Psychology of Sport and Exercise 25 (2016) 60–67

Contents lists available at ScienceDirect

Psychology of Sport and Exercise

journal homepage: www.elsevier.com/locate/psychsport

Development of the Generic Multifaceted Automaticity Scale (GMAS) and preliminary validation for physical activity

Julie Boiché [a,*], Gonzalo Marchant [a,1], Virginie Nicaise [b], Aline Bison [a]

[a] Laboratory Epsylon, Dynamics of Human Abilities and Health Behaviours, University of Montpellier, France
[b] Laboratoire sur les Vulnérabilités et l'Innovation dans le Sport (L-ViS, EA 7428), Université Claude Bernard Lyon 1, France

ARTICLE INFO

Article history:
Received 16 July 2015
Received in revised form
29 December 2015
Accepted 21 March 2016
Available online 22 March 2016

Keywords:
Habit
Habitual behaviour

ABSTRACT

Objectives: This article presents the validation of a Generic Multifaceted Automaticity Scale (GMAS) assessing the automatic properties of habitual behaviours.
Design: A quantitative approach was adopted within various adult samples in order to confirm the internal and external validity of the GMAS pertaining to Physical Activity (PA).
Method: Study 1 investigated the content validity of a series of items among experts ($N = 13$) and respondents ($N = 26$). Study 2 examined the scale's construct validity for PA ($N = 293$). Study 3 tested the GMAS external validity ($N = 161$). Study 4 evaluated the internal consistency and predictive validity for the GMAS applied to transportation modes ($N = 167$). Study 5 used a 1-week prospective design and included Theory of Planned Behaviour (TPB; Ajzen, 2012) variables in order to test the predictive validity of the GMAS for active transportation ($N = 125$).
Results: Study 1 supported the fact that the 9 items primarily reflected one facet of automaticity. Study 2 validated the hierarchical structure of the scale. In Study 3, convergent validity was confirmed regarding PA through significant correlations with the Self-Report Behavioural Automaticity Index (SRBAI; Gardner et al., 2012) and predictive validity was supported by significant correlations with self-report PA behaviour. Study 4 confirmed its internal consistency and predictive validity. Study 5 demonstrated that the scores derived from the GMAS significantly predicted active transportation behaviour, above and beyond TPB constructs.
Discussion: The GMAS appears as a valid instrument for research on everyday PA behaviours.
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1. Introduction

In the Global Action Plan for the prevention and control of Non-Communicable Diseases (NCDs), the World Health Organization indicates that cardiovascular diseases, cancers, chronic respiratory diseases and diabetes are the world's biggest killers, as revealed by numerous scientific studies (Lim et al., 2012). More than 36 million people die annually from NCDs, which globally represented two of every three deaths in 2010 (Lozano et al., 2012). Insufficient Physical Activity (PA) represents one of the main shared factors of NCDs. A majority of prevention interventions focused on communication to change individuals' attitudes or representations about this category of behaviours, and delivered recommendations toward their adoption. Indeed, the prevalent health psychology models developed at the end of the 20th century emphasized the role played by rationale/reflexive processes in behaviour realization. However, a certain disconnection between changing minds and changing behaviours has been noted in several streams, through meta-analyses of the effectiveness of interventions (Albarracin et al., 2005; Webb & Sheeran, 2006).

It was recently advocated that the challenge of behaviour change may rely not only in such deliberative processes, but also in the comprehension and targeting of automaticity within our daily lives (Marteau, Hollands, & Fletcher, 2012). Indeed, psychologists consider that most of everyday behaviours are almost entirely the same, whereas actions that we decide to do and are performed for the first time represent exceptions. Put differently, it can be forward that a common characteristic between behavioural risk factors—in particular PA behaviour—is that they can be conceptualized as habits. According to Verplanken and Aarts (1999), habits are

* Corresponding author. Laboratoire Epsylon, 4 Boulevard Henri IV, 34 000, Montpellier, France.
E-mail address: julie.boiche@umontpellier.fr (J. Boiché).
[1] Gonzalo Marchant benefits from a PhD grant of the National Commission of Scientific Research and Technology from the government of Chile.

http://dx.doi.org/10.1016/j.psychsport.2016.03.003
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"learned sequences of acts that have become automatic responses to specific cues, and are functional in obtaining certain goals or end states". Internal cues such as intention and motivation play a predominant role in future behaviour when performed for the first time or on an infrequent basis (for example, when one attends his or her first stretching class at the gym). However, those rational processes become less important as the behaviour takes on a more "habitual mode", characterized as externally cued by features in the environment (time cues, location cues, or people) where behaviour takes place (Wood & Neal, 2007; Wood, Quinn, & Kashy, 2002). Gardner (2012) proposes that habit should be seen as a form of context-dependent automaticity which, once formed, is not necessarily enacted often, unless the environmental triggers are frequently experienced.

For a long time, researchers tended to consider only the frequency of a given behaviour adoption as an indicator of habit. Other authors used single items devoted to assess individuals' perception of habit strength of their behaviour. Because such methods lead directly or indirectly to confuse behaviour *per se* with the psychological properties it is assumed to hold, other assessment strategies were developed. For example, individuals were asked to indicate which transportation mode they would use for a series of destinations, assuming that the more habitual a mode of transportation, the more frequently it would be chosen as a whole (Klöckner & Matthies, 2009; Verplanken, Aarts, van Knippenberg, & Van Knippenberg, 1994). This method may, however, be difficult to apply to certain behaviours, such as dietary behaviours, that may occur in countless different contexts with a variable amount of available options, and implies a specific development each time a researcher initiates a study relative to a new behaviour.

In order to overcome those limitations, Verplanken and Orbell (2003) developed a 12-item generic tool, the Self-Report Habit Index (SRHI), assumed to illustrate the components of automaticity underlined by Bargh (1994), that is lack of awareness, lack of conscious intent, mental efficiency, and difficulty to control. In this scale, the history of repetition of the behaviour and the extent to which it reflects a sense of identity were considered as well. The psychometric properties of the SRHI (i.e., factorial validity, temporal reliability, convergent validity, and ability to discriminate participants or behaviours) were examined through four studies conducted on travel-mode choices and behaviours adopted at home on a daily *versus* weekly basis. The shortness of the scale as well as its generic format enabled researchers to use it as a measure of habits' strength toward various behaviours, in particular PA (e.g., Verplanken & Melkevik, 2008) *versus* sedentary behaviours (e.g., Kremers & Brug, 2008), with an important focus on transportation mode choices (e.g., De Brujin et al., 2009).

The amount of studies conducted on health-related habits using the SHRI encouraged Gardner, de Bruijn, and Lally (2011) to conduct a meta-analysis. They included as a whole 23 samples from cross-sectional or prospective studies, 10 of which are based on physical (in)activity. They concluded to the existence of a moderate to strong link between habit strength and behaviours ($r = .44$). Furthermore, out of nine studies that tested the hypothesis of a moderating role of this variable in the intention–behaviour relationship, eight concluded that intention was a significantly better predictor of behaviour adoption when habit strength was low. Recent research also provided evidence for the external validity of the SRHI (Thurn, Finne, Brandes, & Bucksch, 2014). Indeed, SRHI scores were found to be significantly related to PA assessed with an accelerometer. Those results support the predictive value of the SRHI with regards to PA behaviours assessed with self-report scales or objectively. However, it has also been advanced that its format is problematic in several ways.

First, several of its items refer to history of behaviour repetition, which paradoxically suggests the same interrogations than previous methods consisting in a measure of habit through the frequency of behaviour adoption. Besides, the presence of an item evoking the individual's identity was questioned, and some authors argued that when other identity items were assessed, they all saturated on another factor than the SRHI items (Gardner, de Bruijn, & Lally, 2012). Because they considered that certain items do not assess the supposed characteristics of habitual behaviour, researchers inclined to adapt the SRHI and did not use all 12 items in their studies. Gardner et al. (2011) excluded 17 studies from their meta-analysis for this reason. However, authors do not systematically present a rationale for their choice, nor do they indicate exactly which items were omitted. This can be seen as highly problematic, because it throws into doubt the possible conclusions reached when comparing results from research using the full SRHI *versus* one of its "shortened" versions. In order to resolve these issues, Gardner, Abraham, Lally and De Bruijn (2012) tested the convergent and predictive validity of a 4-item section of the SRHI, reflecting only automaticity (Self-Report Behavioural Automaticity Index; SRBAI). Basically, the scores obtained on this subscale (i) were highly correlated with those of the 12-item SRHI; (ii) showed slightly lower correlations with behaviours than the SRHI; (iii) generated similar results on intention-behaviour moderations for 5 out of 7 studies.

The SRBAI can be considered as a valid tool and, given its length, it appears particularly relevant for studies targeting several predictors of behaviours—frequent in PA research—or the level of automaticity of a large panel of behaviours—study of sedentary behaviours conjointly to PA or investigation of complex behaviours such as eating behaviours (Gardner et al., 2012). However, it can also be pointed out that its use may limit future research on PA habits. Indeed, if automaticity conceptually refers to several facets of behaviour adoption, both the SRHI—original and shortened forms—and the SRBAI are one-factor scales. Thus, studies based on those questionnaires do not enable to gather information on the facets of automaticity. This can be a limit, because some authors consider that different aspects of automaticity could be particularly crucial to reach regular behaviour adoption (Verplanken, 2010). Recent research also underlined that in the case of exercise, the automaticity of behaviour initiation was a more powerful predictor of structured PA frequency than the automaticity of its execution (Phillips & Gardner, 2016). Disposing from a tool that takes into account those various facets of automaticity would provide more insight as well as more leverage for interactions to change habitual behaviour (Verplanken & Wood, 2006), specifically for PA behaviour.

The purpose of this study was thus to develop a multifaceted automaticity scale focusing on the dimensions that characterize PA behaviours. Although it is widely used in experimental settings, for example in priming studies, the lack of awareness aspect of automaticity, as underlined by Bargh (1994) appears as less relevant to study real-life behaviours such as PA. Indeed, individuals are unlikely to be aware of many or all of the processes of engaging in a health-related behaviour (Hagger et al., 2014). On the contrary, Verplanken and Melkevik (2008) argued that meta-cognitive instruments can be used based on the assumption that people are able to reflect other features of automaticity, particularly for exercise. The current set of studies focused on the Lack of Intention (LOI), Lack of Control (LOC) and efficiency of PA behaviour. Study 1 aimed at creating a pool of items that reflect those three facets in a discriminant way. Study 2 examined the factorial validity of the Generic Multifaceted Automaticity Scale (GMAS) in a large sample, and tested a first level of external validity by comparing the scores obtained for PA by two distinct populations of students (i.e., Sport Sciences students *versus* students engaged in other curricula).

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