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Supplement Article: Motivation and Healthy Aging

Using Theories of Behavior Change to Develop Interventions for Healthy Aging

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Abstract

Healthy aging requires people to adopt and maintain beneficial behaviors in all stages of the life span. Supporting behavior change, including via the motivation to make and maintain those changes, is therefore important for the promotion of healthy aging. The aim of this overview is to introduce theoretical frameworks from the psychology of motivation that lend themselves to the development of effective interventions promoting behavior change conducive to healthy aging. We discuss theoretical frameworks referring to the determinants, properties, and functionality of goals aimed at behavior change, and consider the implications of the various theories for designing interventions to support healthy aging. We first consider theories that focus on beliefs and attitudes as determinants of goals, then we address theories that focus on the structure and content as important properties of goals, and, finally, we examine theories drawing on conscious and nonconscious processes underlying the functionality of these goals. We will present if–then planning and mental contrasting, as well as nudging and boosting, that is, novel strategies of behavior change that support the creation of scalable interventions for healthy aging across the life span. Against this background, new perspectives emerge for modern, state-of-the-art, and individually tailored interventions with the aim of enhancing older people's healthy living.

Keywords: Behavior change, Beliefs, Healthy aging interventions, Self-regulation, Theory-based interventions

With healthy aging a global priority, identifying modifiable determinants of healthy aging is a necessary first step. Such modifiable determinants may draw on improvements in the health care system (e.g., Araujo de Carvalho et al., 2017; Enderlin et al., 2013), improvements in the built environment (e.g., Winters et al., 2015; Zadeh et al., 2018), or they may pertain to improving one's behavior to promote healthy aging outcomes. However, to support people to age healthily, the knowledge that a certain change in behavior is important for healthy aging must be translated into action. The present overview therefore asks how to design interventions that will help guide people toward choices and behaviors conducive to healthy aging. That is, such interventions should be directed toward enabling people to engage in behaviors that promote healthy aging in that people are able to do what they have reason to value (World Health Organization [WHO], 2015).

As outlined in the motivational model of healthy aging (Freund et al., this issue), goals and their respective processes (i.e., setting goals, pursuing them, attaining them,

or disengaging from them) are central to healthy aging. Therefore, we focus on theories that are relevant to goals directed toward behavior change, that is, at improvements of behavior that benefit healthy aging. In addition, again as outlined by Freund and colleagues (this issue) and based on social psychological principles, we assume that context provides both opportunities and constraints for setting, pursuing, and attaining goals directed toward healthy aging. Thus, we discuss models of behavior change that are based on the processes of goals as they unfold in people's individual contexts with their opportunities and constraints (cf. Atkins et al., 2017).

Research on the goals of behavior change toward healthy aging is relatively scarce (Ziegelmann & Knoll, 2015). So far, interventions have targeted such diverse outcomes as physical, cognitive, and mental health, social relationships, achievement, and performance (for meta-analyses, see, e.g., Basak et al., 2020; Buyl et al., 2020; Falck et al., 2019; Masi et al., 2011; Orellano et al., 2012). Varying target populations, diverse intervention characteristics (content, duration, intensity), and inconsistent outcome measures make general evaluations, such as in meta-analyses, particularly challenging. With a few exceptions (e.g., Gothe et al., 2015), these interventions are rarely based on specific theoretical approaches.

To remedy this, the current overview proposes that the development of effective interventions for healthy aging can benefit from theoretical approaches put forward by the literature of motivation and self-regulation. Hence, we address three clusters of theories of motivation psychology that we deem relevant for the development of theory-based interventions to promote setting, pursuing, and attaining behavior change goals that enable healthy aging in people's individual contexts (see Figure 1). First, we consider theories that focus on the origins or determinants of behavior change goals, that is, beliefs and attitudes; then we discuss theories that focus on the properties of behavior change goals, that is, the structure and content of these goals; and finally, we present theories that draw on the interplay of the conscious and nonconscious processes underlying these goals. We will introduce if–then planning and mental contrasting, as well as nudging and boosting, novel methods that trigger behavior change and seem useful for the creation of interventions for healthy aging across the life span.

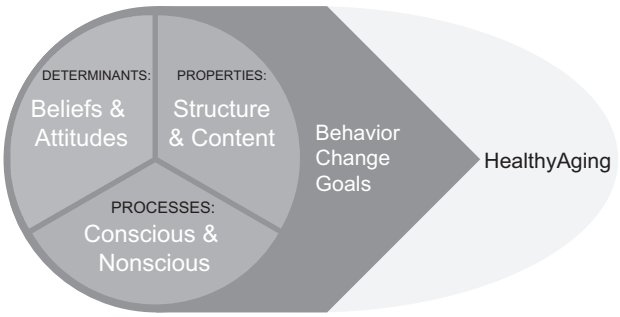

Figure 1. Relevant theoretical approaches for interventions on setting, pursuing, and attaining behavior change goals to support healthy aging.

The approaches presented in the three sections come from different research traditions, but all have been applied to behavior change (Figure 1). Given that the application of theory-based approaches to the promotion of healthy aging is still limited, we selected exemplars in each section based on theoretical relevance and impact within their respective fields. After each of the theoretical sections, we consider how the theory and findings could be used to create interventions across the life span, and specifically in old age, that promote motivation and behavior change for individuals in their contexts, and hence pave the way for healthy aging.

Motivation and Behavior Change to Promote Healthy Aging

Our basic assumption is that motivation and behavior change promote functional ability, a central constituent of healthy aging, defined as to "enable people to be and to do what they have reason to value" (WHO, 2015, p. 28). Thus, a differentiated view on the determinants and processes fostering motivation and behavior change is needed to identify objectives for promoting healthy aging through interventions. In terms of the WHO definition, motivation should link reason and value to doing (behavior). However, when looking at early theories of motivation and behavior, theorists conceived of human beings as responding organisms merely pushed and pulled by internal or external forces that were beyond their control (e.g., by instincts, needs, reinforcers). They assumed that a certain stimulus would be enough to result in motivation and action (e.g., Hull, 1943). Cognitive variables were not necessary, because processes outside of people's awareness guaranteed need satisfaction and arousal reduction.

With the resurgence of cognitive psychology, theories of motivation promoted the view that human beings are rational and analytical, and hence that people themselves are responsible for their decisions and actions. They were therefore assumed to be the creators of their own fate. Expectancy–value theorists (Atkinson, 1957; McClelland, 1985), for example, proposed that people behave and make decisions based on their expectancies or probability judgments of being successful in a given task (e.g., how likely is it that I can still jog when I am 65?) and their incentive value of succeeding in the task (e.g., how important is it to me that I can still jog when I am 65?). The incentive value could be either intrinsic (e.g., I enjoy jogging itself) or extrinsic (e.g., my friends will respect me for still jogging at 65). Goal-setting interventions based on expectancy–value models attempt to heighten the incentive value of performing a given task (e.g., exercise) or of the outcome of the task (e.g., fitness; Charness & Gneezy, 2009; John et al., 2012). They also try to strengthen the subjective probability of being able to successfully complete the task (Carels et al., 2005) or

they try to ease the conditions that may constrain goal attainment (Ward Thompson, 2013). Based on these considerations, we reason that the determinants involved in setting and pursuing behavior change goals should be important parts of a theoretical framework for the development of effective interventions for healthy aging.

Determinants of Behavior Change Goals as the Basis of Interventions: Beliefs and Attitudes

Schwarzer proposed the Health Action Process Approach (HAPA), shown to be valid across a variety of health behavior changes (e.g., diet, exercise, smoking cessation) and which specifies three predictors of intention formation (i.e., goal setting; Schwarzer, 2014; Zhang et al., 2019). First, people have to understand that a certain health problem or risk exists, both in general terms (e.g., smoking can cause lung cancer), but also in personal reference (e.g., if I smoke, my personal risk of lung cancer increases; Renner & Schwarzer, 2003). Second, they need to expect that a given behavior leads to the desired health outcome (outcome expectancies; Bandura, 1977), and third, they need to feel that they can perform the relevant behavior to reach the desired outcome (self-efficacy beliefs; Bandura, 1977). Outcome expectancies and self-efficacy beliefs have been introduced by Bandura within the framework of social-cognitive theory (Bandura, 1986, 2004). Next, we will discuss each of these predictors.

Risk Perception

The Health Belief Model (Becker, 1974; Rosenstock, 1966) introduced "perceived health threats" as resulting from perceived susceptibility multiplied by perceived severity. As a matter of declining biological systems with aging and a higher prevalence for chronic diseases, people's risk perceptions increase in older age (e.g., regarding cardiovascular diseases; e.g., Hamilton & Lobel, 2012). Furthermore, in older compared to younger adults, risk perceptions have a stronger influence on intention formation (Caudroit et al., 2011; Renner et al., 2007).

Personal risk perception in itself, however, is insufficient for intention formation, but it is commonly assumed to set the stage for contemplation (Renner & Schwarzer, 2003). Here, the decisive factors are a positive balance resulting from a weighing of perceived benefits and costs of a specified behavior or its outcome (related to the desirability of the behavior) and the beliefs in being able to accomplish this behavior despite setbacks and barriers (related to the feasibility or attainability of the behavior; Zhang et al., 2019).

Outcome Expectancies

The extent to which people expect that a given behavior leads to a desired outcome is vital for behavior change. For example, a clear understanding that a healthy lifestyle is conducive to health and healthy aging (outcome expectancies) encourages specific efforts to bring about respective health behavior changes. Among the outcomes people expect their actions to produce, Bandura (2004) differentiated physical, social, and self-evaluative outcomes. As part of a contemplation process, outcome expectancies guide the weighing of pros and cons, that is, advantages or benefits as opposed to disadvantages or costs a specified behavior might have (cf. Schwarzer, 2008). When forming outcome expectancies, people consider their context as following the structure of "if … then" relations between possibilities to behave in specified contexts and anticipated likely outcomes (Mischel, 1966, 1973). For example, a 70-year-old women who wants to remain socially included might hold the expectancy that "if I take part in the classes offered by the local community center, then I will meet my friends and acquaintances and will have a good time with them." Thus, these behavior–outcome relations are assumed to direct attention toward outcomes linked to behaviors in specific situations.

For a person to be motivated, the pros must outweigh the cons. This process of weighing the perceived costs (e.g., physical activity is strenuous and time-consuming) and benefits (e.g., physical activity keeps me fit and makes me feel good) is typically depicted in theories used to predict health behavior change, such as in the Health Belief Model or in the Theory of Reasoned Action (Fishbein & Ajzen, 1975), where attitudes result from beliefs about behavioral outcomes and evaluation of these outcomes. Here, expectancies focusing on outcomes closely tied to the behavior itself (e.g., fun, relaxation) have been found to be a better predictor for health behavior such as physical activity in old age than distal ones (e.g., health preservation, illness prevention; Gellert et al., 2012).

Related to the issue of proximity and distance of expected outcomes, shrinking time horizons with increasing old age may also play a role in goal setting for healthy aging. Limited future time perspectives, which occur in terminal illnesses or old age, can lead to prioritization of social and emotional goals rather than pursuing information or knowledge goals, as has been demonstrated by research based on Socioemotional Selectivity Theory (Carstensen, 2006). Specifically, Carstensen showed that older people prefer to spend their time with familiar people they like rather than trying to meet new people (e.g., a famous person) and learning from this new experience.

Consistent with these findings, in a longitudinal field study on improving physical activity in older women, motivational strength emerged when expectancies about immediate, often emotional, rewards of physical activity were high (e.g., feeling relaxed, proud, or free) and these desired outcomes, in particular, had high likelihood of fulfillment (Klusmann et al., 2016). In contrast, more distal social-cognitive outcomes, such as being a good example for others, were less likely to occur and were also

less motivating. Thus, goals with immediate emotional rewards could be particularly helpful in fueling behavior change in old age. As postponing health behavior change is less possible in older versus younger ages (cf. Klusmann & Notthoff, 2018), the findings also fit with the idea of prioritizing emotional goals in old age, as described by Socioemotional Selectivity Theory.

Self-Efficacy Beliefs

In addition to being convinced that a behavior is beneficial for reaching a desired outcome, people must also hold the belief or expectancy that they can do what is thought to be of benefit, even though this may involve effort and barriers to be overcome. Hence they need self-efficacy beliefs to perform the relevant behavior that leads to the desired outcome (Bandura, 2004). Consequently, strengthening efficacy beliefs as part of healthy aging interventions can support the initiation and maintenance of behavior change (Lee et al., 2008). Bandura (1977) suggested that high efficacy beliefs are facilitated through four sources: strong past performance of oneself (personal accomplishment) or of similar others (vicarious experiences), as well as verbal persuasion and encouragement from those whom we respect (e.g., teachers, parents, spouses). Further, efficacy appraisal is influenced by one's own physiological responses when performing a demanding task (e.g., staying calm when giving a talk to a large audience signals high self-efficacy).

In line with Bandura's assumption on the pivotal role of self-efficacy, in the Theory of Planned Behavior, Ajzen (e.g., 2002) suggested adding perceived behavioral control—composed of control beliefs and self-efficacy—to complement attitudes and subjective norms originating from the Theory of Reasoned Action. In sum, when these factors come together (personally feeling at risk, high outcome expectancies, feeling self-efficacious despite obstacles), the likelihood of forming a behavioral intention to improve health behavior increases.

As for creating interventions strengthening or maintaining high self-efficacy in older adults, one may focus on life domains of the individual's extended experience and strong proficiency. Continuing with relevant practice and expertise will guarantee that people maintain their efficacy beliefs for extended time periods. Mandatory retirement from professional life may endanger the practice of what people know and perform best: their profession. The interruption of practice (e.g., as a physician, technician, or teacher) may put people in a precarious situation regarding the maintenance of self-efficacy in a central life domain. That is, they may lose their beliefs of being a qualified and significant contributor to society. In addition, being forced to retire entails the message of "you are no longer useful" and hence can further undermine a person's efficacy beliefs. In line with these considerations, aging self-perceptions were found to shape people's self-efficacy beliefs, with higher self-efficacy resulting in heightened health behavior (e.g., healthy eating; Klusmann et al., 2019; Wurm et al., 2013). Adding modules targeting functional and positive views on aging to exercise programs for older adults increased the success of these interventions (e.g., Beyer et al., 2019; Wolff et al., 2014).

Old age may also provide opportunities to build efficacy in new life domains that people had no or little experience of in the past. For example, an older person who cannot jog anymore may have the opportunity to learn yoga instead. Strengthening self-efficacy in a new area of life may be most effective when starting slow, being challenged by manageable tasks, and being surrounded by a cohort of age-mates. This is because the four precursors of self-efficacy (i.e., past performance, vicarious performance, persuasion, and physiological reactions) are hard to uphold when a new activity is learned in light of unfavorable social comparison, that is, among others who learn faster and with greater ease.

Properties of Behavior Change Goals as the Basis of Interventions: Goal Structure and Content

Besides theories considering beliefs and attitudes as the determinants of intentions or goals, theories regarding the structure and content of goals may inform intervention development: structure and content of goals affect how readily goals are adopted and how effectively they will lead to behavior change.

Structure of Goals

Promotion versus prevention goals

People who see their future self in an ideal light set themselves promotion goals, while those who see their future self in an ought-like light set themselves goals to prevent what they fear might come (Higgins, 2001). In old age, people increasingly face losses and fewer opportunities for growth or gain (Heckhausen et al., 1989). More resources are therefore expended on maintenance and regulation of losses versus growth (Staudinger et al., 1995). Investigating goal orientations in old age by a multimethod approach, Ebner and colleagues (2006) found that older adults had a stronger orientation toward maintenance and loss prevention, whereas growth orientation was of primary importance among younger adults. While an orientation toward prevention was negatively associated with well-being in younger adults, in older adults a maintenance orientation correlated positively with well-being.

With a reducing time horizon in old age, people might be prone to set themselves prevention goals, whereas in young age, the focus would be on expanding and thus on promotion goals (see also Carstensen, 2006). In creating interventions conducive to healthy aging, people might therefore consider the appropriate structure of goals for the different challenges that occur throughout the lifelong process of

aging. For example, setting prevention goals rather than promotion goals should be effective when trying to sustain cumbersome behavior change intended to reduce further deterioration of a chronic disease (see Hennecke et al., 2021).

Approach versus avoidance goals

Promotion and prevention goals need to be differentiated from approach versus avoidance goals. For instance, an older person who wants to sell their house and move into a smaller apartment may frame this specific goal of moving as either approaching a smaller apartment (e.g., approaching the freedom to travel) or avoiding staying in the old house (e.g., avoiding tedious work in the garden). The tendency to set approach rather than avoidance goals can be situation-specific or it can vary with person characteristics such as whether people are more extraverted, less plagued by anxiety, reward-sensitive (vs punishment-sensitive; Gray, 1994), or whether they are disposed toward hope for success versus fear of failure (Gable, 2006). Approach goals have often been found to lead to more satisfaction than avoidance goals (making new friends vs avoiding being lonely; Elliot et al., 2006). In the interpersonal domain, positive (vs negative) social situations were associated with higher approach (vs avoidance) motivation. These associations became weaker in older adults, however (Nikitin & Freund, 2019). Whereas a habitual approach motivation has been found to be prevalent in younger adults, avoidance motivation becomes stronger in older adults (Nikitin et al., 2014).

For creating healthy aging interventions, research on approach versus avoidance goals implies that prior to assigning a specific intervention that either employs a focus on approach or avoidance, one should carefully assess which of the two orientations are more effective in each specific situation (Higgins, 2000). In addition, the interplay of various personality attributes and age might be used to ensure maximum effectiveness for each individual and for particular age cohorts. To this end, one may want to identify personality and age-related variables that facilitate and inhibit beneficial effects of approach versus avoidance goals on indicators of healthy aging, to then inform which intervention is appropriate for whom.

Specific versus vague "do your best" goals

In industrial and organizational psychology, the dominant model specifying the effectiveness of different goal structures has been goal-setting theory (Locke & Latham, 1990, 2002). The model, extensively tested in the laboratory and in everyday work life, suggests that specific, challenging goals (i.e., of medium difficulty) spur high performance compared to easy and vague goals (e.g., "Do Your Best!" goals). Prerequisites for specific and medium difficult goals predicting strong performance are that a person has strong goal commitment, the skills to attain the goal, and no substantial conflict with another goal. Locke and Latham (2002) postulated that medium difficult and challenging goals imply more satisfying outcomes and feelings of growth, because success or failure in attaining medium difficult goals entail more information about a person's skills than very easy or very difficult goals (Atkinson, 1957). Relatedly, goal-setting effects can be heightened by obtaining feedback. However, the benefits of feedback vary with the given task. For example, feedback was found to be more helpful in tasks of low rather than high complexity (Neubert, 1998).

In developing interventions for healthy aging, goal-setting theory and its findings imply that interventions should focus on setting specific and medium difficulty goals that are adjusted to the existing abilities and skills of each individual. Also, goals should be formulated in a specific format (e.g., "I will practice 10 exercises a day" rather than "I will do my best in practicing my exercises"). Moreover, scaffolding (e.g., supporting performance in small steps by helping individuals to set specific medium difficult goals, while ensuring the autonomy of the person who receives help; Vygotsky, 2012) should be an appropriate strategy for providing support in old age when losses occur. Indeed, it has been shown that loss of autonomy when receiving help in old age is linked to low health outcomes (see M. Baltes & Wahl, 1987; Barton et al., 1980).

Content of Goals

Learning versus performance goals

The thematic content of goals also matters for setting goals and effective goal attainment. For example, when goals focus on learning (i.e., goals geared at learning from the given task) compared to performance (i.e., goals geared at trying to show how capable one is), setbacks are responded to more effectively (e.g., get extra training) and people act more vigorously in reaching their goals (Dweck & Leggett, 1988). When confronted with a task to solve (e.g., having to order food online), older people may focus on how *able* they still are in doing so (performance goal) or they may focus on *learning* from the challenge (learning goal). Dweck and Leggett (1988) further argue that implicit theories or naïve beliefs (recent publications label them mindsets; e.g., Dweck, 2017) on the nature of intelligence (or any other personal attributes such as morality) influence the readiness to set performance versus learning goals. If people believe that attributes are stable and hardly changeable (i.e., they hold an entity theory), they tend to set performance goals intended to show their capabilities. On the contrary, if people believe that attributes are malleable and can be acquired by learning (i.e., they hold an incremental theory), they tend to set learning goals to improve their capabilities (for empirical evidence, see, e.g., Dweck & Leggett, 1988).

When people hold entity theories, that the characteristics of old age are unchangeable (e.g., in the form of ageism; see Rothermund et al., 2021), people can be assumed to set performance goals trying to prove that they are well capable of

performing given tasks (e.g., like the young) and to do little to learn from the challenges that come with later years. However, if people believe that attributes in old age are malleable, they are assumed to set learning goals and take the opportunity to master the challenges that come with old age. So far, Dweck's model of implicit theories has been used to design effective interventions in school children and students (e.g., Yeager et al., 2019). The interventions focus on changing people's entity beliefs into incremental beliefs. Parallel interventions could be developed for older people. For example, based on Yeager and colleagues, to convey that the brain is still malleable in older age, one might create materials and films visualizing the plasticity of the brain when trained by memory practice (vs not trained). One would need to strengthen the interventions, however, as the existing approaches by Dweck and colleagues have been recently criticized for their relatively small effect sizes (i.e., Burgoyne et al., 2020; Sisk et al., 2018; for moderating factors, see Yeager et al., 2019).

An independent line of research finds that when people believe future outcomes to be fixed and inevitable, they become discouraged to change their behavior (Hunt et al., 2000). Similarly, higher endorsement of genetic determinants of aging were found to be associated with believing that improvements in old age were less likely and coincided with poorer knowledge of what specific lifestyle factors might be beneficial for healthy aging and with lower engagement in health protective behaviors (Niechcial et al., 2021).

Intrinsic versus extrinsic motivation

Another theory, which like Dweck's Mind-set Theory addresses the individual's quest for growth and well-being, is Deci and Ryan's Self-Determination Theory (e.g., Ryan & Deci, 2017). The theory postulates that how people approach tasks lies on a continuum between autonomous and controlled, with the autonomous approach fostering and the controlled approach hampering a person's intrinsic motivation. Deci and Ryan postulate that external rewards (and punishment) are not always effective for fostering behavior change and well-being. Rather than striving for external rewards to achieve health and well-being, people should satisfy three basic human needs: the needs for autonomy, competence, and relatedness. Indeed, a recent meta-analysis with 77 studies in the health domain (Ntoumanis et al., 2020) suggested that interventions based on self-determination theory foster a series of health indices with modest effect sizes. The benefits can be attributed to heightened self-determined motivation and relatedness to others.

Following Self-Determination Theory, for creating healthy aging interventions one should guarantee that the three named basic human needs will be satisfied despite decreasing physical and psychological resources in old age. In addition, interventions should be adapted to consider age-related changes in the relative importance of the needs (e.g., increasing need for relatedness with old age) as well as age-related changes in relative capacity of need satisfaction (e.g., decreased capacity to satisfy basic needs that come with frailty in old age; cf. Goebel & Brown, 1981; Hyde et al., 2003).

Variety of incentives in goal pursuit

Finally, interventions for healthy aging may also focus on a variety of incentives when setting goals (Heckhausen, 1977). For example, when it comes to solving challenging tasks, anticipating personal success (e.g., when hiking I will be able to keep up with my children), anticipating being praised by relevant others (e.g., I will be applauded by my family), progressing in overarching goals (e.g., I have made progress in writing my biography), and incidental concomitants over and above solving the task (e.g., I am having a good time while selling my family house) can all motivate people to tackle and solve challenges of older age. In the domain of physical activity, financial incentives have been shown to be effective across the life span and in old age (Finkelstein et al., 2008; Kullgren et al., 2014; Mitchell et al., 2020). All these incentives do not refer to the likelihood that these will occur but to the attractiveness of them in relation to the needs and preferences of the person (Heckhausen, 1977). This is because the attractiveness of a stimulus depends on the needs of a person (i.e., the state of deficiency; McClelland, 1985) and their preferences (i.e., when having choice between alternatives; Eidam et al., 2020). Here, interventions should be designed to address outcomes known to be attractive to older adults in terms of healthy aging (e.g., increasing the attractiveness of physical exercise by providing opportunities to do them together with friends and family).

Interpolation: goal regulation in old age

The approach of Selection, Optimization, and Compensation (SOC; Freund & Baltes, 2002) can be considered a metamodel regarding the role of beliefs and attitudes in intention formation (see section on Determinants of Behavior Change Goals as the Basis of Interventions: Beliefs and Attitudes above) and the role of goal structure and goal content. The SOC model postulates that people can minimize losses and maximize gains and thus foster healthy aging by three goal-regulative processes: selecting attractive and (still) attainable goals, optimizing goal pursuit (e.g., through increased practicing), and compensating when goals are not attainable anymore (by adapting one's behavioral goal, e.g., walking instead of running). The model (see Freund et al., 2021) holds that if implemented in a flexible way, the use of these strategies enables people to attain their goals despite the functional losses and diminishing capacity that come with increasing age.

Using SOC as part of an age-tailored intervention increased sustainability of changes in physical activity: SOC heightened effects over and above activity planning strategies and messages to improve self-efficacy (Gellert et al., 2014). Specifically, participants were given information on the benefits of selection (e.g., downsizing daily chores),

optimization (e.g., strong investment in regular exercise), and compensation (e.g., brisk walking instead of jogging), which improved maintenance of physical activity in the 60+ sample. The SOC approach has also been used as part of the Berlin Stays Fit project (see Figure 2), a longitudinal field study, which can serve as a concrete example of the adoption of health behavior change theories to an intervention on motivation and healthy aging (Klusmann et al., 2010).

Processes of Behavior Change Goals as the Basis of Interventions: Conscious and Nonconscious

So far, we have considered theories that specify determinants of behavior change as well as theories that address the structure and content of intentions or goals and we have suggested ways to use these theories to establish healthy aging interventions. In this section, we ask whether theories and findings addressing the interplay between conscious and nonconscious processes can further help create interventions to promote healthy aging in that people can do what they have reason to value (WHO, 2015).

Continuous (Determinants) versus Stage (Processes) Models of Behavior Change

Continuous approaches of behavior change goals assume that the more pronounced the postulated determinants (i.e., beliefs and attitudes as described above), the higher the likelihood that people will form strong intentions (e.g., Weinstein et al., 1998). Hence, strategies aimed at increasing determinants of goal setting would usually end here because models presume that a person's intention to behave in a certain way is enough to see the respective behavior unfolding. It was assumed that when people hold the "right" and appropriately strong attitudes and beliefs, an intention is formed and subsequently followed by goal pursuit (the respective behavioral response; e.g., Fishbein & Ajzen, 1975). Note that the determinants of setting and attaining goals discussed so far refer to conscious (vs nonconscious) attitudes and beliefs.

Stage models of health behavior change, however, assume that distinct strategies are needed to translate an intention into action when the motivational stage ends and the volitional stage takes over. While the number of postulated stages varies from theory to theory, all of them define distinct qualities of each stage. Depending on whether people are in motivational stages (predecisional) or in volitional stages (postdecisional) as defined in the Model of Action Phases (Heckhausen & Gollwitzer, 1987), they benefit from distinct cognitive processes for the optimal solving of the respective task (e.g., deliberating in the predecisional stage vs planning in the postdecisional stage; Gollwitzer, 1990). Hence, interventions should be tailored to specific stages to be effective. The Transtheoretical Model (Prochaska & DiClemente, 1983) and the Precaution Adoption Process Model (Weinstein, 1988) suggest six or seven qualitatively distinct stages, respectively, starting with being unaware of the issue (precontemplation), then getting engaged by an issue (contemplation), deciding to act and acting, and, ideally, maintenance of the respective behavior. Though interventions have considered procedures that fit different stages, more research is needed to provide systematic evidence on how to move people from one stage to the next (Weinstein et al., 2020).

***Example:* The Berlin Stays Fit Project – A Theory-Based Intervention for Motivation and Healthy Aging**

The Berlin Stays Fit project is an example of the adoption of health-behavior change theories to an intervention on motivation and healthy aging (Klusmann et al., 2010). It was the first randomized controlled trial that compared the effects of structured, theory-based long-term standardized physical and cognitive activity programs embedded in real-life settings (Klusmann et al., 2010). Physical, cognitive, and mental health in old age were the primary outcomes. Secondary analyses were run on the motivational processes for healthy aging.

Two intervention programs were newly designed for the target group of 70+ year-old women: A standardized physical exercise course and a computer course, both with three 90-minute sessions per week for a duration of six months. Program characteristics were derived evidence-based: Cognitively stimulating activities should be embedded in everyday life (Vaportzis et al., 2019), because cognitive training effects often remain closely restricted to the trained tasks (Rebok et al., 2007). Beneficial effects of physical activity on cognitive, psychological, and physical health in old age had been shown and meta-analyses informed the optimal training characteristics (Colcombe & Kramer, 2003).

Participation in the activity programs meant health behavior change and the HAPA (Schwarzer, 1992) was used as a theoretical framework guiding the supportive intervention development. Accordingly, motivation was addressed via targeting attitudes and beliefs, namely perceptions of cognitive and physical health risks, high self-efficacy for program participation, and high outcome expectancies. Goals were framed both in terms of health-promotion gains (i.e., learning, mental and physical fitness) as well as prevention of cognitive and physical losses. The fact that the programs were designed as age-homogenous group interventions served the preference of emotionally-rewarding social interaction of older adults combining an activity with an outcome goal.

Course attendance three times a week was a specific, well-defined and evaluative goal. In terms of bridging the intention-behavior gap in old age, it was shown that participants benefited from instructed or assisted coping planning, specifically when they had adherence problems or when SOC strategy use was low, which argues for stage-validity (Evers et al., 2012).

While both interventions had significant effects on objective cognitive performance (Klusmann et al., 2010), participants perceived successes in outcomes they subjectively attributed to the domain –physical or cognitive– in that they had become active, i.e., physical exercise or learning computer skills, respectively (Klusmann et al., 2011). Hence, subjective theories and content of goals should also be considered.

High approach motivation focusing on immediate positive outcomes, such as experiences of pleasure while becoming and being active, was found to be a mediator of buffered dissatisfaction with aging among the target group of 70+ year-old women (Klusmann et al., 2012).

Figure 2. Description of the Berlin Stays Fit project as an example for a theory-based intervention targeting motivation and healthy aging.

Planning to Bridge the Intention–Behavior Gap

Originating in Heckhausen and Gollwitzer's stage model of action phases (e.g., Gollwitzer, 1990), the most prominent strategy to cope with what is known as the intention–behavior gap (Sheeran & Webb, 2016) is planning. Planning is a volitional strategy that helps translate intentions (or goals) into action. It can occur in the form of process simulations (i.e., imagining the various steps toward goal achievement; Taylor et al., 1998) and in the form of if–then plans or implementation intentions on situation–behavior relations: "if situation X occurs, then I will perform the goal-directed behavior Y" (Gollwitzer, 1999). Both strategies are a way to effectively address the intention–behavior gap and have been prominently suggested and empirically validated (Gollwitzer & Oettingen, 2011; Hagger & Luszczynska, 2014; Taylor et al., 1998). Implementation intentions are also the central volitional construct in the HAPA (Schwarzer, 1992): without effective plans to implement intentions, people get stuck at the stage of an "Intender," such as "I always wanted to, but never did." After successful intention formation, in the volitional phase opportunities (e.g., nice weather for a walk), obstacles (e.g., being too tired after work), or setbacks (e.g., a broken leg undermines my exercising) can occur. What is needed here are different forms of planning: action planning for the when, where, and how of doing (behavior) and coping planning (also labeled recovery planning or maintenance planning) which helps to overcome unforeseen barriers or

setbacks (e.g., "if I don't feel like going for a walk, I will ask my friend to support me" or "if I cannot go outside to do my exercises, I will have an indoor workout"). This adjusted planning given the new challenges will be supported by high—phase-specific—maintenance self-efficacy (in the sense of "once hindered or interrupted I can still maintain or resume the respective behavior"). Again, without such strategies, people will probably initiate behavior but will not maintain it in the long run.

Martin and Kliegel (2005) argued that the HAPA should be adopted for older adults. They suggested considering differences in experiences and cognitive status in old versus young age, which have been found to affect determinants and quality of health behavior change processes. In old age, for example, lifelong acquired knowledge might result in changed beliefs and attitudes, or planning might depend on pertinent executive functions still being present. In addition, prospective memory, inhibition, or monitoring of output seem important for behavior maintenance as soon as adaptations to limited resources are necessary. In line with these considerations, in the domain of physical activity, planning has been found to be increasingly necessary in older age (Reuter et al., 2010) and older adults benefit from being assisted with their planning (Evers et al., 2012). The latter findings stem from the Berlin Stays Fit project (see Figure 2).

Using Mental Contrasting for Behavior Change

Mental contrasting of future and reality uses conscious imagery (which people experience) to change behavior by nonconscious processes (which people are unaware of; summary by Oettingen & Sevincer, 2018). It helps people to actively commit to, initiate, and pursue behavior change goals without needing to heighten attitudes and beliefs, and it is applicable to wishes and goals of any structure or content. Specifically, mental contrasting is a self-regulation tool that turns wishes and dreams about the future (e.g., wishes to eat healthily or to exercise regularly) into binding goals that are then actively pursued and attained. When people mentally contrast a wished-for future with the critical obstacle of reality standing in the way (e.g., wanting to eat healthier and then considering the urges to overeat at an upcoming birthday party), they will understand whether and how they will be able to overcome the obstacle. In short, they will now set and pursue their goal in a rational manner: they will turn their wishes into binding goals that they actively engage in and strategically pursue when the obstacle is surmountable; however, they will actively disengage from wish fulfilment when the obstacle is too costly or simply insurmountable. Sole dreaming about one's wished-for future or sole rumination about the obstacles in the way, on the contrary, will lead to unchanged, mostly lukewarm goal commitments and relatively weak goal pursuits (Oettingen, 2000; Oettingen et al., 2001).

In mental contrasting, fantasies about the future provide the direction for action. Identifying and imagining one's obstacles on the way toward fantasy realization provides the energy to tackle and overcome the obstacles on the way to wish fulfilment (Oettingen et al., 2001, 2009). Mental contrasting can be used for any wish or obstacle, across age and life domains, in stressful times and when life is calm, and for people of all ages and diverse backgrounds. For example, adults effectively changed behaviors conducive to healthy aging, such as increasing physical exercise, reducing relationship anxiety, taking responsibility for oneself and others, as well as asking for help and giving help when needed (Oettingen, 2012; Oettingen & Sevincer, 2018). Behavior change promoted by mental contrasting ensued immediately and in the medium term (Kappes et al., 2012) as well as longer term over weeks and months (Sheeran et al., 2013).

Mental contrasting changes behavior by drawing on nonconscious processes, that is, people change their behavior without even realizing it. Specifically, the conscious imagery exercise of mental contrasting creates strong associative links between the future and obstacles of reality and between obstacles and behavior to overcome those (Kappes & Oettingen, 2014). People readily recognize the obstacles in their way and get energized. Finally, when setbacks occur, they are taken as informative hints of how to effectively plan and persist. All these processes triggered by mental contrasting, though people do not realize them, underlie the intended behavior change (e.g., commitment, exerted effort, and performance; Oettingen & Sevincer, 2018).

Mental contrasting with implementation intentions

Mental contrasting has been combined with implementation intentions (if–then plans) to account for obstacles that are particularly difficult to overcome (e.g., strong impulses, ingrained habits). In the context of mental contrasting, if–then plans come in the form of "if obstacle X occurs, then I will perform behavior Y to overcome the obstacle" (Oettingen, 2012; Oettingen & Gollwitzer, 2019). By using mental contrasting with implementation intentions (MCII), people prospectively program themselves so that they can spontaneously respond in the specified way when the obstacle occurs. That is, people will automatically increase their efforts when hindrances are encountered. In sum, the strategy of mental contrasting (Oettingen, 2012) itself and in combination with implementation intentions (Gollwitzer & Oettingen, 2011) benefits behavior change by nonconscious processes. They service the demand for healthy aging by allowing people to flexibly respond to an ever-changing context (e.g., changes in work or transition to retirement in old age, or in relationships, or health). For example, in the context of healthy aging, MCII (vs two active control groups) supported stroke patients to do more physical exercise and to lose more weight over the course of one year (Marquardt et al., 2017). Also, it helped healthy

adults to better take care of themselves by increasing physical exercise and healthy eating (over periods of 4 months and 2 years, respectively; Stadler et al., 2009, 2010). To make MCII more accessible to a broader audience, it has been termed Wish, Outcome, Obstacle, Plan (WOOP). WOOP is a four-step imagery exercise based on the principles of MCII (see Figure 3).

Fostering Habit Formation

Rather than being the result of strong nonconscious associative links created by MCII, behavior change can be the result of strong—likewise nonconscious—associations that emerge from repeated experience of a stimulus triggering a specific impulse or behavior (Carden & Wood, 2018; Gardner, 2015). The repeated stimulus–response experience may originate in goal-directed action or by the unintentional repeated pairing of stimulus and response. This process of habit formation can potentially be used to instigate behavior change conducive to healthy aging across the life span. For example, instigating the repeated experience of presenting healthy food items at the cafeteria with the impulse of satisfying one's hunger during lunch time will trigger a "healthy-food-intake-when-hungry" association, helping to establish and sustain healthy eating in older age. Similarly, repeated goal-directed behavior in response to a stimulus can be maintained until the firm habit is in place (e.g., when shopping I ignore the sweet stand). Such strong associations can also be instilled by social engineering measures, for example, by street signs advising caution when there is the risk of falling.

Gardner (2015) differentiates habitual initiation of a behavior from habitually carrying out a behavior. Habitual initiation will automatize the initial impulse, but people might still need to exert conscious effort to enact the behavior; on the contrary, habitual enactment of behavior might need a conscious decision to enact the habit, but then the behavior will occur automatically. Thus, when designing interventions to foster behavior change toward healthy aging one should carefully consider whether automaticity is in place or not (e.g., instill habitual initiation of already automated motor behavior like riding the bicycle vs instill the automatic performance of a changed way of flossing when people are already habitually flossing in the evening).

It should be noted that whenever an intervention draws on the conscious control of nonconscious processes, we go beyond the dual-process models in their classic form (e.g., Oettingen et al., 2018). Dual-process theories divide mental processes into two categories in terms of whether they run in an automatic or controlled way (e.g., Gawronski & Creighton, 2013). However, in WOOP or deliberate practice toward habit formation, individuals trigger the nonconscious, automatic processes by themselves. Automatic behavior, however, can also be triggered by external stimuli not provided by the person but by institutional or societal agents aiming to foster behavior change (e.g., via norms of showing respect toward older people).

The WOOP (Wish, Outcome, Obstacle, Plan) Approach for Mental Contrasting with Implementation Intentions (MCII)

There are four steps involved in the WOOP exercise. The first three originate in mental contrasting: In the WOO steps, people find an important but attainable **W**ish, specify and imagine the desired **O**utcome, and then identify and imagine the central inner **O**bstacle. The fourth step is the **P**lan or implementation intention. People can do a WOOP exercise in five minutes, wherever they are, at home, when taking a walk, during break at work, or on the bus. In a series of intervention studies, WOOP supported children to perform better in school, adults to solve their professional and interpersonal problems, and patients to manage their health challenges (e.g., stroke, back pain, depression, schizophrenia), and health care providers to experience less stress and to reengage in work. WOOP reduced substance abuse and attenuated weight problems (summary by Oettingen & Sevincer, 2018). The website (http://www.woopmylife.org) and app are examples of how a mental strategy benefitting individualized behavior change can be scaled.

WOOP intervention studies have yet to explicitly address healthy aging. Because WOOP is tuned towards satisfying individualized needs and because it is short and practical – the four steps of WOOP can be autonomously applied in only five minutes – it is a strategy that is well suited for developing new interventions or to be included in existing healthy aging interventions across the life span. WOOP will support people to respond to the ever-changing developmental tasks in their lives (Havighurst, 1948) that when successfully solved, will continuously increase the likelihood of healthy aging.

Figure 3. Description of the Wish, Outcome, Obstacle, Plan (WOOP) approach.

Nudging and Boosting

Many recent intervention approaches focus on "wise" interventions (Walton & Wilson, 2018), which are theory-based, light-touch specific interventions geared towards remedying social and personal problems. Often these interventions focus on contextual influences "nudging" people into behavior change. Nudging can be understood as gently encouraging someone to direct their attention to a particular stimulus that then evokes predictable behavior change without limiting their actual choice (Thaler & Sunstein, 2008). Such approaches demand little engagement from the individuals themselves and often involve people acting automatically in response to the stimulus (e.g., a health message framed in terms of gains vs losses). While nudging is geared toward changing the behavior of individuals, the stimuli are often delivered at scale. Not every individual may be successfully nudged, but the aim is for population-level shifts. Some nudges may include a financial or "coercive" element, while others may be combined with specific regulatory processes, given that monetary rewards may not always be effective (Hertwig & Grüne-Yanoff, 2017).

Such nudges are different from self-regulation tools, as nudges might not entail free choice. Nudges are therefore not uncontroversial, though there has been broad support within the public. For example, in exploring the consent for health policy associated with dietary choices, a majority of adults across six European countries supported a range of nudge options such as calorie labels, educational adverts (e.g., in cinemas), or the placement of healthy foods within shops (Reisch et al., 2017). Nudges in the context of healthy aging

might reach from gently encouraging people to attend to their physical, social, and intellectual needs to encouraging them to take up respective opportunities to satisfy those needs. For example, one may put signs to join a book club at the waiting room in the doctor's office or offer free of charge fitness coaching for 50+ people in a given community.

Nevertheless, many aspects of behavior, including some aspects of behavior change toward healthy aging, may not be clearly applicable to societal nudges (e.g., increased taxation for smoking cessation is clearly established, though programs for increasing physical activity less so). As such, Hertwig and Grüne-Yanoff (2017) discussed "boosts" as an alternative approach for interventions. Boosts are about increasing capacity or "competence" for individuals to choose for themselves, specifically related to the process of decision-making (Hertwig & Grüne-Yanoff, 2017). Boosts focus on improving competencies rather than on only changing short-term behavior and, in the context of healthy aging, might refer to acquiring the competency of how to invest money for retirement, learning how to adapt one's lifestyle to reduced mobility, or for retirees excelling in a hobby that they feel passionate about. The authors argue that nudges and boosts are different concepts, including the potential pathways causing behavior change, the specific targets of the interventions, and the potential reversibility. Boosts may range from being relatively straightforward (e.g., learning how to transfer money into a savings account) to those requiring a much higher degree of effort (e.g., learning how to independently invest money into retirement funds). Although nudging and boosting have been described as potentially competitive in terms of how policy uses behavioral science (Reijula et al., 2018), neither nudges nor boosts are necessarily better, but they may be appropriate in specific contexts. The discussion continues to increase in complexity, as now self-nudges are considered, where, like in MCII or WOOP, boosting is used to nudge oneself into the desired behavior change (Reijula et al., 2018).

Nudges may be helpful for creating interventions for specific behavioral aspects of healthy aging: for example, nudges reminding older people to take the right amount of medicine (e.g., one compartment per pill per day), nudges leading them to make a detour around a place where there is a high risk of falling (e.g., by a respective street sign), or nudges to remind them of their doctor's appointments (e.g., alert on the cell phone). Similarly, boosts should be helpful for healthy aging interventions, for example, when older people are taught how to make sure to take the right amount of medicine, how to purposefully avoid the place with a high risk of falling, and how to set themselves a reminder in the calendar for the next doctor's visit.

Developing Interventions Based on Theories of Behavior Change

When creating interventions based on the theories discussed in the preceding three sections, there are still a host of open questions regarding implementation. Specifically, intervention studies range from efficacy trials to effectiveness trials. While efficacy signifies the accomplishment of an intervention when the circumstances are ideal or highly controlled in a laboratory-like condition, effectiveness pertains to the accomplishment of the intervention under real-life circumstances (Singal et al., 2014). A review considering real-world interventions for cognitive aging, for example, suggested benefits from physical rather than mental activity-based interventions (Vaportzis et al., 2019). In the medical literature, it is argued that a pure efficacy study or a pure effectiveness study can hardly be implemented in real life, and thus, this differentiation is conceptualized as a continuum rather than a dichotomy.

Considering the distinction between efficacy and effectiveness, there are several prerequisites for an efficacious intervention to be effective in the real world. Most importantly, an efficacious intervention must be created and available and the targeted people need to be open and accepting to the intervention. Therefore, to build efficacious and effective interventions based on the theoretical approaches described above, we suggest answering at least the following five questions: First, *who is the intervention for?* Is the intervention for people in good health, for example, or is it for people with multimorbidities, and which age cohort of older people is the intervention meant for: young-old, old-old, or oldest-old? One might also consider personality variables facilitating or inhibiting the effectiveness of interventions (e.g., openness to experience, flexibility in behavior—dispositions that on a mean level decrease in old age [Specht et al., 2011]). Indeed, the more open to experience individuals were, the more they tended to benefit from interventions for cognitive aging (Marr et al., 2020).

Second, *why to intervene and to what end?* Thereby, attempts to improve behavior toward healthy aging must be based on scientific evidence of the beneficial effects of a given behavior on a measurable indicator of healthy aging (e.g., physical or mental health; social, cognitive, or emotional well-being).

Third, *where to intervene?* Considerations refer either to targeting (only) individuals (either focusing on a very specific behavior or on more broad dispositions), on contexts (social or physical environment, society as a whole), or on both.

Fourth, *when to intervene?* Given lifelong development, learning, and habit formation, should the intervention address people when they are (already) old or when they are (still) young? When is the optimal moment to intervene, what qualifies interventions as "appropriate" and "just in time?"

And fifth, tied to the use of new technologies, *how to intervene*? We have argued that interventions should be theory-based and the concepts should be identifiable and measurable. Otherwise, it is hard to determine how and why they work or fail. Against this background, the decision is about the specific approach chosen: tackling beliefs and attitudes, changing structure and content of goals, or drawing on nonconscious processes.

Based on the theoretical approaches presented, to answer the five guiding questions we suggest that a thorough needs assessment is essential, particularly because interventions must be ethically sound and (culturally) fair. Intervention mapping techniques have been suggested for developing tailored interventions (Bartholomew et al., 1998, 2016).

Conclusion

Our brief overview shows that there are theories with well-documented validity that can be used to develop motivation-based interventions to increase behavior change conducive to healthy aging. It seems worthwhile to intervene toward healthy aging by strengthening beliefs and attitudes, given that these are reliable predictors of intentions. Concerning the structure and content of goals, it became clear that it matters whether goals are framed as directed, for example, toward promotion or prevention, involve approach or avoidance, or learning or performance outcomes. The third set of theories on self-regulation and nudging have been partly tested already in the context of healthy aging. As such, planning as a supportive volitional strategy has been shown to be particularly effective in older people. Follow-up work can use these strategies and apply them to healthy aging in domains such as interpersonal, work, retirement, or leisure. Certainly, the motivational approaches reviewed may also be used for paving the way for healthy aging starting in younger ages. For example, as outlined above, keeping openness to experience high across the life span facilitates motivational uplifts and behavior change up to old age.

Clearly, there seems to be room for future research when it comes to a well-derived rationale for developing interventions based on both theory and existing evidence. Given the large heterogeneity of demands and challenges concerning healthy aging, as well as the large individual differences among older people and the contexts in which they live, interventions cannot be designed according to fixed templates. The development of interventions will often require careful tailoring to the individual case and situation. However, the reviewed theories provide the basis for the development of such individualized interventions and likewise allow for straightforward process and outcome evaluations. Overall, with this paper we hope to have convinced the reader that creating interventions based on theory and research in the psychology of motivation would greatly benefit healthy aging across the life span and in old age.

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Conflict of Interest

None declared.

Author Contributions

V. Klusmann and G. Oettingen conceptualized and wrote the article; A. J. Gow contributed to outlining, drafting, and editing of the article; P. Robert contributed to discussions and drafting of an earlier version of this manuscript. All authors finally approved the manuscript.

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