



Expanding marketing empirical generalisations to health behaviours: Physical activity is not so different from buying behaviour, after-all



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ABSTRACT

The Negative Binomial Distribution (NBD) is a model that describes consumer purchase frequency over time. This paper tests the applicability of this model to a novel context: physical activity behaviours (using data obtained from Australia, the United States, and Singapore). The fit of the NBD to the data demonstrates that physical activity behaviour is consistent with other consumer behaviour patterns. Within a one-week period, the majority of people are either non- or light-engagers of the different intensities of leisure-time physical activity. Yet, people are not 'active' or 'inactive', rather, degree of engagement varies. Infrequency of reported levels and variety of physical activities might be due to health promotion having a strong focus on rational persuasion and less focus on mass communication that builds mental availability. Our contribution broadens the applicability of the NBD showing it can be helpful for those seeking to promote health behaviours, not just purchases.

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CHINESE ABSTRACT

负二项分布 (NBD) 是描述消费者在一定时期内的购买频率的模型。本文测试了该模型在一个新的背景下的适用性: 身体活动行为 (使用从澳大利亚、美国和新加坡获得的数据)。NBD对数据的拟合性表明, 身体活动行为与其他消费者行为模式一致。在一个星期的时间里, 大多数人对于不同等级的休闲体育活动, 不是轻度参与, 就是不参与。然而, 并不能把人们分成“活跃”或“不活跃”, 与此相对, 是参与的程度各不相同。报告中对于各级别和类型的体育活动的低频率参与, 可能源于健康宣传时通常重点在于理性说服, 而较少注重能够建立心智显著性的大众传播。本文拓展了NBD的适用范围, 表明它可以帮助推动健康行为, 而不仅仅是购买。

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1. Introduction

While physical activity is important for health and wellbeing (Bize et al., 2007), physical inactivity has become a global pandemic (Kohl et al., 2012). Those physically inactive are at an increased risk of developing chronic diseases. Despite public health efforts, one-third of adults do not reach recommended levels of physical activity (Kohl et al., 2012; World Health Organisation, 2017). Monitoring and analysis of physical activity behaviours are important for informing the development of public health policies and programs to promote physical activity (Hallal et al., 2012).

Marketing theories used to understand buying behaviour have been successfully applied to other consumer behaviours. Social marketers have developed multiple forms of evidence that demonstrate the role that marketing theory can have in assisting to deliver social change. Examples include environmental protection, public safety,

and public health – including physical activity (Cheng et al., 2010; Evans and McCormack, 2008; French and Gordon, 2015; Gordon et al., 2006; National Social Marketing Centre, 2006; Stead et al., 2007; Truong, 2014). While the social marketing literature has looked at very specific physical activity behaviours such as cycling and walking (Fujihira et al., 2015; Kubacki et al., 2017), few have focused on the general patterns that would apply to physical activity as a whole.

The Negative Binomial Distribution (NBD) model, commonly used in commercial marketing, demonstrates patterns of consumer behaviour by analysing and describing the frequency of behaviour. The NBD model is one part of the NBD-Dirichlet model, a stochastic model which is used to predict brand choice (Goodhardt et al., 1984). In past studies, the NBD model has primarily been used to describe and identify patterns of consumer buying behaviour (Ehrenberg, 1966; Romaniuk and Sharp, 2016c; Schmittlein et al., 1985; Sharp, 2010b). The fit of the NBD to consumer purchase data carries important implications for understanding consumer behaviour and appropriate marketing strategies (see Sharp, 2010b). The NBD model is known as an empirical generalisation, due to the consistent fit of the model over different brands, countries and time

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periods (Bass and Wind, 1995; Ehrenberg, 1995; Uncles and Wright, 2004). These empirical generalisations have been extended to contexts not related to buying, such as engagement in leisure-time activity (Hand and Dall'Olmo Riley, 2016; Scriven et al., 2015; Trinh and Lam, 2016) and health-related behaviours – including physical activity (Grunelee et al., 2016). Grunelee et al. (2016) was the first study to apply the Dirichlet analysis (from the NBD-Dirichlet model) to physical activity behaviour, and demonstrated that this marketing theory can be translated to physical activity behaviour. Yet, to the best of our knowledge, no studies have applied the NBD analysis to physical activity behaviours. This is the focus of the current article.

Fitting the NBD model to physical activity offers a novel, evidence-based approach to analysing health behaviour. Applying the NBD to physical activity data will demonstrate (1) whether the NBD model can be used to describe and predict population-level patterns in physical activity behaviours based on past behaviour, independent of cognitive factors (i.e. knowledge, attitudes and intentions), and (2) whether the NBD pattern is evident for physical activity behaviours.

In the spirit of this special issue on Empirical Generalisations, this paper extends the scope of the proven NBD model to a new context of health behaviours, specifically, physical activity. This study aims to (1) describe and analyse frequency of engagement in leisure-time physical activity using the NBD model; and in doing so, (2) broaden the scope of the NBD model through its application to a novel behaviour – physical activity; and (3) offer novel evidence-based recommendations for social marketing and public health efforts aimed at increasing physical activity.

1.1. Background

The Negative Binomial Distribution (NBD) is a descriptive model that analyses patterns of past behaviour (Morrison and Schmittlein, 1988). This model describes consumer behaviour based on the frequency of past behaviour (i.e. number of purchase occasions). Analysis using the NBD model involves the distribution of observed behavioural frequency (e.g. purchase frequency) compared with theoretical values from the NBD model. A 'fit' of the NBD model (similar observed and theoretical values) has important implications for marketers that stem from the model's key assumptions, as outlined in the following section.

The NBD model also highlights the relative importance of *non- and light* buyers (consumers who have not purchased the brand, or have purchased it infrequently in the given time period), compared to *heavy* buyers (consumers who buy the brand many times in the time period) (Ehrenberg, 1966). Heavy buyers are typically the focus of most marketing activities (Kotler et al., 2001; Ritson, 2016), yet the NBD model demonstrates that most consumers are, in fact, non- or light buyers with only a few heavy buyers (Romaniuk, 2011; Romaniuk and Sharp, 2016c; Schmittlein et al., 1985; Sharp, 2010b). The NBD model highlights the great potential of non- and light buyers in growing the customer base (see Sharp, 2010b), simply because there are more of them, hence the implied feasibility of mass marketing.

The NBD model challenges the traditional view that buyers and non-buyers are two mutually exclusive groups. It demonstrates that the classification of a buyer or non-buyer is dependent on the time period of analysis. A short time period leads to misclassification and inflates the proportion of non-buyers, which can lead to ineffective marketing strategies. For example, the use of cognitive appeals and persuasion is ineffective because few people actively reject brands (Bogomolova and Nencycz-Thiel, 2008; Nencycz-Thiel and Romaniuk, 2011; Truong et al., 2011), and as the NBD shows, they actually do buy them, just very infrequently. Thus, the NBD model

suggests the need for marketing and advertising strategies to establish mental cues that trigger behaviour, as opposed to persuasion (Romaniuk and Sharp, 2016c; Sharp, 2010a).

1.2. Assumptions of the NBD model

First, the NBD model is stochastic and reflects a *zero-order process* (Bass et al., 1984). Brand purchase decisions are assumed to be as-if random (Goodhardt et al., 1984), where each decision is assumed to be independent of the last purchase decision (Goodhardt et al., 1984; Johnson et al., 1993). This randomness of behaviour has important implications for creating and maintaining mental availability (propensity of a brand to be thought of or noticed in a buying situation) and ensuring that the brand is easy to find and purchase (physical availability) (Nencycz-Thiel et al., 2016; Romaniuk, 2016a, 2016b; Sharp, 2010a). As brand choice at each purchase occasion can only be determined as a probability based on past behaviour (i.e. a purchase propensity), it is important for a brand to be physically and mentally available all of the time. Mental and physical availability increase the likelihood of a brand to be purchased over alternatives (Nencycz-Thiel et al., 2016; Romaniuk, 2016a, 2016b; Sharp, 2010a).

Secondly, the NBD model assumes *stationarity* in a market, that is, stability over time. A good fit of the model suggests that, at a population level, patterns of purchasing behaviour are consistent over time and that future patterns of behaviour can be predicted based on past patterns of behaviour. Stationarity enables benchmarking of population level consumer behaviour and evaluation of marketing activity (Ehrenberg, 1964; Ehrenberg et al., 2004) and can enable predictions about future patterns of behaviour (Ehrenberg, 1966; Goodhardt and Ehrenberg, 1967). Thus, changes in the fit of the NBD model could indicate behaviour change at a population level (i.e. a shifting trend (Nijs et al., 2001)).

These assumptions have implications that challenge attitudinal and motivational models of behaviour. The NBD model describes behaviour independent from cognitive reasoning and affective/emotional explanations (Ehrenberg, 1988). A disregard for the cognitive and affective factors is counter to most *traditional* marketing theories (Martin, 2008). The consistent fit of the NBD model across numerous marketing contexts including purchases of goods and services (Ehrenberg et al., 2004; Schmittlein et al., 1985), use of gambling services (Lam and Mizerski, 2009), phone subscriptions (Lee, 2009), and attendance at sporting and cultural events (Trinh and Lam, 2016) highlights the role of habits and repeated routines in consumer choices.

1.3. Physical activity promotion

There has been some application of the NBD to health-related behaviours including green brands (Wheeler, 2013), cigarette purchasing (Dawes, 2014), and alcohol purchases (Cohen, 2010; Jarvis et al., 2003). Yet, the NBD model is yet to be applied in understanding people's engagement in healthy lifestyle behaviours, including physical activity. This is the focus of the current paper.

Traditional health behaviour change models that are widely used by health practitioners and academics typically account for less than 30% of the variance in observed behaviour (Baranowski et al., 2003).

Such lack of explanatory power of traditional behaviour change models could be attributed to:

- (1) considering the population of interest in a binary way, such as 'converts' and 'non-converts' or those who comply or not (i.e. smoker or non-smoker, physically active or inactive, healthy or unhealthy eater),

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