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POSTPRINT¹**Beyond Individual Cognitions: Time for Intervention Science to Focus on Health Context and Audience**Aïna Chalabaev^a, Boris Cheval^{b,c}, Silvio Maltagliati^a, Ilyes Saoudi^a, and Falko F. Sniehotta^{d,e}^aUniv. Grenoble Alpes, SENS, 38000 Grenoble, France, aina.chalabaev@univ-grenoble-alpes.fr, silvio.maltagliati@univ-grenoble-alpes.fr, ilyes.saoudi@univ-grenoble-alpes.fr^bSwiss Center for Affective Sciences, University of Geneva, Switzerland, boris.cheval@unige.ch^cLaboratory for the Study of Emotion Elicitation and Expression (E3Lab), Department of Psychology, University of Geneva, Switzerland Department of Public Health, Social and Environmental Determinants of Health^dPreventive Medicine, Mannheim Medical Faculty, University of Heidelberg, Germany, falko.sniehotta@medma.uni-heidelberg.de^eNIHR Policy Research Unit Behavioural Science, Faculty of Medical Sciences, Newcastle University, UKCorrespondence authors: Aïna Chalabaev, aina.chalabaev@univ-grenoble-alpes.fr, @achalabaev, Orcid 0000-0002-1806-354X; Falko Sniehotta, falko.sniehotta@medma.uni-heidelberg.de, @FSniehotta, Orcid 0000-0003-1738-4269.

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In order to help people behaving more healthily, intervention science has advocated a theory-driven approach of behaviour change (Araújo-Soares et al., 2018; Skivington et al., 2021). This perspective considers that interventions can change behaviour effectively, provided that they target factors with proven causal links to the behaviour (e.g., Sheeran et al., 2017). Based on behaviour change models (e.g., Theory of Planned Behaviour, Ajzen, 1991, 2011; Health Action Process Approach, Schwarzer & Luszczynska, 2008; Self-Determination Theory, Deci & Ryan, 2008; Dual-Process Approach, e.g., Hofmann et al., 2008), several psychological factors have been identified as potential targets of intervention, such as conscious beliefs (e.g., self-efficacy, attitudes), motivations (e.g., autonomous and controlled), self-regulation strategies (e.g., action and coping planning) or more automatic constructs (e.g., habits, implicit affect).

Although a theory-driven approach is essential to improve the quality of behavioural interventions, important caveats remain. Notably, the predictive validity of models and the effectiveness of interventions differ between populations. Recent meta-analyses suggest, for example, that intention relates to health behaviours more strongly in non-clinical populations than in clinical ones (Choi et al., 2018; Zhang et al., 2019), and more strongly in the most educated samples (Schüz et al., 2017). Interventions also produce stronger effects in the most educated people, as indicated by a meta-analysis of 123 interventions based on the Theory of Planned Behaviour (Steinmetz et al., 2016). Similarly, a meta-analysis of digital physical activity interventions found significant effects in high socioeconomic status participants, but not in low socioeconomic status ones (Western et al., 2021). A systematic review of 24 interventions in non-clinical older adults even suggests that self-regulation techniques (e.g., goal setting, coping planning, self-monitoring of behavior) have deleterious effects on their self-efficacy and physical activity (French et al., 2014), whereas the same techniques seem beneficial in healthy younger adults (Michie et al., 2009; Williams & French, 2011). In sum, the average effectiveness of interventions hides large inter-individual differences depending on the characteristics of the audience such as clinical status, educational level or age.

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Far from being a sole point of interest for researchers, these results are alarming. Chronic disease patients and older adults are among the most physically inactive groups (Bauman et al., 2012). Likewise, unhealthy behaviours such as smoking, physical inactivity, sedentarity, alcohol consumption, or unhealthy diet, are more prevalent in people from disadvantaged socioeconomic background (Petrovic et al., 2018). As such, intervention science faces a hazardous paradox: on the one hand, these populations are those for whom adoption of healthy behaviours is most urgent; on the other hand, behaviour change models are less predictive, and interventions less successful, in these populations. A paradox that may ultimately impede intervention science to bridge the growing health gap between advantaged and disadvantaged individuals (Dowd et al., 2011; Tawiah et al., 2022).

An undue emphasis on the cognitions of fit and young individuals from high-income countries

At least four reasons may explain this paradox. First, research mostly investigates *what* causes behaviour (e.g., individual cognitions) and *how* to change it (e.g., behaviour change techniques), at the expense of examining *among whom* and *under what conditions* these factors and techniques do or do not predict behaviour (e.g., moderating effects of sociodemographic or contextual factors). As an illustration, most recent meta-analyses of behaviour change models and interventions did not (or could not) include participants' socioeconomic background or clinical status as potential moderators (Choi et al., 2018; Cooke et al., 2016; Gillison et al., 2019; Hagger et al., 2022; N. Lin & Roberts, 2020; McDermott et al., 2015; Ntoumanis et al., 2021; Sheeran et al., 2020; Vasconcellos et al., 2020; Zhang et al., 2019). This prevents intervention scientists to examine the conditions of application of these models.

Second, behaviour change models put an undue emphasis on individual cognitions. For example, much of the current debate on the “intention-behaviour gap” focuses on the cognitive factors that moderate this gap (Rhodes et al., 2022). Yet, behaviours rely on a wider range of determinants: at the individual level, they may include biological (e.g., health status, body mass index, fitness level) and sociodemographic characteristics (e.g., age, sex, education); at the contextual level, precursors of behaviour can be found in the macro-environment (e.g., transport and health policy, social norms) and in the micro-environment (e.g., social, built or natural) (e.g., Bauman et al., 2012). Crucially, factors from different levels may interact in a complex manner. For example, increasing access to recreational facilities may be necessary but insufficient to increase physical activity, as its influence may conjointly depend on the motivation to exercise (Giles-Corti & Donovan, 2002). Conversely, successfully translating intention to eat healthily into action may depend on the accessibility of vegetables in the neighborhood (Schulz et al., 2005). In sum, the current focus on individual cognitions prevents a complete understanding of the multifactorial and intricately caused health behaviours.

Third, research on health behaviour change is concerned with sampling issues. Studies are rarely conducted on populations in situation of vulnerability (e.g., patients, older adults, low-income individuals), but rather on young and healthy people (but see some initiatives like the Swiss National Centre of Competence in Research LIVES, or the Poverty Action Lab). A look at the 95 studies on the Health Action Process Approach applied to multiple health behaviours meta-analysed by Zhang et al. (2019) reveals that only 8% of the studies were conducted on older adults,

relative to 85% on young and middle-aged adults. Likewise, 31% of studies were conducted on clinical populations vs. 69% on non-clinical ones. In addition, most studies include samples from high-income countries. For example, 88% of the 265 studies on Self-Determination Theory meta-analysed by Vasconcellos et al. (2020) were conducted in Europe and North America, only 8% in Asia, 4% in Australia and Oceania, and no study in South America or Africa. Similarly, an analysis of the articles published from 2014 to 2018 in one of the top-tier journals of the APA, *Health Psychology*, showed that 64% of the samples came from the United States, 21% from English-speaking countries, 10% from Europe, and only 5% from the rest of the world (Thalmayer et al., 2021, Table 2). This sampling problem is not specific to intervention science and concerns behavioural sciences more generally. People from Western, Educated, Industrialized, Rich and Democratic (WEIRD) societies represent 80% of samples in psychology (Henrich et al., 2010) and biomedical sciences (Gurven & Lieberman, 2020), while they account for only 12% of the worldwide population. This overrepresentation leads scientists to mistakenly conclude to the universality of phenomena that are yet sensitive to context and individuals' characteristics, as observed in disease etiology (Apicella et al., 2020). Intervention science seems far from immune to such drawback. Recursively, this sampling bias could prevent from examining *among whom* and *under what conditions* models are valid and interventions effective, as it may result in insufficient variability in the factors of interest (Ding et al., 2022).

Fourth, the WEIRD bias also extends to researchers (Thalmayer et al., 2021) and journal editors (Altman & Cohen, 2021; Z. Lin & Li, 2022). For example, 64% of first authors of articles published in *Health Psychology* from 2014 to 2018 lived in the United States, 23% in English-speaking countries, 11% in Europe, and only 1% in the rest of the world (Thalmayer et al., 2021, Table 1). This structural ethnocentrism is problematic as researchers may tend to apply their own system of thoughts and values to the way they conceive and conduct research (Brady et al., 2018). For example, Roberts et al. (2020) showed that White editors-in-chief of journals in cognitive, developmental and social psychology, publish less articles highlighting race than non-White editors-in-chief. Likewise, White authors employ fewer non-White participants in their samples than non-White authors. As such, an overrepresentation of researchers from high socioeconomic background or high-income countries could partly explain why populations in situation of vulnerability are underrepresented in intervention science.

How to address the undue emphasis on the fit and young individuals from WEIRD countries? We need big ideas to solve big problems

Toward a thorough conceptualization of the role of context and audience in health behaviours

It becomes urgent to change the way intervention scientists conceive and conduct research. At the conceptual level, we need to develop theories that not only model more thoroughly how characteristics of the audience (related to sociodemographic characteristics and health) and the context (at the micro and macro level) may act as boundary limits of theory application and intervention effectiveness, but that also consider context and audience as variables of key importance in predicting behaviors.

To do so, one solution is to enrich behaviour change models with theoretical approaches that take into account the context. For example, the socioecological perspective (e.g., McLeroy &

Bibeu, 1988) or the COM-B model (Michie et al., 2011) consider both individual and contextual factors of behavior. However, how these different strata of factors interact with each other remains largely unknown (but see Rhodes et al., 2018), and interventions that simultaneously tap onto these different strata are rare (Teran-Escobar et al., 2022).

In the same vein, integrating findings from epidemiology and social psychology could help to better understand how the context and audience moderate interventions' effectiveness. Some epidemiologists proposed that such effectiveness depends on the extent to which they rely on participants' personal resources (i.e., personal motivation and ability to engage with the intervention) (Adams et al., 2016). Specifically, interventions that require participants to use personal resources (e.g., information campaigns that imply active seeking for knowledge), are likely to reinforce socioeconomic health inequalities by further excluding disadvantaged populations. In contrast, these authors hypothesize that interventions that do not require personal resources, such as "nudging" interventions – which target instead the micro-environment – are more likely to be equitable. Although interesting, such assertion deserves further empirical support, as the effectiveness of nudge interventions (Marteau et al., 2011). Similarly, research from the social psychology of stereotypes suggests that interventions requiring self-control resources (i.e., energy to self-regulate) could be less effective in populations in situation of vulnerability, because their self-control resources are likely to be low (Chalabaev et al., 2022). Indeed, these populations have to cope with the detrimental effects (e.g., stress) induced by everyday stigmatisation (e.g., related to age, weight, health, socioeconomic status). This may tax self-control resources and therefore decrease their availability for other resource-demanding activities that are typically involved by health behaviour change, such as planning one's physical activity (Sjåstad & Baumeister, 2018).

Other approaches may help to provide a more central place to the context and audience characteristics in health behaviour change modelisation. For example, researchers in behavioural economics (Mullainathan & Shafir, 2013) have conceptualised in a fine-grained manner how poverty may undermine cognitive abilities and motivation, by taxing cognitive resources or keeping people away from focusing on long-term goals. Such impact could have in turn deleterious consequences on health behaviours. Adopting a life course perspective could also allow an in-depth analysis of the consequences of (unprivileged) circumstances throughout life. Indeed, vulnerabilities may accumulate over time and contextual factors may shape the way individuals react to major life events (e.g., birth, divorce, moving, retirement), which can in turn have a strong influence on health behaviours across life (Cullati et al., 2018). For example, after a cardiovascular event, people from low socioeconomic status were less likely to change their health behaviours (e.g., stop smoking, being more physically active) than people from higher socioeconomic status (Chan et al., 2008).

In sum, combining behaviour change models with other theoretical approaches could enrich our understanding of the health behaviour determinants that are specific to populations in situation of vulnerability and that are likely to fluctuate across the lifecourse. Ultimately, this would help to identify which behavioural change techniques are the most effective in them, depending on the characteristics of their current situation (e.g., their life period, the place where they live). This requires intervention scientists to develop larger time-windowed projects and interdisciplinary collaborations, by cross-referencing approaches from different disciplines (e.g.,

economics, epidemiology, geography, psychology, sociology). International collaborations (see for example the Psychological Accelerator initiative) or active collaborations with patients and members of the targeted public at all stages of the research project may also be fruitful to broaden researchers' system of thought.

Toward more rigorous methodologies and reporting of samples characteristics

At the methodological level, different propositions can be made in order to better evaluate for whom and when interventions are effective. A first solution is to systematically provide information on participants' socioeconomic and demographic background (e.g., education, income, occupation, zone of residence, country) in empirical reports of both interventional and observational studies. Currently, one in four studies in psychology provides no information on the samples used (Apicella et al., 2020). In the health domain, a recent systematic review of weight management interventions in men indicates that 7 out of 36 studies did not report any socioeconomic information about their samples (McDonald et al., 2022). Even if socioeconomic markers may not have the same meaning in different countries (given differences in income, school systems, etc.), providing such information in a systematic manner would allow meta-analyses to examine whether the validity of behaviour change models or the effectiveness of interventions are moderated by socioeconomic and demographic characteristics. Some researchers go even further by calling for a more systematic reporting of authors' socioeconomic and cultural characteristics, to better evaluate how these shape their approach to research (Brady et al., 2018).

Second, better identifying for which populations interventions are effective or not can be done by using more rigorous or innovative designs. Randomised controlled trials are well adapted for this purpose, however, they are often underpowered. This prevents moderation analyses to be performed. Therefore, conducting highly-powered randomised controlled trials is needed to better evaluate for whom and under what conditions interventions are effective. As access to participants may be difficult, especially when it comes to clinical populations or people living in disadvantaged socioeconomic conditions, alternative designs could be preferred. As an illustration, N-of-1 trials with intensive longitudinal studies (e.g., using experience sampling methods) involve many repeated measurements taken on individuals (Perski et al., 2022), and could allow to provide new insights on the interactions between cognitions and characteristics of the context and audience at the within-person level (e.g., how an increase in financial deprivation at the day-level widens the intention-action gap). Quasi-experimental studies comparing data from samples living in different environments (e.g., in terms of access to recreation facilities) may also be helpful to examine interactions between environmental and personal factors.

Conclusion

Intervention scientists are well aware that changing behaviours is not an easy task, and this also applies to the way they do research. Replacing long-used research practices by novel ones may be time and energy-consuming. However, providing complete information on sample characteristics may be a small step for researchers, but can represent a big first step for the field. Increasing the diversity of sampled populations, or integrating individual and contextual factors in a life-course perspective, can be done by combining expertise through collaborations with researchers from different disciplines and countries, and with participants of the targeted public

(see Figure 1). Regardless the cost of these propositions, it becomes urgent to move towards a more sample-diversified and multifactorial intervention science. Its social utility and credibility depend on it.

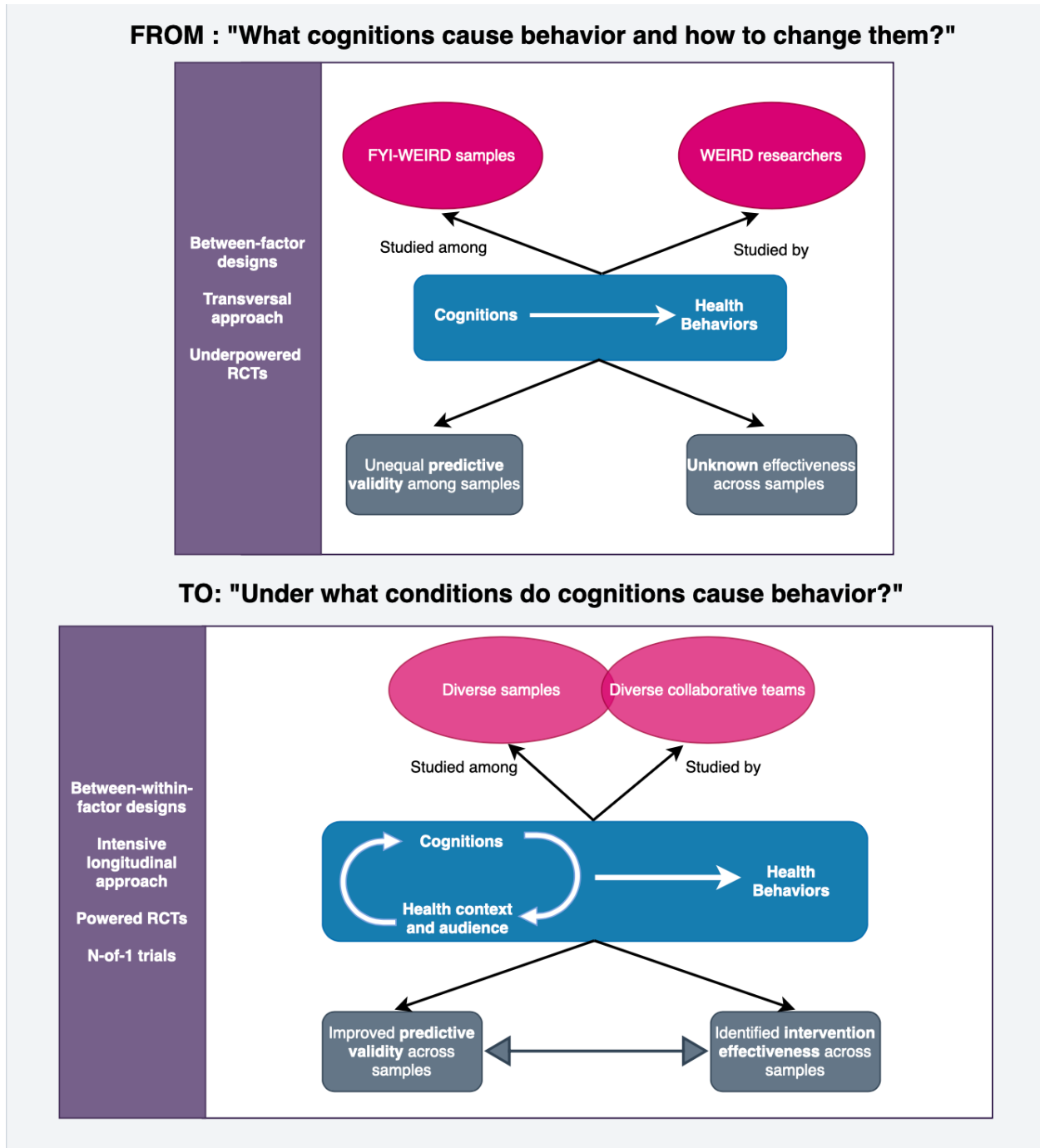
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Figure 1. Schematic representation of the zeitgeist of intervention science and needed future directions



Note. WEIRD = Western Educated Industrialized and Rich Democracies; FYI-WEIRD = Fit and Young Individuals from Western Educated Industrialized and Rich Democracies. The upper figure represents the current zeitgeist of research on behavioural interventions. The lower figure represents future directions that need to be taken to address issues related to the current undue emphasis on individual cognitions in FYI-WEIRD samples.