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Nudging for beginners

A shortlist of issues in urgent need of research

Denise de Ridder

Utrecht University

Everybody is talking about it: the N word where N stands for nudging or gently directing people to behave in the desired way. In UK the government installed the Behavioral Insight Unit ('the nudge unit') already quite a few years ago with psychologist David Halpern as its inspiring director to solve important problems relating to behavioral aspects of policy issues such as organ donation, payment of taxes, traffic behavior, and, indeed, health behavior. More recently, the US government installed a nudging officer to advise on similar issues. In the Netherlands where I live the government is reluctant to adopt the nudge concept despite strong recommendations to do so from important bodies on policy advice. Yet, also in the Netherlands nudging is a buzz word that attracts considerable attention from researchers and policy actors with a conference or a symposium on nudging virtually every week. These recent developments in nudging as a novel concept for influencing people's behavior have sparked debate among scholars and policy advisors alike with some people becoming increasingly enthusiastic about the concept and others fierce opponents (e.g., Hansen & Jespersen, 2013; Hausman, & Welch, 2010; Loewenstein, Asch, Friedman, Melichar, & Volpp, 2012).

What is a nudge and why does the concept raise so much debate? Nudge is a concept introduced by lawyer Richard Thaler and behavioral economist Cas Sunstein several years ago. They published a concise book on nudging in 2008– Nudge. Improving decisions about health, wealth, and happiness - that was

qualified as a bestseller by the New York Times and best book of the year by The Economist. In fact, a quick Google search indicates that the N word now produces over 2000 hits with people commenting upon the nudge concept. Although the nudging term has been used previously, Thaler and Sunstein coined the term which they define as 'simple changes in the presentation of choice alternatives that make the desired choice the easy, automatic or default choice'. The nudge approach advocates libertarian (or soft) paternalism: it respects freedom of choice (libertarian) but suggests sensible choices at the same time (paternalistic). Although inherent in the definition of nudges is autonomous choice, as exemplified in the libertarian part of the definition, opponents question the manipulative nature of nudges, which they qualify as smudge (Bonell, McKee, Fletcher, Haines, & Wilkinson, 2011), fudge (Yeung, 2012) or nag (The Lancet, 2012). Supporters, on the other hand, favor the subtle and gentle way nudges direct people in the desired way.

For psychologists as behavioral architects whose job it is to design and evaluate strategies for behavioral change, nudges are inspiring devices that question many important adages in understanding and explaining how people regulate their behavior. After having witnessed disappointing results of decades of persuasive communication to educate people about healthy behavior, we need something new – and maybe nudges could be part of these new ways of helping people to behave in a healthier manner. Importantly, nudges nicely align with recent insights that health behavior (as with most

other behaviors) often is not so rational, deliberate or reasoned as we tend to believe but in many cases relies on habits, emotions or impulses (e.g., Loersch & Payne, 2011; Strack & Deutsch, 2004). Nudges may thus provide a sophisticated alternative to existing arrangements for promoting health behavior that typically encourage individuals to make effortful changes to their lifestyle which are difficult to sustain. Take for instance, the case of unhealthy eating. Many educational efforts on teaching people to eat a healthy diet have witnessed disappointing results that have proved insufficient to curb the overweight epidemic. Understanding that many people eat mindlessly (Wansink & Sobal, 2007), habitually (Verhoeven, Adriaanse, Evers, & De Ridder, 2012), or impulsively (Hofmann, Friese, & Wiers, 2008) may clarify why education is ineffectual. While many people may adopt the intention to eat more healthily, most of them forget about their intentions when they are confronted with delicious but unhealthy foods. Nudges may exploit the very nature of health behavior as automatic and reflexive, acknowledging the fact that people engage in unhealthy behavior without explicit intent.

To date, quite a few good examples exist as to how we can take advantage of health behavior as swift and intuitive in many instances. A convincing case is using distance to foods as a simple but effective way to lure people into healthy eating patterns, while leaving the alternative option still possible. Several studies have shown that increasing the distance to unhealthy food in a buffet style presentation with as little as 25cm decreased intake dramatically without any after effects on craving for food (Maas, De Ridder, De Vet, & De Wit, 2012; cf. Rozin, Scott, Dingley, Urbanek, Jiinang, & Kaltenbach, 2011; Wansink, Painter, & Lee, 2006). Recent research has demonstrated that also changes in the social (rather than the

physical) environment may act as nudges, such as when the (alleged) behavior of other suggests social preference for a healthy option (De Ridder, De Vet, Stok, Adriaanse, & De Wit, 2013; Prinsen, De Ridder, & De Vet, 2013). Importantly, such effects of social nudges were also found when people had low self-control, which is commonly regarded as a risk factor for behaving unhealthily (Salmon, Fennis, De Ridder, Adriaanse, & De Vet, 2014). Similar examples of nudging interventions that take advantage of the automatic nature of health behavior were documented in a recent Science publication advocating nudges as a superior alternative to existing health promoting interventions with additional benefits such as increased efficiency and decreased costs because the delivery of nudge-like interventions is generally cheaper and easier than the currently available public health solutions (Marteau, Hollands, & Fletcher, 2012).

However, in order to be implemented in health promotion approaches much more research is needed to understand how nudges operate and, importantly, how they operate without harming autonomous choices that would make people victims of manipulation. In fact, debate amongst opponents and proponents of the nudge concept has reached a point where it is no longer productive to discuss if there is no information available about when, how and for whom nudges are effective in steering behavior. From my experience as a researcher in self-regulation and from participating in discussions with psychologists, economists, lawyers, philosophers, and health professionals, I have learned that there are several critical issues that require empirical consideration. Here is my short list of issues that are in urgent need of further investigation.

Let's take Thaler and Sunstein's showcase example of Amsterdam Schiphol Airport men's rooms as point of departure. In order to decrease

spilling, Schiphol management decided to install toilets with the image of an etched black housefly into each urinal to subtly encourage men to aim better; something men usually do not pay much attention to, according to Schiphol management. The result of this simple nudge was a reduction of spillage by 80 percent. While not coming close to most health behavior interventions, the Schiphol nudge example demonstrates three important principles of nudging that challenge our thoughts about nudges in the health domain: it respects autonomous choice because the alternative choice remains possible; there is some sense of awareness that people are being nudged; and the desired choice should be default as in being easy and perhaps even attractive.

Autonomy

Visitors of Schiphol men's rooms had the opportunity to ignore the subtle hint of the black fly and act otherwise than suggested, thus meeting the important requirement of nudges that alternative options must remain available. Respecting this criterion of nudges is, however, easier said than done. Take again the encouragement of healthy eating as an example. Inspired by notions of environmental psychology, many people regard banning unhealthy foods from the environment as a meaningful way to make healthy choices easier. By reasoning that making unhealthy food unavailable the healthy choice is easy to implement, they overlook the very fact that the strategy of banning foods precludes a choice because the alternative option becomes impossible. Taxing unhealthy foods, another popular strategy in health promotion policies, would not qualify as a nudge either because it makes the undesired choice virtually impossible for people who cannot afford to spend money on

expensive fatty foods. Taxing unhealthy foods thus qualifies as a brute shove rather than a gentle nudge. Putting unhealthy food at a distance, in contrast, does qualify as a nudge because it makes the unhealthy choice less obvious (less accessible) but not impossible (still available). Taking the autonomy criterion of nudges seriously means that health professionals should accept that people can decide to behave in an unhealthy manner if they truly wish to. Examining how nudges affect feelings of autonomous decision making is therefore an important avenue for psychological research on nudging.

Awareness

Although no research exists that has examined whether users of Schiphol men's rooms were aware of being nudged I suspect that most male visitors noticed the fly but not in such a way that they consciously deliberated about using it as a target. The issue of awareness raises important questions about nudges. On the one hand, we may argue that awareness of being nudged might ruin the nudge effect and even cause reactance because of feeling manipulated. On the other hand, it may well be that a slight suspicion of being nudged contributes to nudges' acceptability. If people would be completely unaware of being nudged and realize ex post facto that they were tricked, this would threaten the definition of nudges as respecting autonomous choice. Right now, we don't know whether and how awareness of being nudged affects effectiveness of nudges although I would speculate that some sense of awareness might contribute to feelings of agency and thus help rather than harm nudging effectiveness. The issue of awareness thus constitutes an important topic for future research on nudges.

Default

According to Schiphol Airport director Ad Kieboom an etched black fly in the urinal makes the desired choice of not spilling easier: "If a man sees a fly, he aims at it", he explains. If we only knew how we could take advantage of natural inclinations to behave in a certain way, designing good nudges in the health domain would be easy. Unfortunately, in many cases we don't know about these natural preferences. Making choices easier is not so simple and as a result we continue to rely on persuasion when health behavior is involved. A popular strategy to make healthy choices easier is by emphasizing that this particular choice is healthy by, for example, placing little stickers ("Healthy Choice!") on the product. Although this seems a reasonable way to make it easier for people to make the desired choice, research suggests the opposite effect. When stating that a choice is healthy and therefore the right thing to do, it is unintendedly emphasized that this choice is not default but exceptional. Research from Ayelet Fishbach and her team demonstrated that people reported more hunger after having chosen the healthy option, probably because emphasizing the healthy qualities of a food product signals that healthy choices are not default but something people need to be convinced of (Finkelstein & Fishbach, 2010). Such ironic effects of emphasizing the healthy choice have been reported previously (Provencher, Polivy, & Herman, 2009), warning us that simply stating that a choice is healthy doesn't make the choice easy and probably even backfires. Apparently it is not so simple to communicate the easy default choice. We thus are in urgent need to know more about strategies promoting default healthy choices that go beyond the traditional epithet "this is healthy".

There is one other lesson the Schiphol black fly teaches. Although the idea of an etched fly in the urinal seems quite simple, it is also creative and convincing. We as psychologists are perhaps not in the best position to design such creative solutions to health problems. Psychologists may have good ideas about the underlying principles of human behavior change but need some assistance from creative agencies to translate these behavioral principles into effective nudges that truly rearrange the choice context and make healthy choices easy and attractive while leaving the alternative open for people who are dedicated to unhealthy behavior.

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Denise de Ridder

is Professor of Health Psychology at Utrecht University, Utrecht, The Netherlands

d.t.d.deridder@uu.nl

original article

Applying COM-B to medication adherence

A suggested framework for research and interventions

On average only fifty percent of people with long term conditions are adherent to their treatment across diverse disease and patient groups (Holloway & van Dijk, 2011; Sabaté, 2003). Medication non-adherence leads to reduced clinical benefit, avoidable morbidity and mortality and medication wastage (DiMatteo, Giordane, Lepper, & Croghan, 2002). With increases in life expectancies as well as the number of patients managing chronic illnesses, this problem may well become worse in the next few years. Consequently, policy makers have called for successful interventions to address the causes of non-adherence and improve the population's use of medicines (Holloway & van Dijk, 2011; Horne, Weinman, Barber, Elliott, & Morgan, 2006; Nunes et al., 2009; Sabaté, 2003). Indeed, it has been estimated that \$269 billion worldwide could be saved by improving patient medication adherence (IMS Institute for Healthcare Informatics, 2012).

Unfortunately, many adherence interventions to date have not been effective (Haynes, Ackloo, Sahota, McDonald, & Yao, 2008). Medical Research Council guidelines recommend that appropriate theory and evidence should be identified to inform the development of an intervention (Craig et al., 2008). However, most adherence interventions are developed without a sound theoretical base, which may be one of the reasons they have not been effective (Horne et al., 2006). Successful interventions have often involved a level of complexity that would be too difficult and expensive to implement in practice (Haynes et al., 2008).

Explanations and models of medication

adherence/non-adherence have changed over the years. Early work tended to focus on the role of doctor-patient communication and its effects on patient satisfaction, understanding and forgetting as key determinants of subsequent treatment adherence (Ley, 1988). However, health behaviour research has consistently demonstrated that the provision of information alone is not an effective way to change behaviour, and so research has now moved onto approaches and models which focus on patients' beliefs, motivation and planning abilities as the core explanatory variables. Many of these are social cognition or self-regulatory models which emphasize the importance of the beliefs which individuals have about their illness and treatment as well as their own ability to follow the treatment and advice which they are given (see Conner & Norman, 2005). Existing models and frameworks are not comprehensive since they neglect automatic processes such as habit (for example, Ajzen, 1985; Bandura, 1977, 1986; Horne, 1997, 2003; Leventhal, Nerenz, & Steele, 1984; Pound et al., 2005; Rosenstock, 1974), do not describe dynamic behaviours whereby the experience of adherence/non-adherence can alter predisposing factors such as beliefs about medication (for example, Ajzen, 1985; Bandura, 1977, 1986; Horne, 2003; Pound et al., 2005; Rosenstock, 1974) and neglect factors at a systems level (for example, Horne, 2000, 2003; Leventhal et al., 1984; Pound et al., 2005; Rosenstock, 1974). In addition, the often used

Christina Jackson

Atlantis Healthcare

Lina Eliasson

Atlantis Healthcare

Nick Barber

The Health Foundation

John Weinman

King's College London

categories of 'intentional' and 'unintentional' non-adherence have limited use in implementing adherence interventions because there is much overlap between categories. For example, forgetting can be unintentional but might be influenced by intentional or motivational factors, such as lack of perceived need for treatment (McHorney & Spain, 2011).

Finally, while these models and frameworks have identified a wide range of explanatory factors (see Kardas, Lewek, & Matyjaszczyk, 2013), they do not specify how to bring about change. Understanding what underpins non-adherence is a necessary first step, but consideration also needs to be given to how to change it.

Developments in the behaviour-change field

In recent years, increased attention has been paid to the delineation and classification of behaviour change techniques in order to develop and refine interventions within the field of health psychology. The many methods that have been used to attempt to change different health-related behaviours have been brought together and integrated as part of an overarching taxonomy of behaviour change techniques (Michie et al., 2013; Michie, Hyder, Walia, & West, 2011). The latest version of the taxonomy describes 93 distinct techniques that can be used to change behaviour (Michie et al., 2013). The taxonomy has been applied to identifying and understanding effective methods of changing a range of health-related behaviours, including physical activity (Michie, Abraham, Whittington, McAteer, & Gupta, 2009), healthy eating (Michie et al., 2009) and tobacco use (Lorencatto, West, & Michie, 2012). For example, interventions which incorporated the technique of "self-monitoring" (where the

participant monitors and records their behaviour (Michie et al., 2013)) were significantly more successful at promoting physical activity and healthy eating than interventions which did not include this technique (Michie et al., 2009). Successful smoking cessation interventions targeted at pregnant women used techniques such as 'facilitating goal setting' and 'action planning' (Lorencatto et al., 2012).

The Capability, Opportunity and Motivation (COM-B) model of behaviour

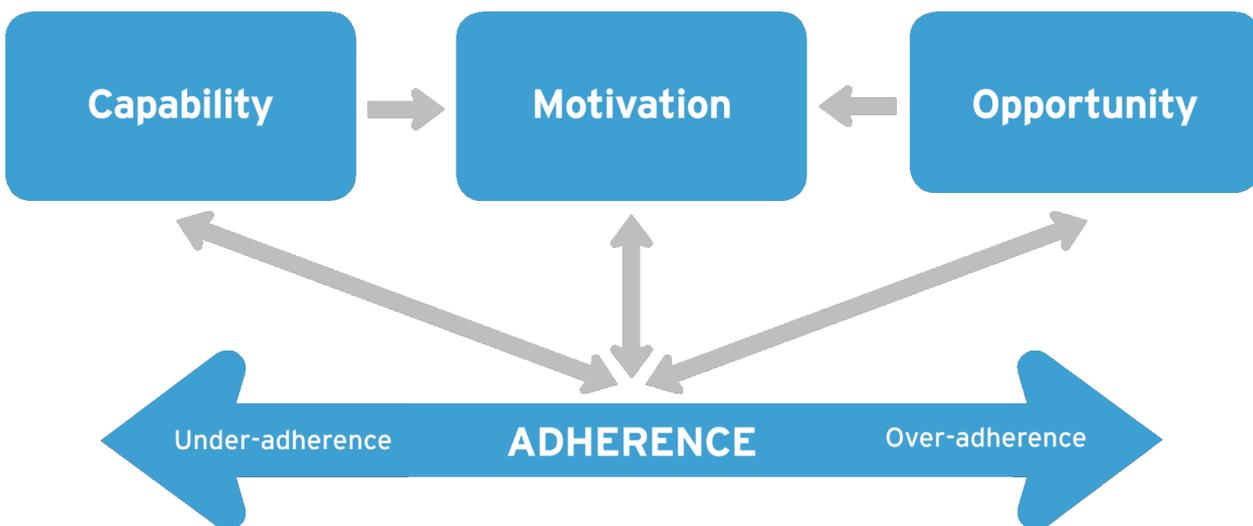
The development of a taxonomy of behaviour change techniques has resulted in new ways of conceptualising the factors which explain or determine individual health-related behaviours. At the core of this new approach is a psychological model for explaining human behaviour intended to capture the range of mechanisms that may be involved in change (Michie, van Stralen, & West, 2011). COM-B is intended to be comprehensive, parsimonious and applicable to all behaviours, and was developed with reference to existing theories of behaviour and a US consensus meeting of behavioural theorists, which considered the prerequisites for the performance of a specified volitional behaviour (Michie et al., 2011). COM-B is intended as a starting point in order to choose interventions that are most likely to be effective, and specific interventions to address each component have been suggested (Michie et al., 2011). The model hypothesises that interaction between three components, Capability, Opportunity and Motivation (COM) causes the performance of Behaviour (B) and hence can provide explanations for why a recommended behaviour is not engaged in. These components are described in more detail below. Each component can influence behaviour

directly and, in addition, Opportunity and Capability might influence Motivation and so affect behaviour. In addition, it is a dynamic model whereby performance of a behaviour can in turn influence Capability, Opportunity and Motivation. Our depiction of the model as it relates to adherence is shown in Figure 1.

In this paper, we examine how COM-B could be applied to describe the wide range of factors which have been identified to explain non-adherence to medication. The purpose of this exercise is not only to achieve a more coherent framework for explaining all types of medication non-adherence but also to make it easier to

and social environment, which can facilitate or impede the behaviour and, as such, is an explicit consideration of external resources, which are not usually included in other health behaviour models. Motivation comprises 'all those brain processes that energise and direct behaviour, not just goals and conscious decision-making' but also 'habitual processes, emotional responding' and 'analytical decision-making' (Michie et al., 2011, p.4). Each component is divided into sub-components to capture important distinctions within the research literature. Capability is subdivided into Psychological Capability (capacity to engage in

Figure 1. Application of COM-B to adherence



identify appropriate behaviour change techniques to improve adherence.

Capability, Motivation and Opportunity are collectively described as "components" influencing behaviour. Capability is defined as the 'individual's psychological and physical capacity to engage in the activity concerned' (Michie et al., 2011, p.4). Opportunity covers all those 'factors that lie outside the individual that make the behaviour possible or prompt it'. Thus, it includes aspects of the individual's physical

necessary thought processes) and Physical Capability (capacity to engage in necessary physical processes) (Michie et al., 2011). Opportunity is subdivided into Physical Opportunity (provided by the environment) and Social Opportunity (cultural milieu that dictates the way we think about things) (Michie et al., 2011). Motivation is subdivided into Reflective Motivation (evaluations and plans) and Automatic Motivation (emotions and impulses arising from associative learning and/or innate

dispositions) (Michie et al., 2011).

Applying COM-B to medication adherence

When representing the COM-B framework for adherence, we chose to depict adherence as a continuum (Figure 1), which reflects the extent any treatment recommendation is adopted. Thus it can include adherence to recommended lifestyle change or to psychological therapies (e.g. Gearing et al., 2013). The global term 'medication adherence' incorporates initiating the prescription, actual dosing in relation to the prescription, and persisting with treatment (Vrijens et al., 2012). This definition captures categorisations such as primary and secondary non-adherence (not redeeming a prescription, and not using a redeemed treatment as prescribed respectively) and non-persistence. However, the definition does not include treatment acceptance (accepting the offer of treatment within a consultation).

Three comprehensive reviews synthesising qualitative and quantitative studies of medication adherence were used to identify and map the different factors associated with adherence. Since adherence has been investigated in both quantitative and qualitative studies, we selected these three sources to identify factors commonly associated with medication adherence (Kardas, Lewek, & Matyjaszczyk, 2013; Nunes et al., 2009; Pound et al., 2005). Kardas et al. (2013) undertook a systematic review of 51 systematic reviews of factors associated with non-adherence. Pound et al. (2005) used a systematic search and analysis procedure to synthesise qualitative papers exploring patients' views of medication. They included 38 papers from 1992 – 2001. Nunes et al. (2009) replicated this process for papers from 2002 and included 45 qualitative

papers. Between them these papers provide a comprehensive overview of what is currently known regarding factors associated with non-adherence.

In order to identify all the factors associated with non-adherence, we first extracted those found by Pound et al. (2005) and Nunes et al. (2009) and then examined the 461 factors listed by Kardas et al. (2013). The evidence was examined by 2 independent raters, who then agreed on a final list of common factors from all three reviews and also on how each of these mapped (or did not map) onto the COM-B model, using the definitions listed above regarding components and sub-components. This secondary analysis indicated that the COM-B proved a workable way to group most of the known determinants of adherence. Table 1 shows how factors extracted from the literature mapped onto COM-B.

While most of the factors could be readily classified within the COM-B framework, four factors associated with non-adherence did not map directly onto a single sub-component of COM-B. These were depression, substance abuse, marital status and forgetting. Their effects on adherence can be explained by a number of different factors. For example, depression and substance abuse might have an effect on adherence by impacting mood (Motivation/Automatic), perceptions of illness and treatment or self-efficacy (Motivation/Reflective), availability of social support (Opportunity/Social), or impairing cognitive function (Capability/Psychological). Marital Status might have an effect on adherence by impacting the availability of social support (Opportunity/Social), cost (Opportunity/Physical) or access (for example ability to travel to hospital for appointments) (Opportunity/Physical). Forgetting might be the outcome of impaired cognitive or executive function (Capability/Psychological), regimen

Table 1. Applying COM-B to factors associated with adherence

CAPABILITY	MOTIVATION	OPPORTUNITY
<i>The individual's physical and psychological capacity to engage in the behaviour*</i>	<i>All brain processes that energise and direct behaviour</i>	<i>All factors lying outside the individual that make performance of the behaviour possible or prompt it</i>
Psychological <i>Capacity to engage in necessary thought processes</i>	Reflective <i>Evaluations and plans</i>	Physical <i>Physical opportunity provided by the environment</i>
<ul style="list-style-type: none"> •Comprehension of disease and treatment •Cognitive functioning (e.g. memory, capacity for judgement, thinking) •Executive function (e.g. capacity to plan) 	<ul style="list-style-type: none"> •Perception of illness (e.g. cause, chronic vs. acute etc.) •Beliefs about treatment (e.g. necessity, efficacy, concerns about current or future adverse events, general aversion to taking medicines) •Outcome expectancies •Self-efficacy 	<ul style="list-style-type: none"> •Cost •Access (e.g. availability of medication) •Packaging •Physical characteristics of medicine (e.g. taste, smell, size, shape, route of administration) •Regimen complexity •Social support •HCP-patient relationship / communication
Physical <i>Capacity to engage in necessary physical processes</i>	Automatic <i>Emotions and impulses arising from associative learning and/or innate dispositions</i>	Social <i>Cultural milieu that dictates the way we think about things</i>
<ul style="list-style-type: none"> •Physical capability to adapt to lifestyle changes (e.g. diet or social behaviours) •Dexterity 	<ul style="list-style-type: none"> •Stimuli or cues for action •Mood state/disorder (e.g. depression and anxiety) 	<ul style="list-style-type: none"> •Stigma of disease, fear of disclosure •Religious/cultural beliefs

*statements in italics represent definitions given by Michie et al. (2011)

complexity or requirement to change daily lifestyle (Capability/Physical), beliefs about illness and treatment (for example if treatment is not perceived as necessary) (Motivation/Reflective), or absence of cues or stimuli for action (Motivation/Automatic).

The hypothesised interaction whereby Capability and Opportunity can influence Motivation enables description of the complex ways in which a known determinant of non-

adherence, such as treatment complexity might have its effect. A complex regimen (e.g. multiple varying medication schedules throughout the day) might be beyond the planning capabilities of some (Capability/Psychological), whereas for others, although it is within their ability to follow, it may be a factor that negatively influences motivation to take treatment (Motivation/Reflective). For example, Nunes et al. (2009) reported that individuals with

complex regimens chose to take those medications offering symptom relief or for the most feared condition, suggesting that complex regimens might be a challenge to both capability but also motivation to take treatment. The feedback loop between adherence and Motivation fitted well with the findings of the reviews. Pound et al. (2005) reported that individuals might stop or alter medication and watch the effects thereby influencing perceptions of the need for medication and efficacy of medication. Kardas et al. (2013) listed disappearance of symptoms/feeling better or cured as factors associated with non-adherence. We posit that feedback loops between adherence and Capability and Opportunity are also possible. For example, experience of using medical equipment (such as inhalers or injections) will improve Physical Capability to use the medication (that is, the capacity to perform the behaviour improves with practice). An example of adherence improving Opportunity would be an improved relationship with a HCP following adherence: playing the role of the 'good' patient may encourage the HCP to view the patient in a more positive light and then provide more encouragement or support, which, in turn, could result in better treatment persistence over time.

From our work on this, we feel that COM-B provides a more comprehensive explanation of adherence than existing models. Firstly, it includes automatic processes such as habit (unlike social cognition models which have been applied to adherence). Secondly, it explicitly includes factors at a systems level (unlike many social cognition models and the Perceptions and Practicalities Approach (Horne, 2000)). Thirdly, the specificity of components within the COM-B model, and hypothesised relationships between them, allows a precise description of the relationship between individual determinants and adherence, making it easier to identify

appropriate interventions. Since this framework allows a more comprehensive and fine grained analysis of the causes of non-adherence, this should mean that an intervention can be selected more precisely to target a particular cause. Consequently it helps us move beyond simply dichotomising adherence into 'intentional' and 'unintentional' categories. In COM-B the determinants of non-adherence are Capability, Opportunity and Motivation, some of which may be conscious ('Intentional') and some unconscious or outside the individual's control ('Unintentional'). Adherence relates simply to the behaviour itself - using treatment at the right time, for the right period, in the right quantity, and in the right manner.

Not all factors identified from the literature review fitted into exactly one sub-component but might have their effects via a number of components (depression, substance abuse, marital status, forgetting). We do not feel that this is a limitation of the model since the effects of the factors are explained by components within the model. It highlights that in order to improve adherence research should be undertaken to investigate how a particular factor has its effect in order to generate clear hypotheses about processes. For example, marital status is sometimes cited as a factor associated with non-adherence, but the appropriate intervention would not be to set up matchmaking services, rather to understand what benefits are conveyed by marital status and find a way of extending these to unmarried people.

Implications and applications in practice.

In order to have the greatest chance of success, relevant theory and evidence should be identified before an intervention is designed

(Craig et al., 2008). As a first stage, an adherence intervention designer should identify factors associated with non-adherence within their target population through reference to existing literature or primary research. These factors could be assigned to Capability, Opportunity, and Motivation (recognising that some factors may have specific effects on different components). Mapping the evidence to the COM-B model is helpful for making sure that the intervention designer does not get drawn in to thinking of adherence only on one level (for example on an individual or systems level).

In a second stage, the designer could identify intervention types and behaviour change techniques that are appropriate for the sub-components identified in the first stage. Here the designer could use intervention types and techniques that have already been described and could readily be applied to adherence (Michie et al., 2013; Michie et al., 2011). With reference to both Michie et al. (2011) and the taxonomy of behaviour-change techniques (Michie et al., 2013) we would suggest that improved Physical Capability can be achieved through interventions such as feedback and monitoring, demonstration of the behaviour, repetition, or through enabling interventions such as provision of aids (e.g. monitored-dosing box) (Michie et al., 2013; Michie et al., 2011). Psychological Capability can be achieved through techniques such as shaping knowledge, feedback and monitoring, and through enabling interventions (Michie et al., 2013; Michie et al., 2011). Reflective Motivation can be improved through techniques such as shaping knowledge, giving information about consequences, comparison of outcomes, comparison of behaviour, setting goals and improving self-belief (Michie et al., 2013; Michie et al., 2011). Automatic Motivation can be improved through associations (e.g. presence of prompts or cues), imitative learning (e.g. watching someone else

performing the behaviour), and repetition (Michie et al., 2013; Michie et al., 2011). Finally, Physical and Social opportunity can be achieved through environmental change (changing the physical or social context) (Michie et al., 2011). When determining appropriate techniques, the designer would also take into account available resources, and the target population. For the interested reader, links are also made between each intervention type and policy categories which enable or support that intervention type (Michie et al., 2011).

Finally, as the evidence around effective behaviour change techniques grows, it will be possible to determine which techniques are most effective at addressing each of the components. Researchers across research groups and disciplines will be able to move forward together to develop a science of behaviour change. We are not aware of any interventions using COM-B to improve medication adherence, but a recent systematic review of adherence to cardiovascular medication did use it as a framework for grouping existing interventions (Laba et al., 2013). Within other research areas, work is underway to identify the types of behaviour change techniques that are effective (e.g. Webb, Joseph, Yardley, & Michie, 2010) and COM-B has been used in the design of interventions in areas as diverse as eating (Robinson et al., 2013; Watt et al., 2013), risk of Alzheimer's disease (Anstey, Bahar-Fuchs, Herath, Rebok, & Cherbuin, 2013), and condom use (Newby, French, Brown, & Lecky, 2013).

In conclusion, we believe that COM-B has advantages over existing theories of adherence. It can account for a wide range of factors affecting adherence (including cognitive and emotional factors, individual factors such as forgetting and dexterity and external influences of the healthcare system, policy and media). Additionally, this dynamic framework also explains how the performance of a behaviour

can in turn influence capability, opportunity and motivation. Lastly, the framework has been explicitly developed to inform behaviour change interventions and as such can be used to guide both adherence researchers and health care practitioners involved in the care of non-adherent patients. The publication of interventions applying COM-B in combination with related intervention types and behaviour change techniques will enable the growth of a body of knowledge regarding effective elements of adherence interventions.

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Conflict of interests

Christina Jackson and Lina Eliasson are full-time employees of Atlantis Healthcare. John Weinman is a part-time employee of Atlantis Healthcare. Nick Barber has no conflicts to report.

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Christina Jackson

Is a Senior Health Psychology Specialist at Atlantis Healthcare, and Visiting Lecturer at King's College, London, UK

Christina.jackson@atlantishealthcare.com



Lina Eliasson

Is a Clinical Strategist at Atlantis Healthcare, and Honorary Research Associate at Imperial College, London, UK

Lina.eliasson@atlantishealthcare.com



Nick Barber

Is Director of Research at The Health Foundation, London, UK

nick.barber@health.org.uk



John Weinman

Is Professor of Psychology as Applied to Medicine at King's College London, and Head of Health Psychology at Atlantis Healthcare, , UK

John.weinman@kcl.ac.uk

original article

Early Intervention Tool (EIT) for children with developmental delay: A pilot study

Ram Lakhan*Jackson State University***Ajay Singh***Western State Colorado
University*

Children with developmental delay (DD) are at a higher risk for intellectual disabilities (Lakhan, 2013; Shevell, 2010; Shevell, 2008). Intellectual developmental disorder (IDD) (McIntyre & Brown, 2013) is a new word coined for intellectual disabilities in the recent Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V) (Pynoos, 2013). An intellectual developmental disorder affects an individual's life in terms of self-help care, education, family, occupation and social life (Lakhan, 2013; Wehmeyer & Garner, 2003; Seltzer et al., 2001). Cognitive, communications, motor and social are considered the four main areas of child development. Significant delay in any one area is considered developmental delay. Coexisting conditions such as epilepsy, cerebral palsy, psychiatric disorder are very common with developmental delay and may pose an even higher level of risk for a child becoming intellectually disabled (Kogan et al., 2009). Early identification and intervention is highly crucial (Singh & Squires, 2014; Lakhan, 2013; Sheldrick et al., 2011; Matson et al., 2010; Shevell, 2010).

DD children face enormous challenges in their lives if not treated on time. Therefore, attempts should be made to recognize such delay and provide early intervention (Girimaji, 2008). Early intervention reduces both the chance of secondary disabilities and increased severity (Singh et al., 2014; Allen, et al., 2013; Bagner et al., 2013; Case-Smith, 2013; Engle et al.,

2013; McIntyre & Brown, 2013).

Developmental screening constitutes an ongoing process of monitoring the status of a child by gathering information about development from multiple sources, including skillful direct observation from parents/caregivers and relevant professionals (Squires et al., 1996; Gilbride, 1995). The American Academy of Pediatrics and the British Joint Working Party on Child Health Services recommend developmental screening as an effective means to identify children with developmental delay (Garg & Dworkin, 2011; Shevell, 2010). Developmental screening refers to a brief process of testing in order to identify those who are at risk for developmental delay. Developmental screening identifies those who are in need of further evaluation for eligibility for specialized services (Das et al., 2013; Overton, 2009; Rydz, Shevell, Majnemer, & Oskoui, 2005). For early identification and detection of delays, attention has shifted to developmental screening (Gregoire, & Lucky, 2012). Developmental screening is viewed as a necessary strategy in the primary prevention of developmental disabilities (Katoff & Reuter, 1980).

Currently, early intervention services are being offered in various settings including rehabilitation centers, special schools, community-based rehabilitation projects and child guidance clinics by different rehabilitation professionals. Early intervention can be very specific depending on the nature and severity of developmental delay (Rapee, 2013). Professionals have the ability to choose the

appropriate tools to monitor and evaluate the progress of a DD child, especially if an intervention is targeted towards a particular coexisting condition such as cerebral palsy, communication, cognitive functions, psychiatric disorder etc. There is a need for a simple, reliable, valid, less time consuming and easy to use tool to measure the comprehensive progress of a child with DD in all the domains of development (Moss & Hurley, 2014; Baker et al., 2013; CPNP-PC & Daniels, 2013; Illingworth, 2013). Worldwide prevalence of developmental disabilities has risen in the last decade (CDC, 2013). This increased prevalence demands more infrastructural resources, and professionals to serve the needs of the population. A low and middle-income country such as India does not have the capacity to serve the DD population via a multidisciplinary team. In general, there is huge shortage of trained EIT professionals in India. Available professionals are situated in big towns and cities and they do not prefer to serve in rural communities. In that situation, especially, in rural and more disadvantaged areas of India early intervention services are offered by community based organizations and paraprofessionals in most cases under supervision of trained professionals. Thus, there is a need for an easy, comprehensive and time-efficient tool to measure the progress of a child who is receiving the intervention. (Das & Singh, 2013; Lakhan, 2013; Poon et al., 2010).

The Functional Assessment checklist for programming (FACP), Madras Developmental Program Schedule (MDPs), and Portage guide (Kohli, 1990) are commonly used tools in India. These tools are standardized and very reliable. However their administration in community settings (Dougherty, 2013) is not always feasible due to time constraints, complexity in scoring (Kammerer et al., 2013; Lukersmith, 2013; Nosworthy et al., 2013, Robertson & Blaga, 2013). To address this need in a community

based rehabilitation project in Barwani, state of Madhya Pradesh, an Early Intervention Tool (EIT) was developed by the authors.

Objective

The objective is to describe an early intervention tool and its use in measuring the effect of early intervention and assessment for children with developmental delay. EIT includes four domains or developmental areas: (i) physical; (ii) cognitive; (iii) communication; and (iv) social development and is designed to monitor the typical development of children between 3 months to 36 months.

Method

The EIT was developed by the authors in a community based rehabilitation (CBR) project in Barwani, India, which is one of the poorest district in the state of Madhya Pradesh situated in India (Lakhan, 2013). This tool was developed for community based rehabilitation workers, rural health workers, physicians, rehabilitation therapist, social workers, parents and psychologists.

Process of Design and Validation

The items listed on the scale were developed in consultation with a child psychiatrist, a clinical psychologist, a physiotherapist, a speech therapist, an occupational therapist, a medical and psychiatric social worker and a specialist in mental retardation. Millstones from all four areas of development were selected first. These milestones/items were culturally adopted from other standardized tests including the FACP (Narayan, et al., 1990), the Developmental Screening Test (Bharat, 1983), the Vineland Social Maturity Scale (Indian adaptation by Malin; revised by Bharat Raj, 1992), MDPS

(Jeyachandran & Vimala., 2000), Portage Guide (Kohli, 1990), BASIC-MR (Peshawaria & Venkatesan, 1992). These modified test items were placed in lower to higher order and circulated among the professionals. Suggestions and comments were incorporated in finalizing the 14 item scale applicable for children with DD. It is important for a tool to be reliable and valid (Gowen et al., 2012; Fink, 2002). For validation EIT was administered on 19 children (12 tribal and 7 non-tribals) in Barwani and Pati Blocks, of Barwani District in India by community based rehabilitation workers. Other professionals, physiotherapists, occupational therapists and specialists in intellectual disabilities also administered EIT on their clients and provided their feedback. Administration was conducted in different settings. Data obtained on 19 children supports internal consistency and face validity of the tool. Based on the results of these administrations, EIT was found easy to use, less time consuming, reliable and valid. Items listed in the tool were found to simple and easy to understand by non-tribal and tribal parents with and without education. Tribal and non-tribal communities speak two different languages. Tribal community is highly underprivileged, habilitated in disperse hamlets, and heavily relies on traditional faith healing. The tool was administrable on both populations. The results were comparable to other standardized early intervention instruments: Functional Assessment Checklist for Programming FACP (Narayan et al., 1990), Portage Guide Indian adaptation (Pratibha, 2013; Kohli, 1990), and Language Assessment Tool (Subbarao, 1990).

Results

EIT contains 14-items (see Appendix). Items included four domains or developmental areas;

physical, cognitive, communication and social development. It is based on a likert scale. Items are scored with numbers 0-5. Number 0 represents no progress, and the number 5 represents maximal progress or the attainment of the milestone. This assessment tool can be administered by parents, teachers, community workers, rural health workers, social workers, psychologists, rehabilitation therapists, pediatrics, rural health physicians, nurses and professionals in any setting. Scores are assigned on the basis of a parent's/caregivers responses and direct observation of professional's, who is delivering early intervention to the child or assessing the child to start intervention. Direct observation by professionals is not the criteria of assigning the scores on EIT, but this consultative process of assigning scores helps both parties (parent and therapist) to understand scoring patterns and stay on same level of understating during the intervention process. This tool measures development between ages 3 months to 3 years. However it can be administered from age of 3 months to 6 years. It can also be administered in order to design and monitor interventions with older age groups of children with confirmed diagnosis of moderate or lower level intellectual disabilities. The diagnosis result is valid for one year. It is designed to be administered every quarter (3 months) and/or for four times in a year to monitor the developmental progress.

Limitations

The EIT tool primarily belongs to the discipline of developmental and health psychology. The EIT tool can provide an indication of deficit in development in quantifiable terms, but the results cannot be matched with other standard psychological tests such as the DST and VSMS in terms of the

diagnostic criteria of DD.

Conclusion

The EIT tool helps users to measure progress in four domains of development in quantifiable terms. This tool can be easily used by variety of professionals and parents due to its simple language and easy scoring. Compared to other existing tools, EIT takes far less time in administration. It is a parent/caregivers and professional friendly assessment tool.

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**Ram Lakhan**

Is a DrPH Candidate at the Department of Epidemiology, School of Health Sciences, Jackson State University, Jackson, Mississippi, USA

ramlakhan15@gmail.com

**Ajay Singh**

Is Tenure Track Assistant Professor of Teacher Education, Graduate Faculty Education Department, Western State Colorado University, Gunnison, Colorado, USA

ajaysingh363@gmail.com

Appendix

Early Intervention Tool (EIT), India (Age: 3 months to 3 Years)

Child Name:

DOB/Age:

Parent name:

Date:

Referred by:

Address:

Items	Date (1- 3 months)					Date (3-6 months)					Date (6-9 months)					Date (9-12 months)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1. Make eye contact	<input type="checkbox"/>																			
2. Neck control present	<input type="checkbox"/>																			
3. Roll over	<input type="checkbox"/>																			
4. Sit with support	<input type="checkbox"/>																			
5. Sit independently	<input type="checkbox"/>																			
6. Stand with support	<input type="checkbox"/>																			
7. Stand independently	<input type="checkbox"/>																			
8. Walk with supports	<input type="checkbox"/>																			
9. Walks independently	<input type="checkbox"/>																			
10. Babbling	<input type="checkbox"/>																			
11. Tries to talk	<input type="checkbox"/>																			
12. Says one word	<input type="checkbox"/>																			
13. Says two words	<input type="checkbox"/>																			
14. Have toilet control	<input type="checkbox"/>																			
Total																				

The full questionnaire is downloadable [here](#)

networking grant report

Changing self-perceptions on aging to enhance personal resources for the promotion of physical activity in older people

A pilot study to test the effectiveness of an evidence-based intervention in 4 countries (France, Germany, Italy, Romania)

Catrinel Craciun

*Babes-Bolyai University
Free University Berlin*

Julia Katharina Wolff

*German Centre of
Gerontology*

Susanne Wurm

*Friedrich-Alexander
University Erlangen-
Nuremberg*

*German Centre of
Gerontology*

Lisa Marie Warner

*German Centre of
Gerontology
Free University Berlin*

Andrea Greco

University of Milan-Bicocca

Dario Monzani

University of Milan-Bicocca

Cecile Bazillier

University Paris Ouest

Many countries worldwide currently experience a significant increase in life expectancy. It is expected that by 2050 the number of people over 65 will reach 34% in Germany (Federal Statistic Office, 2011) and Italy (National Institute of Statistics, 2004), 26% in France (Insee, 2006) and 30.8% in Romania (EuroStat, 2013).

Longevity and how successful people age depend on objective factors (i.e. health), but also on personal attitudes and psychosocial resources. Specifically, self-perceptions of aging are important predictors of physical, functional and self-rated health (e.g., Levy et al., 2002; Wurm et al., 2007), subjective well-being and even longevity (Maier & Smith, 1999;

Levy et al., 2004; Levy & Myers, 2005). Self-perceptions of aging affect health by influencing physiological mechanisms (Levy et al. 2000) or health behavior change (Levy et al., 2004). Several studies have shown that older people who attribute symptoms to age instead of a potential illness, place less importance on healthcare utilization (Sarkisian, Hays, Mangione, 2002; Goodwin, Black, Satish, 1999). In contrast, people with a positive view on aging tend to practice more preventive health

behavior in general and are more physically active (Levy & Myers 2004; Wurm et al. 2010). Therefore, changing views on aging represents a promising intervention technique to enhance resources for health and health behaviors in older adults.

Aims

The present study tested the effectiveness of a pilot intervention aiming to change self-perceptions of aging and thereby facilitate physical activity (PA) in older adults in four European countries. In addition, the implementation process and the evaluation of the intervention by the participants were investigated.

Methods

The intervention's effectiveness in changing self-perceptions of aging was tested against a control group, who received a healthy eating intervention, in each of the four networking countries. The intervention was organized in terms of group sessions with 5 to 10 persons and comprised three steps:

1. Provide information about positive aspects in old age (e.g., satisfaction with life, training of cognitive abilities) and false stereotypes about older adults by using a quiz on age-related questions and by providing empirical evidence for the right answers afterwards.
2. Formulate a negative view on aging and find arguments against this view in a group discussion to attenuate the negative view (based

on cognitive behavioural therapy principles; adapted from Hautzinger, 2000).

3. Ask the group for positive views on aging and give homework to ask other people whether this view is true in order to strengthen the positive view (based on cognitive behavioural therapy principles; adapted from Hautzinger, 2011).

Step one was based on the behaviour change technique “providing information” (Michie, Ashford, Sniehotta, Dombrowski, Bishop, & French, 2011), which has proved to be effective in changing attitudes (in this case towards ageing and older adults). Considering the target group of older adults, step two and three were adapted from techniques used in cognitive

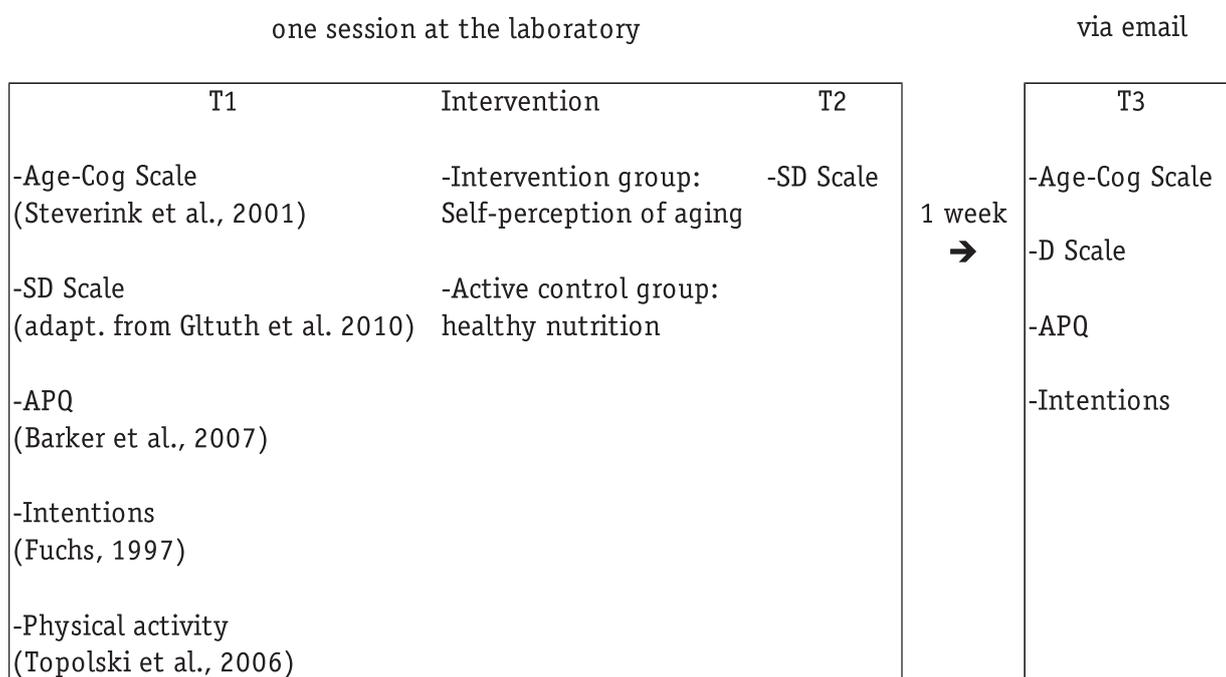
ageing and older adults.

To evaluate the intervention’s effectiveness questionnaires assessed cognitions and PA at different time points (see Figure 1).

Participants and recruitment

Recruitment was conducted via local newspaper articles, leaflets displayed in meeting places of the elderly, pharmacies or by word of mouth. In Germany, 56 individuals (70% women, mean age 72, SD = 5.6), in France 23 participants (63% women, mean age 77, SD = 6.1), in Italy, 55 individuals (67% women, mean age 73, SD = 6.3) and in Romania 30 individuals (50% women, mean age 68, SD = 5.3) participated.

Figure 1. Study design with assessed variables at each measurement occasion



behavioural therapy with older adults in a group setting. Originally these techniques were developed for depression therapy, and were focused on changing negative automatic thoughts about oneself. These techniques were adapted to change negative thoughts about

Results

1. Intervention effects from T1 to T2

Analyses of variance with repeated measures

showed a significant group*time interaction for the Semantic Differential Scale (SDS; e.g., "Older adults are... open to new things reserved about new things") in Germany ($F(1; 50) = 6.02, p = .02, \eta^2 = .11$) and Italy ($F(1; 50) = 4.86, p = .03, \eta^2 = .09$) but not in Romania ($F(1; 28) = 3.42, p = .07$) or France ($F(1; 23), p = .11, \eta^2 = .74$).

2. Intervention effects from T1 to T3

In Germany, in all models, group*time interactions were not significant, indicating no change from T1 to T3 (Age-Cog Scales: Developmental Gains: $F(1; 47) = 0.04, p = .84$; Physical Losses: $F(1; 47) = 0.13, p = .73$; Social Losses: $F(1; 47) = 0.00, p = .98$ SDS: $F(1; 48) = 2.31, p = .14$; Ageing Perception Questionnaire (APQ): $F(1; 48) = 0.19, p = .66$; PA Intentions: $F(1; 47) = 1.32, p = .26$).

In France group*time interactions were not significant, indicating no change in Intentions: $F(1; 16) = 0.13, p = .72$, APQ: $F(1; 16) = 0.57, p = .46$ and SDS ($F(1; 16) = 3.6, p = .07$).

In Italy, a significant group*time interaction was found for SDS: ($F(1; 48) = 4.84, p = .03, \eta^2 = .09$) and PA Intentions ($F(1; 48) = 4.12, p = .05, \eta^2 = .08$) but not for Developmental Gains: $F(1; 48) = 0.02, p = .96$, Social Losses: $F(1; 48) = 1.93, p = .17$ and APQ: $F(1; 48) = 3.71, p = .06$.

In Romania group*time interactions were not significant, indicating no change from T1 to T3 (Developmental Gains: $F(1; 28) = 0.43, p = 0.51$; Physical Losses: $F(1; 28) = 0.44, p = .51$; Social Losses: $F(1; 28) = 1.39, p = .24$; SDS: $F(1; 28) = 1.97, p = .17$; APQ: $F(1; 28) = 0.26, p = .60$; PA Intentions: $F(1; 28) = 0.63, p = .43$).

3. Process evaluation

The process evaluation at T2 and T3 indicated that participants rated the intervention content positively, assessed the intervention as relevant and would recommend it to others (in all countries means were above 3 on a Likert-scale

with 4 being the best rating). At T3, participants agreed they could apply the intervention content in their daily life (Germany: $M = 2.79, SD = 0.54$; Italy: $M = 2.98, SD = 0.55$; Romania: $M = 2.50; SD = 0.50$) and talked about the intervention content with others (Germany: $M = 2.76, SD = 0.83$; Italy: $M = 3.06, SD = 0.44$; Romania: $M = 2.43; SD = 0.50$). In France, most participants agreed the workshop was interesting and enjoyed the group session.

Discussion

The present study provides evidence that it is possible to change self-perceptions of ageing and attitudes towards older people in a sample of older adults. This finding is consistent with previous studies evaluating cognitive interventions with younger adults (Eskildsen & Flacker, 2009; Bardach, Gayer, Clinkinbeard, Zanjani & Watkins, 2010) and extends research on intervention effects on self-perceptions of ageing in older adults (Sarkisian, Prohaska, Davis, & Weiner, 2007).

Intervention effects

Between T1 and T2 the intervention group improved their attitudes towards older persons on the Semantic Differential Scale compared to the control group in Germany and Italy, but not in France and Romania. In Italy, this change was also present from T1 to T3. The study was able to change attitudes towards older adults that were directly addressed in the intervention (items of SDS were formulated in accordance with the intervention content). However, we cannot generalize this finding to more distal measures of self-perceptions of ageing. Thus, the overall intervention effect should be regarded as rather proximate and the intervention sessions' capacity to change more distal self-perceptions

of ageing needs to be further investigated in future studies. In Italy, results showed additionally an overall intervention effect one week after the intervention for PA Intentions.

The absence of more significant findings in all countries could be due to the short duration of the intervention (around 1.5h) and the absence of booster sessions, which may help older adults to remember and internalize intervention contents (Koder, Brodaty & Anstey, 1996). In future studies, the effect of an increase in duration as well as in the number of session should be investigated. In France, participants complained about the length and repetition of the questionnaire, and said the items were created by young people, who do not understand how older people think. This could be one explanation why they were not very motivated by the intervention and thus no significant changes in age perceptions or intentions could be found. In Romania, the small sample size as well as participants' complaint that the intervention was too short to address all their ageing problems could constitute explanations of the insignificant results. Moreover, in Romania and France means of age perceptions and intentions were already high at the beginning of the intervention accounting for the possibility of a ceiling effect. Significant differences between the age perception means in the four countries could be due to the differences in sample size and provide an explanation for the different results.

Process evaluation

Participants rated their satisfaction with the intervention and the relevance of the intervention as high. This finding is in line with previous studies on cognitive interventions with older adults (Winocur et al., 2007; West, Bagwell & Dark-Freudman, 2008). Even though intervention effects were not found for all

outcome measures, participants did on average agree with the statement that they applied the intervention content in their daily life. Thus, the outcome measures might not have been sensitive enough to capture the change and application of the intervention content in this sample.

Limitations and future directions

The sample of our study consisted mainly of "young old" individuals (mean age 68 to 77). Older individuals who are increasingly confronted with physical limitations (Baltes & Smith, 2003; Schöllgen & Huxhold, 2009) may have shown different intervention effects and future research should consider age-specific effects. Additionally, due to recruitment procedures the samples may be selective in terms of interest in research and education which may have an influence on compliance with intervention strategies. Finally, perceptions of ageing may not only be an outcome but a moderator of intervention success: older adults who have the attitude that they are too old for a behavioral change may be less susceptible to a cognitive intervention (Koder et al., 1996).

Conclusion

The present findings underline a new research line on perceptions of ageing interventions in older adults and, thereby, extend the literature on effective interventions for an improvement of self-perception of ageing in younger adults to the target group of older adults. An overall intervention effect was found in only one questionnaire that was very close to the intervention content. However, in Italy, an effect on a distal outcome, namely intentions for PA, was found. Furthermore, moderation analyses showed distinct positive intervention effects for persons with high as well as low PA levels (due to word limit not reported here). To

conclude, interventions that enhance self-perceptions of ageing in older adults are a promising pathway to successful ageing and should be developed further in future research.

Participating Teams

Romania (coordinating country): Catrinel Craciun (Free University Berlin, Germany; Babes-Bolyai University, Cluj Napoca, Romania, catrinelcraciun@yahoo.com)

Germany: Susanne Wurm (Friedrich-Alexander-Universität Erlangen-Nürnberg; DZA, susanne.wurm@dza.de), Julia K. Wolff (DZA, Julia.Wolff@dza.de), Lisa M. Warner (DZA, Free University Berlin, lisa.warner@fu-berlin.de)

France: Cécile Bazillier-Bruneau (B-research, Université Paris Ouest Nanterre la Défense, cecile.bazillier@b-research.fr)

Italy: Andrea Greco (University of Milan-Bicocca, Milan, Italy, andrea.greco@unimib.it), Dario Monzanni (University of Milan-Bicocca, Milan, Italy, dario.monzanni@unimib.it)

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Catrinel Craciun

Is Lecturer of Health Psychology at Babes-Bolyai University, Cluj-Napoca, Romania and a Post-doc Research Fellow at Free University Berlin, Berlin, Germany

catrinelcraciun@yahoo.com



Julia Katharina Wolff

Is a post doctoral researcher in the PREFER project, which is a cooperation of the department of Health Psychology at the Freie Universität Berlin and the German Centre of Gerontology, Germany

julia.wolff@dza.de

Susanne Wurm

Is Professor of Psychogerontology at Friedrich-Alexander Universität Erlangen-Nürnberg and Honorary Associate at the German Centre of Gerontology, Germany

susanne.wurm@fau.de

**Lisa Marie Warner**

Is a post doctoral researcher in the PREFER project, which is a cooperation of the department of Health Psychology at the Freie Universität Berlin and the German Centre of Gerontology, Germany

lisa.warner@fu-berlin.de

**Andrea Greco**

Is adjunct professor of motivation, emotion and personality and research collaborator at the Department of Psychology of the University of Milan-Bicocca, Italy

andrea.greco@unimib.it

**Dario Monzani**

Is a Post-Doc Research Fellow at the Department of Psychology of the University of Milan-Bicocca, Italy

dario.monzani@unimib.it

**Cecile Bazillier**

Is a researcher and director of B-research, a university company associated to University Paris Ouest, France.

cecile.bazillier@b-research.fr

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