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Mind-body dualism and health revisited:

How belief in dualism shapes health behavior

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Introduction

"Mens sana in corpore sano" [a sound mind in a sound body] is a phrase attributed to the Roman poet Juvenal (approx. 55 AD). Obscuring its original meaning, it has since been adopted by many writers and organizations, ranging from sport clubs to the military, underlining the belief that mental and physical well-being are somehow contingent upon one another. Scientific support notwithstanding, many lay people have integrated the essence of its meaning into their common-sense conception about mind-body relations. Accordingly, some people seem to believe that in order to feel good, one must take care of one's body, while others reject this idea, claiming that healthy minds do not necessarily require healthy bodies. The power of such common-sense beliefs and lay theories in health-related domains is nicely illustrated by the so-called "placebo effect"—the influence of expectancies on the efficacy of a medical treatment (Crum & Langer, 2007)—and becomes evident in numerous popular statements such as "If you believe in treatment X it will work for you!"

Indeed, research has identified some important beliefs that shape health-related outcomes. McFerran and Mukhopadhyay (2013), for example, found that even one's body weight is partially predicted by one's beliefs about the antecedents of obesity (i.e., whether it is primarily caused by a poor diet or by lack of exercise). Similarly, in other health-related domains such as self-control (Moffitt et al., 2011), lay theories were found to play a critical role: people who believe that willpower operates like a muscle that can be exhausted are more likely to display self-control failures, for example with regard to eating behavior, as a result of fatigue (Job, Dweck, & Walton, 2010).

In contrast to such rather specific beliefs regarding tangible phenomena like eating and exercising habits, the present research focuses on how more fundamental, metaphysical beliefs—particularly, belief in mind-body dualism—shape health-related behaviors. In fact, lay people's beliefs about these issues have repeatedly been shown to influence behavioral outcomes just as much as more specific beliefs do (see Forstmann & Burgmer, 2017, for a

recent overview). The goal of the present research is to expand our understanding of the relation between belief in dualism and health outcomes by examining how lay people conceptualize the physical antecedents of their mental well-being. Replicating and extending previous work in this domain (Forstmann, Burgmer, & Mussweiler, 2012), we report six correlational and experimental studies investigating how belief in mind-body dualism shapes health-related intuitions about the physical roots of mental well-being, and how these in turn affect attitudes and behaviors in various health-related domains—including actual behavior in the field.

Belief in Mind-Body Dualism

Research in the domain of common-sense beliefs and lay theories has addressed numerous beliefs that people hold—spanning from daily-life to metaphysical issues—and their consequences (Zedelius, Müller, Schooler, 2017). Is our will free, or are our thoughts and actions determined? Is our mind simply what our brain does, or are "we" more than complex biological machines? Two fundamental entities that constitute our "self" are our minds and our bodies. But are they really two entities? René Descartes (1641/1984) was among the first to systematically address this issue from a philosophical viewpoint, differentiating the "res cogitans" (i.e., "thinking thing," referring to the mind) from the "res extensa" (i.e., "extended thing," referring to the body)—two distinct kinds of substances.

The scholarly complications in the Philosophy of Mind notwithstanding (Chalmers, 1995), psychological scholars have asserted that people are "natural-born dualists" (Bloom, 2004). Indeed, even young children seem to readily dissociate mental from material properties (Hood, Gjersoe, & Bloom, 2012). Whether or not mind-body dualism has an innate component to it, research suggests that people are indeed intuitive dualists (Forstmann & Burgmer, 2015). This intuition may also underlie a variety of more complex, metaphysical beliefs. Belief in an afterlife as a reaction to pondering mortality, for example, has been

shown to rest on such a dissociation of mind and body (Heflick, Goldenberg, Hart, & Kamp, 2015). Further, belief in supernatural beings seem rooted in dualism, as believers typically construe them as agents lacking a body (Bloom, 2007, 2012; Willard & Norenzayan, 2013). While belief in dualism can be encountered across cultures (Roazzi, Nyhof, & Johnson, 2013), lay concepts related to mind and body show variation between individuals (Lindeman, Riekki, & Svedholm-Häkkinen, 2015). In addition, they have important downstream consequences for psychological processes such as how we reason about other people's minds (Burgmer, Forstmann, & Todd, 2018; Forstmann & Burgmer, 2017). More important for the current research, however, are the effects of belief in dualism on health-related attitudes and behaviors.

Mind-Body Dualism and Health

The consequences of how people construe the relation of minds and bodies become evident in various domains at the intersection of medical and psychological science. For example, consider psychosomatic medicine, where the basic idea is that people's mental states profoundly influence their physical well-being. Conversely, how we perceive and think is often distorted by bodily states (e.g., hunger). In medical research, scholars have stressed the detrimental consequences of Cartesian dualism in clinical settings (Mehta, 2011) in that it might lead medical practitioners to isolate patients' mental well-being from their physical constitution, concentrating on treading the diseased body while neglecting the mind. The idea of a total separation of mind and body—arguably, a misconception of Cartesian dualism—has been adopted by many patients as well, leaving them skeptical about non-biological explanations for their illnesses (Duncan, 2000). Additionally, the rise of neuroscience and its public dissemination might have contributed to this bio-centric conception of health and illness (but see Hook & Farah, 2013). Scholars have thus argued in favor of an "interactive

dualism," rejecting the notion of treading patients merely as diseased bodies (Switankowsky, 2000).

However, adopting a reductionist view on mind-body relations should also have consequences for people's general views on what constitutes being or staying healthy, as well as for their health-related behaviors, even in non-medical contexts. Yet, there is a surprising lack of empirical research regarding the psychological underpinnings of how dualistic beliefs may affect people's health behavior. Previous findings suggest that endorsing a belief in dualism has detrimental effects on health-related attitudes and behaviors (Forstmann et al., 2012). It has been proposed that dualists construe the non-physical mind as less dependent on the constitution of the "vessel" within it resides. Such a view on mind-body relations might in turn result in greater neglect of one's physical health. However, this research did not empirically test for a process underlying the effects observed.

Notions of *physicalism* or *materialism* in their strongest version argue that what we refer to as "mind" is not only dependent on physical aspects of the world, but that it actually originates from these aspects (versus from some other substance as described in Cartesian dualism; Descartes, 1641/1984). Following this logic, if one thinks of minds (i.e., the self) as fully originating from bodies (i.e., physical matter), one might also believe that in order to mentally "feel good," one needs to maintain a proper physical condition, more so than if one merely perceives a vague interrelation between both constructs. We will refer to this notion as the belief that bodily states shape mental well-being (BSMW). There is no healthy mind without its healthy substrate. The more lay people perceive a strong connection between minds and bodies, the likelier they should be to endorse the corresponding health belief.[1] Some support for this notion comes from previous research using a qualitative interview technique with ageing participants. This study found that an increased awareness of the body

[1] Here, we focus on the causal direction in which dualism affects BSMW beliefs and not the other way around. Despite the reversed causality being conceivable, the focus of the current research is to examine how lay people deduce more specific health-related beliefs (i.e., BSMW) from more general ontological propositions about how minds relate to bodies (i.e., dualism).

as important for psychological and social well-being critically shapes health-sustaining behaviors (Thomas & Wardle, 2014). Arguably, then, strengthening belief in the separation of mind and body, as in the case of dualism, should attenuate BSMW intuitions, which in turn should decrease health-sustaining attitudes and behaviors. This causal model rests on the assumption that people are generally motivated to sustain their mental well-being—presumably, because they more strongly associate "who they are," that is, their selves and their personal identity with mental (vs. physical) states (e.g., Corriveau, Pasquini, & Harris, 2005).

Previous research on how lay people think about the determinants of mental well-being has mostly focused on psychological disorders (Helman, 2007; see Furnham, 2017, for a recent overview). For instance, we know that lay people construe certain mental disorders such as autism as biomedical, whereas they construe others such as obsessive-compulsive disorder as psychological in nature (Furnham & Buck, 2003). However, much less is known about lay people's theories regarding the determinants of their *general* mental well-being (as opposed to specific pathological states). Examining metaphysical notions of dualism as an antecedent of people's health beliefs thus also expands our understanding of "health beliefs models," that is, lay people's explanations of health-related issues. These health beliefs, in turn, have important consequences, for example, in that they can determine whether or not people take action and comply with treatments, and the degree to which people stigmatize certain disorders (Furnham, 1998, 2017).

Present Research

We report six studies that took a closer look at the relation between belief in mind-body dualism, intuitions about the physical foundation of mental well-being, and health-

related behaviors.[2] We expected to be able to replicate the basic negative relation between dualism and bodily health and to extend past literature in important ways. First, we ran a high-powered replication of the correlation between belief in dualism and health behavior reported in the literature (Study 1). In addition, we replicated this relation in a field study further corroborating the importance of belief in dualism for health behaviors in various daily-life settings (Study 2). Based on the notion that belief in mind-body dualism refutes the material origin of mental states, we next turn to a potential explanation for the effect of dualism on health. Specifically, following a causal-chain approach to mediation, we investigate whether belief in dualism attenuates the intuition that psychological well-being is contingent upon bodily states (Studies 3a and 3b), followed by two additional studies testing how the belief in the material origins of psychological well-being affects health-related outcome measures (Studies 4a and 4b).

For each study, we report our rationale for sample-size determination, and ran samples with adequate statistical power. In addition, we report all experimental conditions realized as well as all predictor and all dependent variables assessed that are relevant to the current research project. Further, for each study, we report all subject exclusions, all of which were based on data-quality checks that we implemented based on a-priori considerations. Finally, additional analyses (ESM 1) and all study materials (ESM 2) can be found in the Electronic Supplementary Material.

Study 1

Belief in Dualism and Health Behavior

Study 1's goal was a high-powered replication of the negative correlation between belief in dualism and health behavior (Forstmann et al., 2012). Participants answered two self-

[2] Note that most of the studies reported here involved *self-reported* attitudes (Study 3b) or behaviors (Studies 1 and 4b) related to health outcomes. However, in Study 2 (field study), health was operationalized via actual behavior that participants had engaged in.

report measures—one assessing belief in mind-body dualism and one assessing the frequency of engaging in health-sustaining behaviors. We predicted that belief in mind-body dualism would emerge as a negative predictor of health-sustaining behaviors.

Method

Participants and design. Following recent recommendations (Schönbrodt & Perugini, 2013), we aimed at a sample size of $N = 300$, that is, roughly four times as large as in the original study. We were able to recruit 310 adults who participated following a link on Amazon's Mechanical Turk website (MTurk). They received moderate monetary compensation. Six participants were excluded from analyses, because they indicated that their data should not be analyzed. The final sample consisted of 304 adults (147 females, 157 males, $M_{age} = 33.30$, $SD = 11.13$). In a correlational design, all participants saw the same measures. Order of measures was counterbalanced between participants.

Materials and procedure. Participants responded to a pictorial one-item dualism measure and a health-behavior questionnaire (Forstmann et al., 2012) (Figure 1). Responses to this dualism measure ($M = 3.20$, $SD = 1.42$) were recoded such that high values reflect stronger belief in mind-body dualism. The health questionnaire required participants to indicate for each of 26 statements (e.g., "I exercise on a regular basis"), how much it applied to their personal behavior on a scale from 1 (*not at all*) to 7 (*very much*) (see ESM 2, for complete scale). Responses to the health questionnaire were averaged (Cronbach's $\alpha = .82$, $M = 4.18$, $SD = 0.79$) and coded such that higher scores indicate a higher self-reported frequency of engaging in health-sustaining behaviors. Finally, participants responded to a subjective data-quality item that read "If you were the researcher running this study, would you include your data in data analysis or should it be excluded due to you having been too distracted or inattentive?" (*Yes, include* or *No, better not include*). This item served as the basis for data exclusions.

Results and Discussion

As expected, belief in dualism negatively predicted health-sustaining behaviors, $\beta = -.201$, $SE = .056$, $t = -3.58$, $p < .001$, 95% CI_{β} [-.323; -.083]. In all of our studies, we also re-ran the focal analyses while controlling for participants' level of formal education—a likely predictor of both belief in dualism and health behavior (Cutler & Lleras-Muney, 2010; Preston, Ritter, & Hepler, 2013). The current relation between dualism and health remained robust when controlling for education. Details for all studies can be found in the Electronic Supplementary Material (ESM 1).

In sum, this current study replicates that people who endorse dualistic beliefs are less likely to engage in health-sustaining behaviors (Forstmann et al., 2012). We conducted the next study to extend the observed correlation between dualism and health to actual behavior in various daily-life situations.

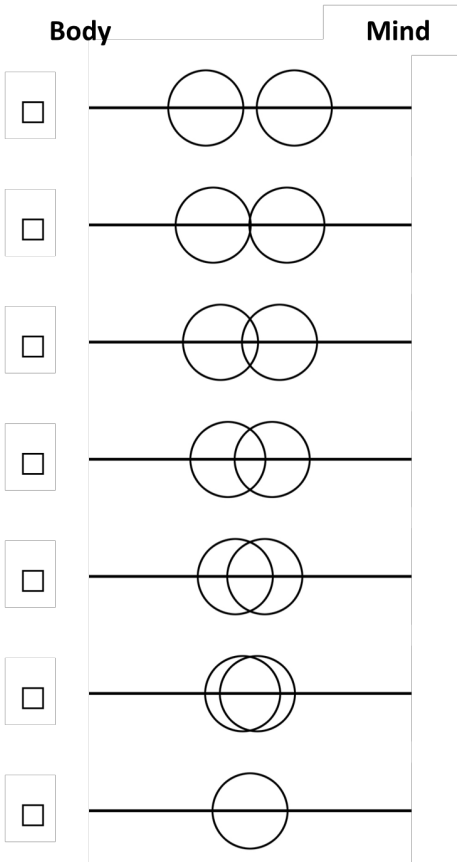

Figure 1. Pictorial dualism measure used in Studies 1, 2, and 3a. Instructions read "In the following image you will see two circles. The left circle represents your body, while the right circle represents your mind. Please indicate which of the the different constellations best represents your idea of how your body relates to your mind."

Study 2

Field Study

We conducted an additional study to extend the association between belief in mind-body dualism and health-related behaviors to the field. To this end, we approached passers-by at various locations in the pedestrian area of a large German city and assessed their belief in mind-body dualism. Specifically, we pre-selected different locations that we assumed to be associated with either health-sustaining or health-constraining behaviors. We expected that those passers-by who had engaged in relatively health-constraining behaviors would indicate stronger belief in dualism than those who had engaged in relatively health-sustaining behaviors. Such a finding would extend the relation between dualistic beliefs and health from online and laboratory studies to various real-life contexts in the field.

Method

Participants and design. We instructed our research assistants to recruit as many passers-by as possible during three days of data collection in the downtown area. They were able to recruit a total sample of 320 participants. Seven participants were excluded from analyses based on observations that the research assistants made (e.g., lack of compliance with task instructions or comprehension of task materials), leaving a final sample of 313 German-speaking participants (173 females, 139 males, 1 undisclosed, M_{age} = 35.56, *SD* = 15.61). Participants were approached at six different locations, three of which were selected to represent relatively health-constraining behaviors (fast-food restaurant, conventional grocery store, escalator), and three of which were selected to represent relatively health-sustaining behaviors (salad bar, organic grocery store, regular stairs).

Materials and procedure. Passers-by were approached at the six different locations by our research assistants who were blind to the research hypotheses. Participants first completed the pictorial one-item measure of belief in mind-body dualism from previous studies (Figure 1).[3] Responses to the seven-point dualism item were again coded such that high values indicate stronger belief in dualism ($M = 3.28$, $SD = 1.49$). Participants were asked to complete the survey by themselves and our research assistants recorded cases where participants did not comply with the instructions or indicated that they did not understand the material. Next, participants evaluated how healthy they thought the behavior was that they just engaged in. Note that they did this after indicating their belief in dualism, thus reducing potential demand characteristics due to the salience of their prior (un)healthy behavior. Specifically, depending on location, on scales from 1 (*not at all*) to 7 (*very much*), passers-by were instructed to indicate how healthy their meal was (fast-food restaurant vs. salad bar), how healthy they would judge their purchase (conventional vs. organic store), and how important they find getting exercise for their health (escalator vs. regular stairs). We included these items as a manipulation-check proxy to make sure that our selected locations indeed differed on how much they were associated with health-constraining versus health-sustaining behaviors. Finally, participants were thanked, given the opportunity to choose a snack as compensation, and handed further debriefing information.

Results and Discussion

Manipulation check. As expected, participants who just ate at a salad bar ($M = 5.57$, $SD = 1.21$) judged their meal to be healthier than did participants who just ate at a fast-food restaurant ($M = 2.84$, $SD = 1.92$), $t(84.64) = 8.53$, $p < .001$, Cohen's $d = 1.71$, 95% CI_d [1.23; 2.17]. Similarly, those who just bought their groceries at an organic supermarket ($M = 5.72$, $SD = 1.25$) judged these groceries to be healthier than did those who just bought groceries at a

[3] On the back of the questionnaire, participants responded to four dualism-related items that we included for scale development purposes. These items, however, showed poor psychometric properties and were not related to the main dualism measure used in the current study (see ESM 1, for details).

conventional supermarket (M = 4.76, SD = 1.76), t(95.68) = 3.28, p = .001, d = 0.63, 95% CI_d [0.24; 1.02]. However, participants who just used regular stairs (M = 6.50, SD = 0.88) did not deem exercising more important for their health than did participants who just used an escalator (M = 6.54, SD = 0.72), $|t| < 1$, p = .815.[4]

Health behavior. First, we collapsed the three locations associated with health-constraining behaviors (fast-food restaurant, conventional grocery store, escalator) and the three locations associated with health-sustaining behaviors (salad bar, organic grocery store, regular stairs), resulting in two groups of locations (0 = unhealthy, 1 = healthy). Confirming our expectations, participants who were recruited at a location representing relatively unhealthy behaviors (M = 3.60, SD = 1.60) indicated stronger belief in dualism than did participants who were recruited at a location representing relatively healthy behaviors (M = 2.94, SD = 1.29), t(300.14) = 3.98, $p < .001$, d = 0.45, 95% CI_d [0.23; 0.68]. These results remained robust when controlling for participants' education. Further, money spent did not differ between the various locations (i.e., restaurants and supermarkets) (see ESM 1).

Results for different locations. Analyzing the differences for each pair of locations separately revealed that participants recruited at a fast-food restaurant (M = 4.06, SD = 1.78) indicated stronger belief in dualism than did participants recruited at a salad bar (M = 2.86, SD = 1.26), t(88.34) = 3.89, $p < .001$, d = 0.78, 95% CI_d [0.37; 1.19]. Consistently, participants exiting a conventional grocery store (M = 3.26, SD = 1.32) reported stronger belief in dualism than did participants exiting an organic grocery store (M = 2.96, SD = 1.30), t(104) = 1.17, p = .245, d = 0.23, 95% CI_d [-0.16; 0.61], and finally, those approached at an escalator (M = 3.51, SD = 1.62) indicated stronger belief in dualism than did participants approached at regular stairs (M = 3.00, SD = 1.34), t(103) = 1.74, p = .084, d = 0.34, 95% CI_d

[4] In a separate online study, we presented German-speaking participants (57 females, 28 males, 1 missing, M_{age} = 27.32, SD = 9.10) with a more precisely worded item, asking how healthy they judge using regular stairs or an escalator (between participants). Using regular stairs (M = 6.54, SD = 0.68) was indeed judged to be healthier than was using an escalator (M = 2.32, SD = 1.51), t(48.96) = 16.02, $p < .001$, d = 3.48, 95% CI_d [2.67; 4.28].

[-0.05; 0.73]. Whereas all differences were in the predicted direction, the latter two differences, however, did not reach statistical significance.

Overall, results from this field study further attest to the idea that belief in dualism is negatively related to health-sustaining behaviors. Here, passers-by who had been engaging in relatively unhealthy (vs. healthy) behaviors were indeed more likely to endorse a dualistic stance on mind-body relations. This relationship emerged for various real-life instantiations of unhealthy (vs. healthy) behaviors, thus again replicating and extending the correlation between dualism and health observed thus far. Further, these results were robust to other variables such as formal education and money spent at the various locations (see ESM 1, for additional notes and analyses).

Study 3a

Dualism Measure & BSMW Measure

In Study 3a, we explore people's lay intuitions about the determinants of their mental well-being as a potential explanation for why belief in dualism negatively affects health behavior. As argued earlier, we propose that belief in dualism attenuates the intuition that bodily states determine mental well-being (BSMW), which in turn should decrease attitudes and behaviors aimed at sustaining physical health. To test this idea, we adopted a causal-chain approach to mediation: two studies tested whether belief in dualism is related to BSMW intuitions (Studies 3a and 3b), and two additional studies tested whether BSMW intuitions are related to our outcome measures of health-related attitudes and behaviors (Studies 4a and 4b). The current study tested the first path of the causal chain, using a correlational design and assessing both belief in dualism and BSMW intuitions. We expected that belief in dualism would emerge as a negative predictor of BSMW intuitions, that is, participants with strong dualistic belief should be less likely to entertain the idea that their mental well-being rests on bodily states.

Method

Participants and design. Based on the same rationale for correlational studies outlined above, we recruited 301 adults via MTurk. Two participants were excluded for not correctly answering an attention-check item, leaving 299 participants (117 females, 180 males, 2 other, M_{age} = 33.90, *SD* = 15.09). In a correlational design, all participants saw a dualism and BSMW measure. Order of measures was counterbalanced between participants.

Materials and procedure. Participants responded to the same pictorial dualism measure as in Studies 1 and 2 (Figure 1). Responses to the dualism measure (*M* = 3.24, *SD* = 1.36) were coded such that high values indicate strong belief in dualism. Additionally, we developed a new seven-item measure to assess BSMW intuitions including statements such as "How I feel is largely dependent on my physical well-being" (see ESM 2, for the complete scale). Responses were made on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Responses to the new BSMW measure (α = .85, *M* = 4.97, *SD* = 0.98) were averaged to form one BSMW score, with higher values indicating greater endorsement of the notion that mental well-being is determined by bodily states. Finally, participants' attention was prompted with one item asking "To monitor data quality, please move this slider to number four on this scale".

Results and Discussion

As predicted, belief in mind-body dualism negatively predicted BSMW intuitions, β = -.544, *SE* = .049, *t* = -11.17, *p* < .001, 95% CI_{β} [-.662; -.411]. These results held when controlling for participants' formal education (see ESM 1).

Participants who endorsed dualistic beliefs were less likely to entertain the notion that material states shape their psychological well-being. Merely entertaining the notion that minds and bodies are two somehow different things seems to have tangible consequences for how we construe the origins of our psychological well-being. We designed Study 3b to corroborate these correlational findings with experimental evidence.

Study 3b

Dualism Manipulation & BSMW

In Study 3b we experimentally varied participants' belief in mind-body relations and again measured their intuitions about the material roots of psychological well-being. Thus far (Studies 1-3a), and consistent with previous theorizing (Forstmann & Burgmer, 2017), we observed rather low levels of *explicit* belief in dualism, hinting at the possibility that physicalism (i.e., monistic materialism) might actually be the default belief when people are explicitly asked. Consequently, we designed a new manipulation that allowed us to present all participants with what can be considered their default belief and, subsequently, asked them to either argue in favor of that belief (i.e., increasing physicalism or decreasing dualism) or to argue against that belief (i.e., decreasing physicalism or increasing dualism). Similar vignette-based belief manipulations have been used and validated in past research (e.g., Forstmann et al., 2012, Study 1). We expected participants randomly assigned to a physicalism condition to show greater endorsement of BSMW intuitions than participants assigned to a dualism condition.

Method

Participants and design. Based on an a-priori rule to run roughly 100 participants per between condition to be able to detect small-to-medium effects, we recruited 203 adults via MTurk. Two participants were excluded for either failing an attention-check item and/or not completing the survey, leaving 201 participants (90 females, 110 males, 1 other, M_{age} = 34.22, *SD* = 10.54). Participants were randomly assigned to either a *physicalism* condition or a *dualism* condition.

Materials and procedure. Participants first worked on a task described as "[…] investigating people's standing on questions related to the philosophy of mind." They saw a brief statement and were asked to elaborate on it. The statement summarized a monistic (i.e.,

physicalistic or materialistic) stance on mind-body relations. The text was carefully worded to avoid any reference to health and well-being (see ESM 2). Participants in the *physicalism* condition were then asked to list two examples in favor of mind-body monism, whereas participants in the *dualism* condition were asked to list two examples refuting mind-body monism. Next, we prompted participants' attention as we did before. Finally, participants completed the BSMW measure from the previous study. Responses to the BSMW measure were collapsed to form one BSMW score ($\alpha = .83$, $M = 4.97$, $SD = 1.04$), with higher values indicating the intuition that mental well-being rests on bodily states.

Results and Discussion

Consistent with expectations, participants in the physicalism condition ($M = 5.18$, $SD = 0.92$) indicated greater endorsement of BSMW intuitions than did participants in the dualism condition ($M = 4.76$, $SD = 1.11$), $t(199) = 2.92$, $p = .004$, $d = 0.41$, 95% CI_d [0.13; 0.69]. This difference remained significant when controlling for participants' formal education (see ESM 1).

This finding replicates the correlational pattern from the previous study employing an experimental design. Participants whose belief was shifted towards a more physicalistic stance on mind-body relations were more likely to entertain the notion that their mental well-being is contingent upon their bodily states compared to those participants whose belief was shifted towards mind-body dualism. Together, Studies 3a and 3b suggest that abstract metaphysical beliefs regarding mind-body relations shape concrete health-related intuitions about the causal impact of bodily states (or physical condition) on mental well-being. Specifically, a rather complex and abstract metaphysical notion about whether or or not minds share the same origin as do bodies shapes how people construe the roots of their psychological well-being. Such health beliefs, in turn, should be related to attitudes and behaviors in the health domain. We conducted the next two studies to test the second path of the proposed causal chain.

Study 4a

BSMW Measure & Health Attitudes

Similar to Studies 3a and 3b that tested the first path of the causal chain, we ran one correlational and one experimental study testing the second path. We designed Study 4a to examine whether the intuition that psychological well-being is rooted in physical states positively predicts health-sustaining attitudes. Studies 3a and 3b support the notion that a physicalistic—and thus less dualistic—stance on mind-body relations facilitates the intuition that our psychological well-being is contingent upon our physical condition. We expected that these BSMW intuitions, in turn, would positively predict health-sustaining attitudes.

Method

Participants and design. Following the same sample-size determination rule from previous correlational studies, we recruited 303 adults via MTurk. Six participants were excluded from analysis because they failed an attention check, leaving 297 participants (119 females, 175 males, 3 other, M_{age} = 33.48, SD = 10.71). In a correlational design, all participants saw a BSMW and health-attitudes measure. Order of measures was counterbalanced between participants.

Materials and procedure. Participants completed the BSMW measure from the previous studies. Responses to the BSMW measure were collapsed to form one BSMW score (α = .84, M = 5.12, SD = 0.97). Again, higher scores indicate greater endorsement of the notion that bodily states determine mental well-being. Additionally, they completed a 22-item measure of health-related attitudes. This measure was largely adapted from the previous health-behavior questionnaire (Study 1) with some minor changes. On a scale from 1 (*not at all important*) to 7 (*extremely important*), participants indicated how much they agreed that various health-sustaining behaviors are important to them (e.g., "... to eat natural foods without additives"). Responses to the health-attitudes questionnaire were collapsed to form

one health-attitude score ($\alpha = .87$, $M = 4.73$, $SD = 0.82$), with higher values expressing greater subjective importance of health-sustaining behaviors. Finally, participants attention was probed as before.

Results and Discussion

Consistent with our expectations, BSMW intuitions positively predicted health-sustaining attitudes, $\beta = .360$, $SE = .054$, $t = 6.64$, $p < .001$, 95% CI_β [.241; .476]. This relation remained robust when controlling for participants' formal education (see ESM 1).

These results provide correlational evidence that people's health-related attitudes are contingent upon whether or not they believe that their psychological well-being is firmly rooted in physical matter. We believe that this could be an important antecedent of health-sustaining attitudes and behaviors and designed the subsequent study to explore its causal effect on health.

Study 4b

BSMW Manipulation & Health Resolutions

We designed our last study to examine whether manipulated BSMW intuitions would have a causal impact on people's health-related cognitions. To so do, we developed a new manipulation of BSMW and a new measure of health-related resolutions. We ran this study the day before/of New Year's Eve 2016. We thereby hoped to facilitate external validity of the new health measure, as we assumed that many of our participants would entertain numerous health-related New Year's resolutions during these days. Such a measure would complement the previously employed instantiations of health-related attitudes and behaviors. In addition, this study would provide causal evidence for the second path of the proposed causal chain. We predicted that strengthening (vs. weakening) BSMW intuitions would increase commitment to health-sustaining resolutions.

Method

Participants and design. As in previous studies involving experimental manipulations, we aimed at running a minimum of 100 participants per between condition. We were able to recruit a total of 302 participants the two days prior to New Year's Day. Six participants were excluded from analyses, because they either failed an attention check or they did not complete the experimental manipulation, leaving 296 adults in the final sample (148 females, 146 males, 2 other, M_{age} = 36.06, *SD* = 12.50). Participants were randomly assigned to either a *BSMW-pro* condition or a *BSMW-con* condition.

Materials and procedure. Upon informed consent, all participants worked on a task investigating "well-being". Participants then either saw a short text explaining how their physical condition often determines their mental well-being (*BSMW-pro* condition) or a short text explaining how their mental well-being can often remain largely unaffected by their physical condition (*BSMW-con* condition) (see ESM 2). All participants were then prompted to provide three examples in writing from their personal experience supporting the notion they read about. On the next screen, we asked them to further elaborate on the one example that they thought was best suited to illustrate the respective notion (see Dunn & Schweitzer, 2005, for a similar approach in experimental emotion research). Upon completing our new BSMW manipulation, participants saw the BSMW scale from the previous study, serving as a manipulation check. Responses were again given on a scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) and collapsed to one BSMW score (α = .86, *M* = 4.74, *SD* = 1.25) with higher scores reflecting stronger endorsement of the belief that physical states determine mental well-being. Next, participants saw an attention-check item as previously used. Finally, as the focal outcome measure, participants indicated how committed they were regarding numerous health-sustaining resolutions (e.g., "For 2017, I am committed to try to spend more time outdoors"). They indicated their commitment to a total of eight different resolutions (see ESM 2, for complete list of items), on a scale from 1 (*not at all*) to 7 (*very much*). Responses to this new health-resolution questionnaire were collapsed (α = .87, *M* =

4.83, *SD* = 1.33), with higher scores reflecting greater commitment to health-sustaining behaviors.

Results and Discussion

Confirming the manipulation, participants in the BSMW-pro condition (*M* = 5.29, *SD* = 1.00) indeed scored higher on the BSMW scale than did participants in the BSMW-con condition (*M* = 4.07, *SD* = 1.19), $t(294) = 9.59$, $p < .001$, $d = 1.12$, 95% CI_d [0.87; 1.36].

Consistent with expectations, participants in the BSMW-pro condition (*M* = 4.96, *SD* = 1.38) indicated greater agreement with the health-sustaining resolutions than did participants in the BSMW-con condition (*M* = 4.67, *SD* = 1.24), although this effect did not reach significance, $t(294) = 1.84$, $p = .067$, $d = 0.22$, 95% CI_d [-0.02; 0.44]. Participants' BSMW intuitions again significantly predicted their agreement with the health-sustaining resolutions, $\beta = .264$, $SE = .056$, $t = 4.69$, $p < .001$, 95% CI_β [.142; .394]. This replicates the previous correlational study. The effect of the BSMW manipulation on health resolutions was not affected by participants' formal education (see ESM 1).

In sum, results from Studies 4a and 4b indicate that people's intuitions about the material origins of psychological well-being shape how they reason about health. Together, Studies 3a, 3b, 4a, and 4b are consistent with the causal model proposed. They reveal that those who consider minds and bodies as two distinct entities (i.e., decreased physicalism and increased dualism), view their mental well-being as less contingent upon their physical constitution (i.e., decreased BSMW), and are thus less likely to entertain health-sustaining attitudes as well as resolutions promoting a healthy lifestyle (i.e., decreased health).

General Discussion

How lay people construe arguably abstract and complex metaphysical problems—such as how minds relate to bodies—can shape quite tangible outcomes such as the decision whether to grab a burger or stick to salad. Results from six studies (*N* = 1,710) consistently

indicate that people who view minds as separate from bodies are less likely to take care of their physical health. Lay people's belief in mind-body dualism was negatively related to various health-related outcomes such as self-reported (Study 1) or factual engagement in health-sustaining behaviors (Study 2). The present findings thus replicate previous work (Forstmann et al., 2012), and, importantly, extend that work by clarifying which health-related intuitions underlie the observed relationship between dualism and health. Endorsing mind-body dualism entails the intuition that psychological well-being is rather independent from its material substrate (Studies 3a & 3b). Adopting a causal-chain approach to mediation, this intuition about the material origin of mental well-being, in turn, affected health-related outcomes (Studies 4a & 4b). In sum, dualistic beliefs indeed entail detrimental health behavior, because they refute the physical roots of our psychological well-being.

Theoretical and Practical Contributions

Using newly-developed experimental manipulations and measures, the present research corroborates demonstrations of how lay people's intuitions about psychological and physiological states are intimately linked. From a theoretical viewpoint, it identifies a psychological process behind the effects of mind-body dualism on health outcomes (Forstmann et al., 2012). Moreover, it clarifies how metaphysical beliefs in dualism or monism influence health beliefs about the foundation of psychological well-being, thereby extending research on "health beliefs models" which have been mostly examined with regard to descriptions and explanations that lay people give for various disorders (Furnham, 1998, 2017).

While it has been argued that lay people exploit a "modern scientific" approach to mental well-being as an excuse for not taking responsibility for one's health (Helman, 2007), the present findings indicate that stressing the physical foundation of mental well-being has beneficial effects on health attitudes and behaviors. The notion that bodily states shape mental well-being might thus be more consistent with a "medical model" of health and illness as

opposed to a "psychosocial model" (Furnham, 2017)—the former usually being endorsed by experts. Consequently, strengthening beliefs in how bodies shape minds motivates lay people to adopt a more scientific stance on health issues, counteracting some of the misconceptions about Cartesian dualism regarding a total separation of mind and body (Duncan, 2000; Switankowsky, 2000). The positive effects of materialistic monism on health beliefs and outcomes emerged regardless of participants' level of education, indicating that one does not have to become a (medical) expert for the effects of reduced dualism to unfold.

Our findings may therefore have important practical implications for interventions in the health domain. It seems that even quite subtle manipulations of how lay people construe their mind in relation to their body can shape consequential behavior. Stressing the material origin of the "self" and the causal relation between mental well-being and physical constitution may be an effective means to improve patients' adherence to treatments targeting health outcomes. Consistent with the present research, recent findings from clinical contexts support the important role of how lay people construe mind-body relations—among patients, perceivers, and clinicians. The way lay people and experts describe and explain health-related issues critically shapes their behavior, including patients' compliance with treatment and clinicians' decision which treatments to implement (Kim, Ahn, Johnson, & Knobe, 2016).

Limitations and Alternative Explanations

The scope of the current research, however, is limited. Specifically, we focused on outcome variables related to physical health and a causal direction whereby belief in dualism and health beliefs affected health outcomes (see Studies 3b and 4b)—and not the other way around. However, the correlational results from Studies 1 and 2 are open to the interpretation that having recalled or engaged in health-comprising behaviors may have increased belief in dualism. Specifically, reminding participants of unhealthy behaviors that they cannot change retrospectively—as in Study 2, where they just had committed the behavior—might motivate them to change their beliefs about the relation of their body and their "self" in order to avoid a

state of cognitive dissonance (see McGrath, 2017, for a recent overview). One cannot undo having eaten a cheeseburger, but one can effortlessly adjust one's beliefs in terms of how a cheeseburger will only harm one's body, but not one's mind. In fact, such processes of dissonance reduction often operate outside of people's conscious awareness (Lieberman, Ochsner, Gilbert, & Schacter, 2001), and they thus might have played a role in some of the correlational studies of the present research.

Consistent with this notion, previous research already hints at the possibility that lay people utilize belief in dualism as a dissonance-reduction strategy (Forstmann et al., 2012, Study 3). Likewise, in similar domains, lay people increase belief in science as a coping strategy to deal with existential threats that they cannot avert, such as mortality (Farias, Newheiser, & Kahane, 2013). Taken together, the presented support of the proposed causal direction—that is, dualism shaping health outcomes—notwithstanding, conceptualizing dualism as a motivated and malleable belief that aids people in reacting to various (physical) threats offers intriguing possibilities for future research, potentially informing findings on how people may utilize a dissociation of the mind from the body to cope with traumatic experiences (Greyson, 2000).

When addressing how belief in dualism shapes health outcomes, we focused on a secular conceptualization of health, that is, the degree to which lay people care about their physical and mental well-being while being alive. However, dualistic beliefs have also been linked to belief in an afterlife (Thalbourne, 1996; Heflick et al., 2015). Thus, it may be conceivable that strengthening belief in mind-body dualism attenuates health-sustaining behavior via an increase in afterlife belief—if the immaterial soul (i.e., the "self") can survive death, the motivation to sustain the body as its material container might be reduced.

However, we argue that such a supernatural belief in an afterlife is not necessary for the effects of dualism on health behavior. As the current findings suggest, people's belief in the self as a non-material substance whose *present* well-being is not contingent upon bodily

states, might suffice to shape their health behavior—believing in the *continuing* existence of souls after death thus seems to be a rather extreme scenario that matters most in the context of entertaining one's mortality. Additionally, whereas previous research in this regard has established belief in dualism as a moderator of the effects of mortality salience on afterlife belief, under neutral baseline conditions (i.e., no existential threat), the relation between dualism and afterlife belief seems less straightforward, that is, either non-existent (Heflick et al., 2015, Studies 1-2) or even negative (Heflick et al., 2015, Study 3). In our studies, we thus focused on people's intuitions about the relation between minds and bodies and the physical foundation of mental well-being largely from a secular perspective, that is, carefully avoiding any reference to "souls," "afterlife," or any related religious or supernatural concept (see ESM 2, for the exact wordings of our measures and manipulations). In doing so, we sought to provide a theoretical framework that can be applied to lay people independent of their inclinations to entertain religious and supernatural notions, providing a more parsimonious explanation for the effects observed.

Beyond religiosity and afterlife belief, there might be additional variables linked to both dualism and health. For example, belief in dualism might be associated with less education and reduced belief in science which in turn might attenuate health-sustaining behavior (Cutler & Lleras-Muney, 2010; Preston et al., 2013). However, in none of our studies did controlling for participants' level of formal education—as a proxy for how much (scientific) knowledge they have—reduce the effects of dualism on health (see ESM 1).

Another prominent candidate associated with dualism is belief in free will (Nadelhoffer, Shepard, Nahmias, Sripada, & Ross, 2014). Even though we did not assess other metaphysical lay beliefs such as in free will or determinism in the current research, the effects of dualism and free will—which are both positively correlated—on health might unfold in opposite directions. Whereas the current findings are consistent with previous research documenting that dualism attenuates health-sustaining behavior (Forstmann et al.,

2012), a reduced belief in free will—or an increased belief in determinism—might rather be associated with less self-control to sustain a healthy lifestyle, presumably, because one's physical condition and health is determined anyway (Baumeister & Brewer, 2012; Rigoni, Kühn, Gaudino, Sartori, & Brass, 2012).

Taken together, we argue that other potential processes either require additional assumptions such as religious beliefs or belief in an afterlife, or can be ruled out to a certain degree as in the case of education. Accordingly, we believe that one of the strengths of the present studies is that they operationalize metaphysical and health-related beliefs in such a way that they are applicable to lay people independent of more complex and supernatural beliefs that these may or may not entertain.

Conclusion

Does a sound mind require a sound body? Our research suggests that rejecting the notion of mind-body dualism motivates people to take care of their physical health, thereby hoping to sustain their mental well-being. If you are a dualist yourself, you may find comfort in the belief that wrecking your body will not affect your psychological well-being. A physicalist, appreciating the material origin of the self, however, would strongly advice against it.

Electronic Supplementary Material (ESM)

ESM 1. Additional Notes and Analyses.

Includes additional notes and analyses.

ESM 2. Study Materials.

Includes all of the study materials.

References

Baumeister, R. F., & Brewer, L. E. (2012). Believing versus disbelieving in free will: Correlates and consequences. *Social and Personality Psychology Compass*, *6*, 736–745. http://doi.org/10.1111/j.1751-9004.2012.00458.x

Bering, J. M. (2006). The folk psychology of souls. *Behavioral and Brain Sciences*, *29*, 453–498. http://doi.org/10.1017/S0140525X06009101

Bloom, P. (2004). *Descartes' baby*. New York, NY: Basic Books.

Bloom, P. (2007). Religion is natural. *Developmental Science*, *10*, 147–151. http://doi.org/10.1111/j.1467-7687.2007.00577.x

Bloom, P. (2012). Religion, morality, evolution. *Annual Review of Psychology*, *63*, 179–99. http://doi.org/10.1146/annurev-psych-120710-100334

Burgmer, P., Forstmann, M., & Todd, A. R. (2018). *Belief in dualism and other minds.* Manuscript in preparation.

Chalmers, D. J. (1995). Facing up the problem of consciousness. *Journal of Consciouness Studies*, *2*, 200–219.

Corriveau, K. H., Pasquini, E. S., & Harris, P. L. (2005). "If it's in your mind, it's in your knowledge": Children's developing anatomy of identity. *Cognitive Development*, *20*, 321–340. http://doi.org/10.1016/j.cogdev.2005.04.005

Crum, A. J., & Langer, E. J. (2007). Mind-set matters: Exercise and the placebo effect. *Psychological Science*, *18*, 165–171. http://doi.org/10.1111/j.1467-9280.2007.01867.x

Cutler, D. M., & Lleras-Muney, A. (2010). Understanding differences in health behaviors by education. *Journal of Health Economics, 29*, 1–28. http://doi.org/10.1016/j.jhealeco.2009.10.003

Descartes, R. (1641). Meditations on First Philosophy, in *The Philosophical Writings of René Descartes* (J. Cottingham, R. Stoothoff and D. Murdoch, Trans.). Cambridge, UK: Cambridge University Press, 1984.

Duncan, G. (2000). Mind-body dualism and the biopsychosocial model of pain: What did Descartes really say? *The Journal of Medicine and Philosophy*, *25*, 485–513. http://doi.org/10.1076/0360-5310(200008)25:4;1-A;FT485

Dunn, J. R., & Schweitzer, M. E. (2005). Feeling and believing: The influence of emotion on trust. *Journal of Personality and Social Psychology*, *88*, 736–748. http://doi.org/10.5465/AMBPP.2003.13793140

Farias, M., Newheiser, A.-K., Kahane, G., & de Toledo, Z. (2013). Scientific faith: Belief in science increases in the face of stress and existential anxiety. *Journal of Experimental Social Psychology*, *49*, 1210–1213. http://doi.org/10.1016/j.jesp.2013.05.008

Forstmann, M., & Burgmer, P. (2015). Adults are intuitive mind-body dualists. *Journal of Experimental Psychology: General*, *144*, 222–235.

Forstmann, M., & Burgmer, P. (2017). Antecedents, manifestations, and consequences of belief in mind-body dualism. In C. M. Zedelius, B. C. N. Müller, & J. Schooler (Eds.), *The science of lay theories: How beliefs shape our cognition, behavior, and health*. New York, NY: Springer.

Forstmann, M., Burgmer, P., & Mussweiler, T. (2012). "The mind is willing, but the flesh is weak": The effects of mind-body dualism on health behavior. *Psychological Science*, *23*, 1239–1245. http://doi.org/10.1177/0956797612442392

Furnham, A. (1988). *Lay theories: Everyday understanding of problems in the social sciences*. Oxford: Pergamon.

Furnham, A. (2017). How lay theories influence our mental health. In C. M. Zedelius, B. C. N. Müller, & J. Schooler (Eds.), *The science of lay theories: How beliefs shape our cognition, behavior, and health.* (pp. 355–374). Springer US. http://doi.org/10.1007/978-3-319-57306-9

Furnham, A., & Buck, C. (2003). A comparison of lay beliefs about autism and obsessive-compulsive disorder. *The International Journal of Social Psychiatry*, *49*, 287–307. Retrieved from http://discovery.ucl.ac.uk/23154/

Greyson, B. (2000). Dissociation in people who have near-death experiences: Out of their bodies or out of their minds? *Lancet*, *355*, 460–463. http://doi.org/10.1016/S0140-6736(00)82013-9

Heflick, N. A., Goldenberg, J. L., Hart, J., & Kamp, S.-M. (2015). Death awareness and body–self dualism: A why and how of afterlife belief. *European Journal of Social Psychology*.

Helman, C. A. (2007). *Culture, health and illness*. London: Hodder/Arnold.

Hood, B., Gjersoe, N. L., & Bloom, P. (2012). Do children think that duplicating the body also duplicates the mind? *Cognition*, *125*, 466–474. http://doi.org/10.1016/j.cognition.2012.07.005

Hook, C. J., & Farah, M. J. (2013). Look again: Effects of brain images and mind–brain dualism on lay evaluations of research. *Journal of Cognitive Neuroscience*, *25*, 1397–1405. http://doi.org/10.1162/jocn

Job, V., Dweck, C. S., & Walton, G. M. (2010). Ego depletion--is it all in your head? Implicit theories about willpower affect self-regulation. *Psychological Science*, *21*, 1686–1693. http://doi.org/10.1177/0956797610384745

Kim, N. S., Ahn, W., Johnson, S. G. B., & Knobe, J. (2016). The influence of framing on clinicians' judgments of the biological basis of behaviors. *Journal of Experimental Psychology: Applied*, *22*, 39–47. http://doi.org/10.1037/xap0000070

Lieberman, M. D., Ochsner, K. N., Gilbert, D. T., & Schacter, D. L. (2001). Do amnesics exhibit cognitive dissonance reduction? The role of explicit memory and attention in attitude change. *Psychological Science*, *12*, 135–140.

Lindeman, M., Riekki, T., & Svedholm-Häkkinen, A. M. (2015). Individual differences in conceptions of soul, mind, and brain. *Journal of Individual Differences*, *36*, 157–162. http://doi.org/10.1027/1614-0001/a000167

McFerran, B., & Mukhopadhyay, A. (2013). Lay theories of obesity predict actual body mass. *Psychological Science*, *24*, 1428–1436. http://doi.org/10.1177/0956797612473121

McGrath, A. (2017). Dealing with dissonance: A review of cognitive dissonance reduction. *Social and Personality Psychology Compass*, *11*, 1–17. http://doi.org/10.1111/spc3.12362

Mehta, N. (2011). Mind-body dualism: A critique from a health perspective. *Mens Sana Monographs*, *9*, 202–209. http://doi.org/10.4103/0973-1229.77436

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., … Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences*, *108*, 2693–2698. http://doi.org/10.1073/pnas.1010076108

Nadelhoffer, T., Shepard, J., Nahmias, E., Sripada, C., & Ross, L. T. (2014). The free will inventory: Measuring beliefs about agency and responsibility. *Consciousness and Cognition*, *25*, 27–41. http://doi.org/10.1016/j.concog.2014.01.006

Preston, J. L., Ritter, R. S., & Hepler, J. (2013). Neuroscience and the soul: Competing explanations for the human experience. *Cognition, 127*, 31–37. http://doi.org/10.1016/j.cognition.2012.12.003

Rigoni, D., Kühn, S., Gaudino, G., Sartori, G., & Brass, M. (2012). Reducing self-control by weakening belief in free will. *Consciousness and Cognition*, *21*, 1482–1490. http://doi.org/10.1016/j.concog.2012.04.004

Roazzi, M., Nyhof, M., & Johnson, C. (2013). Mind, soul and spirit: Conceptions of immaterial identity in different cultures. *International Journal for the Psychology of Religion*, *23*, 75–86. http://doi.org/10.1080/10508619.2013.735504

Schönbrodt, F. D., & Perugini, M. (2013). At what sample size do correlations stabilize? *Journal of Research in Personality*, *47*, 609–612. http://doi.org/10.1016/j.jrp.2013.05.009

Switankowsky, I. (2000). Dualism and its importance for medicine. *Theoretical Medicine*, *21*, 567–580. http://doi.org/10.1023/A:1026570907667

Thalbourne, M. A. (1996). Belief in life after death: Psychological origins and influences. *Personality and Individual Differences*, *21*, 1043–1045. http://doi.org/10.1016/S0191-8869(96)00167-5

Thomas, M., & Wardle, G. A. (2014). "I'm more aware of the body than ever": Old adults' experiences of the psychosocial significance of their bodies. *Psychological Studies*, *59*, 11–21. http://doi.org/10.1007/s12646-013-0208-8

Willard, A. K., & Norenzayan, A. (2013). Cognitive biases explain religious belief, paranormal belief, and belief in life's purpose. *Cognition*, *129*, 379–391. http://doi.org/10.1016/j.cognition.2013.07.016

Zedelius, C. M., Müller, B. C. N., & Schooler, J. (Eds.) (2017). *The science of lay theories: How beliefs shape our cognition, behavior, and health.* New York, NY: Springer.