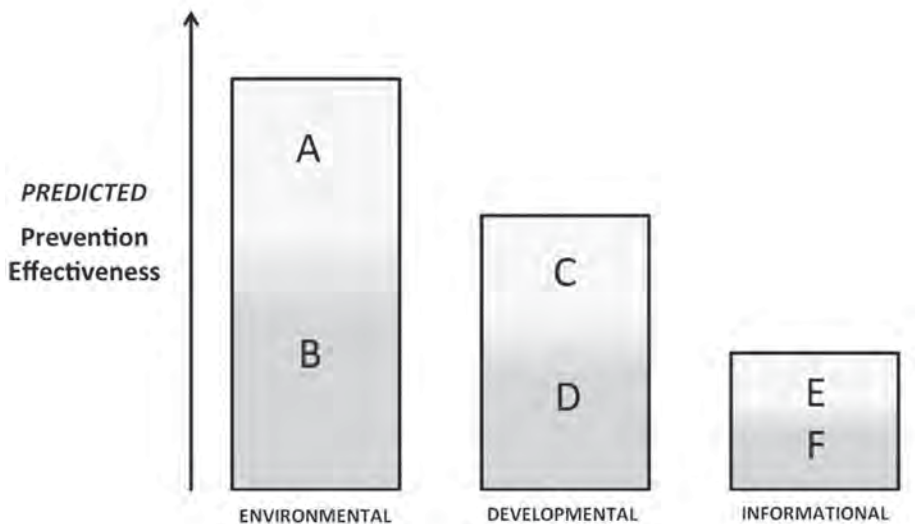


Figure 2: Predicted effectiveness across and within different functional types of prevention.

prevention is provided in Figure 2, which shows that environmental prevention is generally more effective than developmental prevention, which in turn is generally more effective than informational prevention. This prediction assumes that implementation or enforcement of prevention interventions across all functional types is equally robust.

Moreover, within each functional type, there will be interventions that are more or less effective. To illustrate this point, within environmental prevention, a strong intervention would be price or legislation policy controls that have a direct impact on opportunities to engage in maladaptive behaviours, or concentrated policing and urban renewal to remove drug dealing from particular neighbourhoods (Figure 1; A). A good example of strong and effective environmental interventions is minimum unit pricing for alcohol (Brennan, Meng, Holmes, Hill-McManus, & Meier, 2014; Stockwell, Auld, Zhao, & Martin, 2011; Wagenaar, Salois, & Komro, 2009), or a minimum age to legally purchase alcohol (DeJong & Blanchette, 2014). By contrast, a relatively weak environmental intervention is server training (Ker & Chinnock, 2008), which encourages bar staff to limit the sale of alcohol to people who are already intoxicated by offering soft drinks instead; this is an example of 'nudging' (Figure 1; B).

Similarly, within developmental prevention, a strong intervention would be an early intervention prevention programme that impacts the ongoing socialization and normative development of children and young people (Figure 1; C); on the contrary, a brief skills-oriented school curricula for alcohol and drug misuse prevention for 14-year-olds, would be a relatively weak prevention intervention for many young people who have been exposed to years of marketing and social norms around the use of particular substances, and who may have already started drinking or experimenting with drugs (Figure 1; D). Evidence for the effectiveness of early intervention prevention programmes can be seen in the results of two long-term randomised controlled trials. In one trial, students and their families were randomly allocated to an intervention group or a control group; the intervention group received the 7-session Strengthening Families Programme 10-14 together with the Life Skills Training classroom curriculum, whereas the control group had no additional support over usual practice (Spoth, Redmond, Trudeau, & Shin, 2002). Five years later, the intervention group

students were much less likely to be metamphetamine users. Similarly, an early intervention prevention programme that focused on improving classroom behaviours at ages 6 and 7, called the Good Behaviour Game, followed up on students from a randomised controlled trial in Baltimore in the United States (Kellam et al., 2011). Fifteen years later, there were important reductions in smoking and drug abuse for all males, compared with the control group, and even more pronounced differences for higher risk males with more challenging behaviours at the time of the intervention (when they were in primary school).

Within informational prevention, a more effective prevention intervention (E) could be social normative feedback, which corrects erroneous perceptions of peer group levels of particular behaviours, or motivational interviewing for heavy drinking college students, although effect sizes for behaviour change tend to be small and perhaps not useful for achieving improvements to population health (Foxcroft, Coombes, Wood, Allen, & Almeida Santimano, 2014; Foxcroft, Moreira, Almeida Santimano, & Smith, in press). A relatively weak intervention would be a mass media campaign to warn of the dangers of alcohol or drug abuse (Ferri, Allara, Bo, Gasparini, & Faggiano, 2013) (F). Of course, these are predictions with selected evidence to support them; further empirical and theoretical work is needed to fully test the relative effectiveness of different functional types of prevention.

To sum up, in this paper, I have suggested that a prevention taxonomy that incorporates the function of prevention improves on the existing typology of universal, selective and indicated forms of prevention. Three functional types of prevention are suggested: environmental, developmental and informational; furthermore, it is predicted that for many important risk behaviours, environmental prevention will generally be more efficacious than developmental and informational prevention efforts. Further, empirical and theoretical work is required to test these predictions, and future research should also assess the robustness of this new taxonomy; for example, how easily the categories can be reliably applied, and also the theoretical and empirical basis for profiling prevention investments across the various forms and functions of prevention.

The main advantage of this new taxonomy is that a matrix combining the form and function dimensions of prevention can be used to: identify and map out prevention strategies; consider where research evidence is present and where

more is needed; and evaluate the relative effectiveness of different categories of prevention for specific health and social issues, including the aspects of multi-component prevention programmes delivered at different ecological levels. Such evaluations would provide empirical evidence as to whether the different categories of prevention are related to outcomes or processes of prevention in ways that suggest the value of the taxonomy for understanding and increasing the impact of prevention science. In one European country, Sweden, this new taxonomy has already been useful for identifying and planning a strategy for preventing problem gambling and co-morbid conditions (Foxcroft, 2014).

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