"Form ever follows function. This is the law". A prevention taxonomy based on a functional typology

"La forma siempre sigue a la función. Esta es la ley". *Una taxonomía de la prevención basada en una tipología funcional*

David R. Foxcroft

Faculty of Health and Life Sciences, Oxford Brookes University.

Resumen

El esquema de clasificación de la prevención en sus formas de universal, selectiva e indicada ha sido recomendado y ampliamente adoptado como una mejora frente a las anteriores nociones de prevención primaria y secundaria. Sin embargo, no existe consenso ni claridad sobre cómo situar las intervenciones preventivas ambientales, de base comunitaria, o en los medios de comunicación, dentro de este esquema. Se sugiere que una nueva dimensión funcional de los tipos de prevención, concretamente de la prevención ambiental, de la evolutiva y de la informativa debería especificarse junto con las formas de prevención en una matriz taxonómica, y que esto supondría una mejora en el actual sistema unidimensional de universal, selectiva e indicada. Asimismo, se argumenta que una re-evaluación de las principales teorías de la prevención conduce a una predicción de la eficacia relativa de estos tipos funcionales de prevención. Esta predicción especifica que la prevención ambiental es generalmente más efectiva que la prevención del desarrollo la cual, a su vez, es generalmente más eficaz que la prevención informativa.

Palabras clave: prevención, teoría, taxonomía.

Abstract

The universal, selective and indicated forms of prevention classification scheme has been recommended and largely adopted as an improvement on previous notions of primary and secondary prevention. However, there is no consensus or clarity about the placing of environmental, community-based or mass media preventive interventions within this scheme. It is suggested that a new dimension of functional types of prevention, namely environmental, developmental and informational prevention should be specified alongside the forms of prevention in a taxonomy matrix, and that this is an improvement on the current one-dimensional universal, selective and indicated scheme. Moreover, it is argued that a re-appraisal of mainstream prevention theories leads to a prediction of the relative effectiveness of these 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.

Key words: prevention, theory, taxonomy.

Enviar correspondencia a:
David R. Foxcroft. Faculty of Health and Life Sciences, Marston Campus, Oxford Brookes University, Oxford,OX3 0FL, U.K.
david.foxcroft@brookes.ac.uk

The field of prevention science is 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, poor diet/nutrition, low 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 scientific field, with strong coverage in the United States, including a scientific society, methodology groups and networks, and a growing impact journal. The recently established European Society for Prevention Research (EUSPR) is seeking to emulate this strong coverage across Europe and, 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). In the original use of the phrase "form and function", form was specified to follow function, illustrated in this quote from the American architect Louis Sullivan (1896):

"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."

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, then a 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 (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 did not have a clear biological manifestation. Primary prevention was defined as *"…practiced prior to the biologic origin of disease…"* and secondary prevention as *"…practiced after the disease can be recognised, but before it has caused suffering and disability…"*. 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."*

Instead, Gordon suggested that prevention should be classified according to the population groups in which there is optimal application. Universal prevention, the most generally applicable type, 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 were known to be at higher risk, and where the balance of risk against benefits and costs from prevention indicated that universal approaches were not attractive, then selective prevention which targeted preventive measures to higher risk groups was 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.

In 1994, the United States Institute of Medicine (IoM) of the National Academies adopted the classification system proposed by Gordon (1983), namely universal, selective and indicated prevention. And more recently, in 2009, the IoM looked again at the definition and classification of prevention, this time for a report on 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 which identify risk to individuals based on genomic analysis. The report concludes that the original 1994 IoM classification system (Institute of Medicine, 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 selling of alcohol to minors, or increasing excise taxes on alcohol or tobacco are all environmental prevention measures. 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. So can we regard environmental prevention as universal prevention: are they synonymous? The answer is no, because although environmental prevention often takes a universal form, it doesn't always. For example, restricting alcohol sales to people 21 years and older targets a higher risk group (children and adolescents) with the aim of preventing purchase and consumption of alcohol before their bodies are physically mature. Similarly, gun control laws may dictate that higher risk individuals should not be allowed access to firearms. So, although environmental prevention is typically universal, it can also take the form of selective or indicated prevention.

A suggestion, to try and get over this conceptual confusion, is that alongside the forms of prevention in the universal-selective-indicated scheme, it would be helpful to classify prevention according to its function, or purpose. 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 system wide policies, restrictions and actions. For example legal restrictions, economic (dis)incentives or situational crime prevention.

- Developmental preventive interventions aim to promote adaptive behaviours, and prevent maladaptive behaviours, by focusing on the development of skills that are key in 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 increase knowledge and raise awareness about specific risk behaviours, through communications. For example 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.

Table 1
Prevention Forms and Functions: illustrative examples for youth alcohol misuse prevention

	Universal	**Selective**	**Indicated**
Environmental	Tax and pricing policy for alcohol	Reducing alcohol retail outlet density in high risk neighbourhoods	Legislation to prevent problem individuals from accessing alcohol premises
Developmental	Social / life skills programs that provide young people with skills to cope with social influences	Family / parenting programs with families in the most deprived areas in a region or country	Individual counselling programs with adolescent males with impulse control problems
Informational	Mass media campaigns to raise awareness of alcohol dangers	Informational interventions targeted at young males in deprived neighbourhoods with strong gang cultures	Normative feedback interventions for individuals who screen positive for problem drinking

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, but Frolich and Potvin (2008) have pointed out that such universal strategies can have the unfortunate consequence of increasing health inequalities, because they are generally more impactful on better off, lower risk, population groups. In fact Rose (1981; see also Allebeck, 2008) acknowledged this and, as Marmot et al. (2010) suggest an optimal strategy is one which 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 against theoretical analysis and empirical evidence reviews that weigh up the relative benefits and disbenefits 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 goes for 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, because 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, and these theories are increasingly being challenged (Sniehotta, Presseau, & Araújo-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 aspects of the environment, and that cognitive processing is mostly secondary to behaviour that emerges from the transaction between an individual and objects in their environment. Simply put, the notion that "brain follows behaviour" (Marsh, Johnston, Richardson, & Smith, 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 not consistent 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 (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, that aims to change knowledge and awareness, can have a direct and strong impact on the largely automatic, unconscious, action-oriented predictive processing. Given this, a theoretically informed prediction of the relative effectiveness of different functional types of prevention is provided in Figure 1, 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.

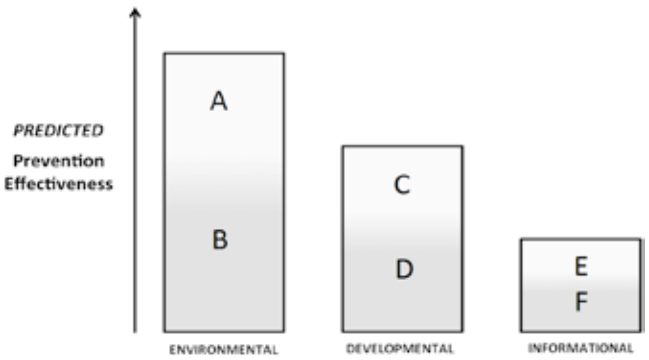

Figure 1. Predicted Effectiveness across and within different functional types of prevention

Moreover, within each functional type there will be interventions that are more or less effective. For example, 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 (Figure 1; A). By contrast, a relatively weak environmental intervention is server training, which encourages bar staff to limit alcohol to people who are already intoxicated by offering soft drinks instead, an example of "nudging" (B). Similarly, within developmental prevention, a strong intervention would be an early years prevention programme that impacts the ongoing socialization and normative development of children and young people (C); compared with a brief skills-oriented school curricula for alcohol misuse prevention for 14-year-olds, a relatively weak prevention intervention for many young people who have been exposed to years of alcohol marketing and who may have already started drinking (D). Within informational prevention a more effective prevention intervention is social normative feedback, which corrects erroneous perceptions of peer group levels of drinking (E); and a relatively weak intervention is a mass media campaign to warn of the dangers of alcohol or drug abuse (F). Of course, these are predictions, and further empirical and theoretical work is needed to test them out.

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; and 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 needed to test these predictions.

References

Allebeck, P. (2008). The prevention paradox or the inequality paradox. *European Journal of Public Health, 18,* 215. doi: 10.1093/eurpub/ckn048.

Clark, A. (2013). Whatever next? Predictive brains, situated agents, and the future of cognitive science. *Behavioural and Brain Sciences, 36,* 181-253. doi: 10.1017/S0140525X12000477.

Commission on Chronic Illness (1957). *Chronic illness in the United States,* vol. 1. , Cambridge, MA: Published for the Commonwealth Fund by Harvard University Press.

Dennett, D. C. (2013). Expecting ourselves to expect: The Bayesian brain as a projector [Commentary]. *Behavioural and Brain Sciences, 36,* 209-210. doi: 10.1017/S0140525X12002208

Foxcroft, D. R. (2014). Can prevention classification be improved by considering the function of prevention? *Prevention Science.* Advance publication online. doi: 10.1007/s11121-013-0435-1

Frolich, K. L. & Potvin, L. (2008). The inequality paradox: the population approach and vulnerable populations. *American Journal of Public Health, 98,* 216-21.

Gibson, J. J. (1979). *The Ecological Approach to Visual Perception.* Hillsdale, NJ: Lawrence Erlbaum Associates.

Gordon, R. S. (1983). An operational classification of disease prevention. *Public Health Reports, 98,* 107-109.

Institute of Medicine (1994). *Reducing the risks for mental disorders: Frontiers for preventive intervention research.* Washington, DC: National Academy Press.

Marsh, K. L., Johnston, L., Richardson, M. J., & Schmidt, R. C. (2009). Toward a radically embodied, embedded social psychology. *European Journal of Social Psychology, 39,* 1217-1225. doi: 10.1002/ejsp.666

National Research Council and Institute of Medicine (2009). *Preventing Mental, Emotional, and Behavioral Disorders Among Young People: Progress and Possibilities.* Washington, DC: The National Academies Press.

Rose, G. (1981). Strategy of prevention: lessons from cardiovascular disease. *British Medical Journal, 282,* 1847-51.

Marmot ,M., Atkinson, T., Bell, J., Black, C., Broadfoot, P., Cumberlege,J.,… Mulgan, G. (2010). *Fair society, healthy lives. Strategic review of health inequalities in England post 2010.* London, England: The Marmot Review [available from www.ucl.ac.uk/marmotreview; date accessed 14th January 2013]

Sniehotta, F. F., Presseau, J., & Araújo-Soares, V. (2014). Time to Retire the Theory of Planned Behaviour. *Health Psychology Revie.* Advance publication online. doi: 10.1080/17437199.2013.869710

Sullivan, L. (1896). The Tall Office Building Artistically Considered. *Lippincott's Magazine (March 1896),* 403-409. Retrieved at https://archive.org/details/tallofficebuildi00sull