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Development and Validation of a Scale to Assess Moral Disengagement in High-Carbon Behavior

Susanne Stoll-Kleemann ^{1,*}, Philipp Franikowski ² and Susanne Nicolai ¹

¹ Institute of Geography and Geology, Department of Sustainability Science and Applied Geography, University of Greifswald, 17489 Greifswald, Germany

² Institute of Psychology, Department of General Psychology II, University of Greifswald, 17489 Greifswald, Germany

* Correspondence: susanne.stoll-kleemann@uni-greifswald.de

Abstract: The reduction of individual carbon consumption could make an important contribution to the worldwide effort to limit global warming. Based on Bandura's theory of moral disengagement, we hypothesized that the propensity to morally disengage concerning high-carbon behaviors (e.g., eating meat or traveling by plane) is one important factor that prevents individuals from reducing their carbon footprint. To measure the propensity to morally disengage in high-carbon-related behavior contexts, a questionnaire (MD-HCB) was developed and psychometrically validated in an online study with a German sample ($N = 220$). Confirmatory factor analyses revealed that the final nine-item scale had a one-dimensional structure, as intended. The internal consistency of the scale was excellent (Cronbach's $\alpha = 0.94$) and the scale interpretation had predictive validity for both past low-carbon consumption behavior and the intention to engage in such behavior in the future. Correlational analyses with relevant existing instruments confirmed the construct validity of the interpretations that can be drawn from the MD-HCB, as its resulting score is related to, yet separable from, the general tendency to morally disengage and is meaningfully connected to related constructs. A pre-study with a student sample ($N = 89$) not only helped to identify limitations in the study design but also showed a weak predictive ability of moral competence concerning high-carbon consumption behavior and intention to change. Based on our findings, future media campaigns designed to increase people's intention to reduce high-carbon behavior could focus on the modification of common cognitive disengagement strategies.

Keywords: behavior change; high-carbon behavior; moral disengagement; moral motivation; validation



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1. Introduction

It is undisputed that the mitigation and reduction of the human-induced climate crisis are imperative to limit severe public health dangers, social and economic disruption, forced migration, and increased regional conflict [1,2]. This crisis is largely the result of the behavior of the world's wealthiest countries and their high-income inhabitants [3,4]. Because individuals aggregate into collectives, only concentrating on collective behavior is too limited [5], and the gap between the people that are responsible and those concerned focuses our view on the moral dimensions of the climate crisis. The personal response to addressing the climate crisis is clearly a moral issue because the consequences of cumulative individual and political (in)action threaten key human rights such as those to life, health, and reasonable subsistence [6–9]. Since droughts and floods undermine food security, with extended hunger and poverty as consequences, there is widespread evidence that the principle of avoidance of harm is violated [10–12]. The number of vulnerable people exposed to natural disasters, with a yearly average of 198.8 million, will increase by 48–74 percent by 2100. Heatwave events affected 175 million in 2015 [13], and the number of people who will be affected by floods will double by 2030 and triple by 2050 [10,14].

Droughts exacerbated by climate change have already instigated conflicts over depleting water availability and eroding arable land [12].

This ethical dilemma is our starting point for studying and understanding why individuals engage in high-carbon behavior, even though they know better. High-carbon behavior is widespread and includes eating animal products, flying, driving too frequently with large high-consuming vehicles, heating too much, wasteful electricity use, and consuming “unnecessary” products. At the same time, there is no lack of information on the negative effects these behaviors have. Thus, being able to better understand and predict why people engage in such behaviors that cause harm to others through their high personal carbon footprints is crucial for the survival and the wellbeing of a large number of people—if not the planet as a whole—both in the present and the future.

According to Gifford [15], many studies have shown that well-known established social-psychological models such as the theory of planned behavior [16], the value-belief-norm model [17], and the norm-activation theory [18] should be “expanded to include other personal and social factors” [15] (p. 141), as they are under-complex and therefore not suitable for application in practice. Therefore, models such as that developed by Kollmuss and Agyeman [19] are more appropriate because they include personal (including emotions, cognitive dissonance, and personality traits) as well as more external social and political factors (such as factors related to social norms, culture, and religion) and are thus highly comprehensive. However, to our knowledge, no model that aims to predict pro-environmental behavior includes moral disengagement.

In our perspective, a research gap lies in the fact that existing behavioral models do not include cognitive dissonance and moral disengagement, and emotional components are not sufficiently considered. In previous research, we showed the explanatory power of Bandura’s Theory of Moral Disengagement—as part of his wider, well-known socio-cognitive theory—for understanding ongoing high-carbon behavior [4,20]. Bandura [21] himself describes selective disengagement of moral self-sanctions as an impediment to individual and collective action designed to reduce global warming, but also other moral problems [22,23] because by means of separating moral reactions from inhumane conduct and eliminating self-condemnation, it convinces people that ethical standards do not apply in a particular context [24,25]. Thus, moral disengagement involves a process of re-interpreting damaging behavior as becoming morally acceptable [26–28]. Similarly to the well-known “dragons of inaction” [15], moral disengagement poses a psychological barrier to pro-environmental behavior. Therefore, it is important to better understand the mechanisms of moral disengagement in high-carbon behavior. A validated instrument is needed to investigate these mechanisms quantitatively, and this article aims to fill this gap.

Empirical research on moral disengagement has been undertaken in areas such as organizational behavior, terrorism, military commitment, and juvenile delinquency, while research on climate change and moral disengagement is largely confined to conceptual theory (e.g., [22,23,28,29]). It is important to expand this body of evidence to demonstrate that moral disengagement is widespread and requires more empirical evidence regarding triggers to activate climate-safeguarding actions. Individuals who do not tend to morally disengage but highly subscribe to personal moral norms or values were found to be likely to engage in pro-environmental behavior [30–33].

In particular, the research by Moore et al. [34] has convincingly shown the strength of the propensity to morally disengage as a predictor of unethical behavior and therefore partially functions as a blueprint for our instrument development applied to the area of high-carbon behavior. We agree that it is necessary to investigate how the propensity to morally disengage relates to other individual constructs, such as morally relevant individual traits, moral reasoning abilities including cognitive moral development, and selected dispositional moral emotions, which can subsequently finally be integrated into a strong overarching theoretical framework [34].

1.1. Theoretical Background

The broader approach of moral disengagement frames moral action as “the product of the reciprocal interplay of cognitive, affective and social influences” and “personal agency operates within a broad network of socio-structural influences” [24] (p. 102). Separating moral reactions from inhumane conduct and eliminating self-condemnation convinces people that ethical standards do not apply in a particular context [24].

Eight psycho-social mechanisms operate here at both the individual and social-systems level (see Figure 1, [35]). The first three operate at the stage in which people translate harmful practices into worthy ones through (1) moral justification (e.g., the framing of inappropriate behavior such as lying as appropriate to protect friends); (2) advantageous comparison (e.g., with people who have a much higher carbon dioxide [CO₂] footprint); and euphemistic labeling (e.g., renaming harmful actions to make them appear harmless). Through two further mechanisms called (4) displacement and diffusion of responsibility, people are released from their personal accountability by shifting the responsibility to others. Through (5) diffusion of responsibility, moral control can be suspended by subdividing activities that seem harmless in themselves. One strategy, (6) minimizing, ignoring, or misconstruing consequences, aims at reinterpreting the harmful consequences. The final two mechanisms are responsible for (7) marginalizing and (8) blaming the victims, e.g., for worsening ecological conditions [29].

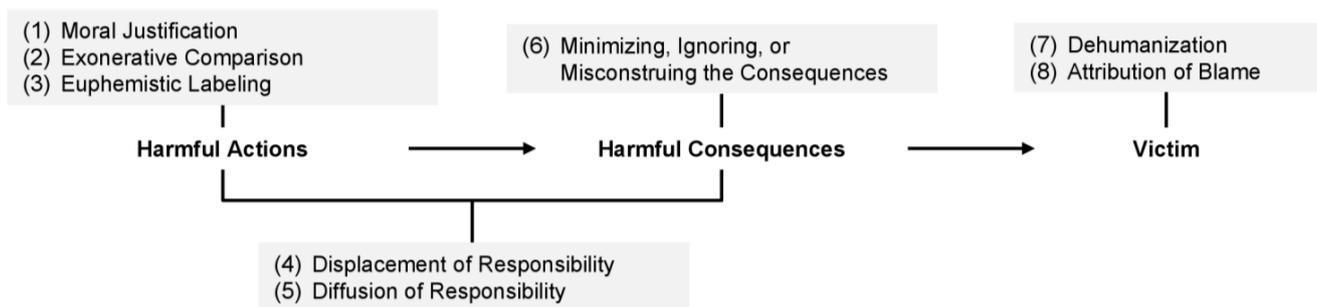


Figure 1. Moral disengagement strategies. Note: slightly adapted from Bandura [35].

According to Moore et al. [34], it makes sense to follow Bandura in treating these eight moral disengagement mechanisms “as a coherent set of cognitive tendencies that influence the way individuals may approach decisions with ethical import” (p. 6) although others have discussed or studied similar cognitive mechanisms separately (e.g., euphemistic language, diffusion of responsibility, exonerative comparison).

Further potential theoretically related constructs, which are of particular importance for fulfilling our research aim of developing and validating a scale to assess affective and cognitive predictors of high-carbon behavior, are shown in Figure 2.

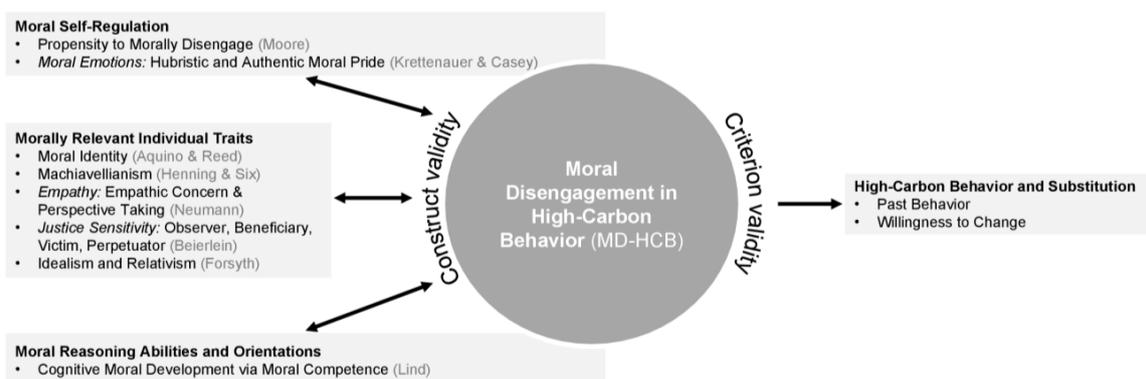


Figure 2. Network assessed for moral disengagement in high-carbon behavior. Note: Own representation.

1.2. Dispositional Moral Emotions

Because the propensity to morally disengage is closely linked to feeling distressed [34,36], it is beneficial to investigate the degree to which dispositional moral emotions are part of its network (see Figure 2). Since moral emotions are identified as key aspects driving ethical conduct [37,38], we are in line with Moore et al. [34] that the propensity to morally disengage is related to certain dispositional moral emotions. In addition, moral emotions are inherently linked to a further important concept, namely moral identity (see below). In the two studies, we focus on pride and elevation and integrate the concept of Krettenauer and Casey [39], who distinguish between authentic pride (focusing on the “self-in-action” and tied to a specific situation) and hubristic pride (focusing on the “self-as-actor” and generalized across situations). Krettenauer and Casey found that authentic pride positively predicted moral behavior, whereas hubristic pride undermined it. Moral elevation is regarded as an emotional reaction to acts of moral beauty (e.g., acts of kindness, charity, or compassion; [37,40]) whereby elevation can be regarded as the opposite of disgust [41,42] because it transmits positive feelings to a person [43]. Moral elevation was found to activate moral behavior, as it lets people admire and emulate a role model they observed [44,45].

1.3. Morally Relevant Individual Traits

Six traits are of particular relevance for achieving low-carbon behavior: The first is moral identity, which has been defined as “the degree to which being a moral person is important to an individual’s identity” [46] (p. 212; see also [47]). In other words, if individuals feel that moral values such as being honest, compassionate, fair, and generous are central to defining their identity, they have a strong moral identity. In addition, moral identity seems to “counteract situational pressures and affordances for acting immorally” [39] (p. 173; see also [48]). According to Moore, individuals with a highly salient moral identity should be more concerned about harm to others but, on the other hand, they fear that mechanisms of moral disengagement may disrupt the activation of the self-concept by, e.g., focusing on the victim (dehumanization, attribution of blame) or reducing personal agency (diffusion and displacement of responsibility).

The second morally important individual trait is Machiavellianism, which “represents an individual’s propensity to be manipulative and ruthless in the pursuit of self-interested goals” [34] (p. 7). Several researchers assume that those who score high in Machiavellianism will be more inclined to morally disengage because it is easier for Machiavellians to “pursue their own interests without self-censure” [34] (p. 7). Machiavellianism was shown to be positively related to many transgressive behavioral tendencies [49–51].

The third key concept is trait empathy, which functions as an umbrella term for different sub-concepts, namely sympathetic feelings, responsiveness to others, and an ability to cognitively understand others’ perspectives [16,34,52–54]. It is disputed whether perspective-taking should be subsumed under trait empathy because, in contrast to affect sharing and emotional empathy, it is a cognitive mechanism [55]. However, it has also been shown that both sub-concepts are directly dissociated at a neural network level and they may thus also interact and facilitate or impair one another in complex situations that require both functions simultaneously [55]. Here, we follow Moore et al. [34] who indicate that trait empathy is useful to investigate in relation to the individual’s propensity to morally disengage because “those predisposed to morally disengage should be less likely to take others’ viewpoints or feel compassionate towards them” [34] (p. 8; see also [56]).

Fourth, idealism and relativism appear to be important traits because they describe stable individual orientations toward ethical decision-making. While idealism is understood as an individual’s belief that “the ‘right’ action [can] always be obtained,” relativism is understood as the degree to which an individual “rejects universal moral rules when drawing conclusions about moral questions” [57] (pp. 175–176). Together with Moore et al. [34] we reason that the propensity to morally disengage will be positively correlated with relativism because holding a relativist position is facilitated by morally disengaged cognitions. Conversely, the propensity to morally disengage should be negatively correlated with

idealism because idealists are driven to pursue absolute ethical standards and thus may not be motivated to find (cognitive) ways to skirt them.

Finally, the tendency to perceive injustice and react to it emotionally, as well as on a behavioral level, is called justice sensitivity [58] and was found to be a personality trait [59]. Injustice can be experienced from four different perspectives: victim, observer, beneficiary, and perpetrator. Individuals can be more or less sensitive toward each of these perspectives. A high sensitivity of observer, beneficiary, and perpetrator indicates the desire for justice for others, as well as a feeling of social responsibility (one is rather afraid of profiting from injustice). High scores in victim sensitivity show a need for justice for oneself (one is rather afraid of being disadvantaged by injustice [60]).

1.4. Moral Reasoning Abilities and Orientations

The final category in our network is called cognitive moral development, which could potentially be the precondition for moral behavior because it refers to the point at which individuals decide what is right or wrong in a particular situation. Cognitive moral development is described as a series of stages “through which individuals progress as they become more cognitively advanced and autonomous in their moral reasoning” [34] (p. 9; see also [61–63]. Stengel [64] and Stoll-Kleemann [20] apply Kohlberg’s model to pro-environmental and high-carbon behavior and reach the main conclusion that being on a “high” level of moral development is at least very supportive in deciding to conduct morally responsible behavior. However, it is disputed whether higher levels of cognitive moral development are really positively linked to moral behavior [50] because an ethical decision does not necessarily lead to an ethical action [65] and is often better explained by impulsive or intuitive models [66]. It is of interest here that the “construct’s potential relationship to the overall moral disengagement process or specific mechanisms of disengagement has never been studied” [34] (p. 9), which is even more true for high-carbon behavior. Therefore, we agree with Moore et al. [34] that cognitive moral development is distinct from the propensity to morally disengage because the former is an indicator of the level of ethical sophistication “whereas the propensity to morally disengage describes a dispositional tendency to use cognitive mechanisms that disengage moral self-regulatory sanction” [34] (p. 9).

Building on Kohlberg, Lind [67,68] developed the construct of moral competence, meaning the ability to solve problems and conflicts on the basis of universal moral principles. Moral competence is neither an attitude nor conformity to norms, which is in line with Kohlberg’s view of post-conventional morality. The ability to accept counter-arguments is important for high moral competence, which is why Lind sees moral competence as a requirement for democratic life. However, contrary to Kohlberg, he views moral competence as a continuum instead of stages. To Lind, the very fact that moral competence is an ability can explain the discrepancy between intention and behavior [69] and he states that moral competence can be trained like other abilities [70].

To validate the questionnaire indicating moral disengagement in high-carbon behavior, it was necessary to investigate the associations between this construct and the above-mentioned ones.

2. The Current Study

Our investigation was inspired by a study by Moore et al. [34] who developed a scale to measure the general (i.e., trans-situational) proclivity of individuals to morally disengage. Supporting Bandura’s [21] theory of moral disengagement, Moore et al. [34] found that their general moral disengagement scale (MD-G) was able to predict, to some degree, unethical behavior in organizations. In the present study, we used this scale as a blueprint for developing a moral disengagement scale for the assessment of an individual’s disposition to morally disengage in high-carbon behavior contexts. As is known from psychological research on attitudes, the predictive power of attitude scales for actions increases according to the extent to which the scales are specifically formulated, i.e., targeted at the action they seek to predict (e.g., [71]). To maximize the explanatory and predictive power of an

instrument for measuring moral disengagement in high-carbon behavior contexts, a new scale that focused on high-carbon behavior was therefore desired.

This article reports a series of two studies documenting the development and validation of the proposed interpretation (indicating the proclivity to morally disengage in high-carbon behavior) of this new scale, called the moral disengagement scale for high-carbon behavior (MD-HCB). The steps of the scale construction and validation process are depicted in Figure 3 (inspired by Kenzie et al. [72]). After defining the construct (see above), we designed a unidimensional 18-item scale that measured nine proposed moral disengagement strategies in the area of high-carbon behavior (MD-HCB-18). Based on the content (face) validity (Study 1) and the results of scale analyses (Studies 1 and 2) and confirmatory factor analyses (Study 2), we reduced this scale to a more compact 9-item scale with equal, or even superior, psychometric quality (unidimensionality, reliability) in addition to reduced length (MD-HCB). Again, following Moore et al. [34], the construct validity of the interpretation from this reduced scale was subsequently examined by studying its correlations to related constructs measured with established scales (Study 2). These included Moore et al.'s [34] scale for general moral disengagement (convergent validity), as well as the set of scales used by Moore et al. to validate the interpretations from this scale (discriminant validity; Machiavellianism, moral identity, idealism, and relativism, moral competence, moral identity, perspective taking and empathetic concern). To enrich the discriminant validation, we included scales for justice sensitivity and moral pride. Finally, we examined the explanatory capacity of the new scale for explaining past low-carbon behavior (LCB) and for predicting intentions to engage in such behavior in the future (Study 2).

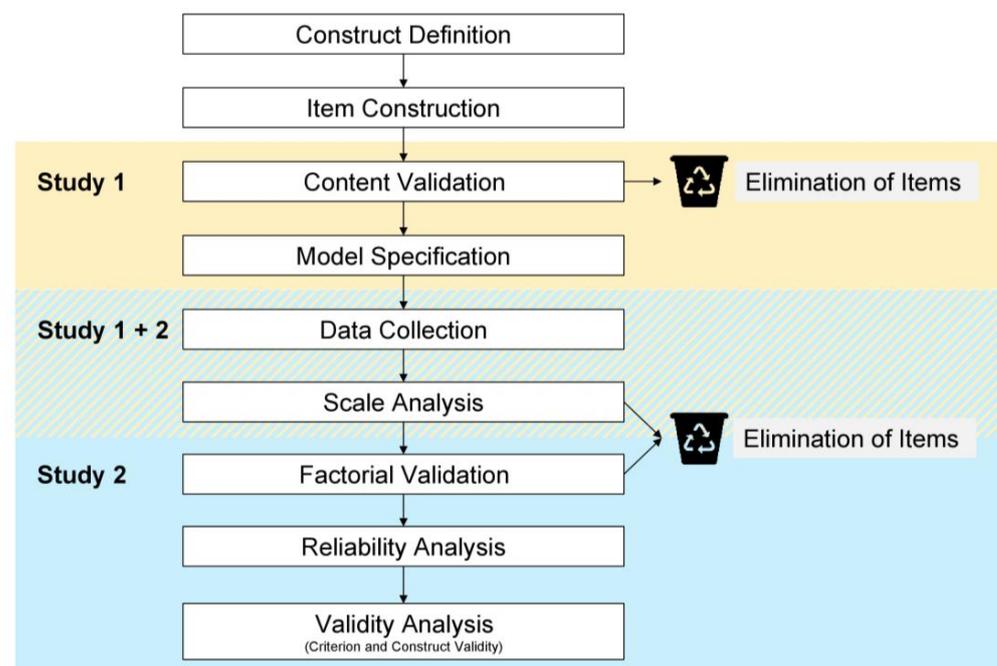


Figure 3. Steps for Developing and Validating the MD-HCB. Note: The yellow background reflects the steps that were part of Study 1 while the blue background reflects the steps that were part of Study 2. The yellow-blue-striped background depicts steps that were part of both Studies 1 and 2 (diagram loosely based on [72]).

2.1. Ethics Statement

Both studies were designed and conducted in accordance with the Code of Ethics of the World Medical Association [73]. The participants in the two studies gave their informed consent to participate prior to the start of the survey. In accordance with German

legislation and institutional requirements, ethical review and approval were not required for these studies.

2.2. Study 1: Pre-Study

Two studies were conducted to develop the moral disengagement in high-carbon behavior (MD-HCB) questionnaire and validate its proposed interpretation. The pre-study was designed to test the comprehensibility of the MD-HCB, identify potential drawbacks of our survey design, and compare a linguistically slightly modified version of the Moral Competence Test (MCT) with its original version, as well as to obtain first indications of validity of the proposed interpretation of the MD-HCB (and the MCT).

2.2.1. Participants

For the first study, 61 participants were recruited via mailing lists available to the institutes of Psychology and Geography at the University of Greifswald. Incomplete cases were excluded beforehand. The sample consisted of 38 females (=62%), 20 males (=33%), two diverse participants (=3%), and one participant who did not specify their gender (=2%). The participants were between 16 and 61 years old ($M = 30.0$, $SD = 8.3$ years); their education level was mostly Abitur (general higher education entrance qualification, 15%) or a university degree (44%). The participants were compensated for their efforts by taking part in a voucher lottery.

Due to quality concerns related to the relative speed index (RSI; cf. [74]), we removed one panelist who was too fast ($RSI > 2$) compared to the majority of the other participants. Moreover, because of social-desirability concerns, one more participant was excluded due to an increased social-desirability score. Therefore, the final sample for the pre-study comprised 59 participants: 37 females, 19 males, two diverse, and one without specification (age $M = 30.0$, $SD = 8.4$, range = 16–61 years).

2.2.2. Instruments

In the undertaking of designing the MD-HCB and validating its interpretation, German versions of scales to measure constructs parallel to those of Moore et al. [34] were administered. When no German version of the questionnaire existed, we translated the English one.

Moral Disengagement in High-Carbon Behavior Scale (MD-HCB). Based on the questionnaire by Moore et al. [34], we constructed a German questionnaire that measures an individual's propensity to morally disengage in the context of high-carbon behavior. The initial item pool was derived from the items of the MD-G instrument by Moore et al. [34] and was tailored to address high-carbon behavior instead of general behavior. In addition to the eight mechanisms of Bandura [21] and Moore et al. [34], we added two questions on the blamelessness of unintentional action. As a result, the MD-HCB covers nine relevant forms of moral disengagement with two questions each. An item example of the newly generated blamelessness of unintentional action is "If I happen to cause harm to other people through the high CO₂ emissions of my vacation flights, it's not really so bad. After all, I didn't do it intentionally." Moreover, we exchanged the construct dehumanization, which was too harsh within the context of high-carbon behavior, with a less deterrent construct, namely, social distance. Whereas dehumanization is more common in the context of military conduct and also referring to past atrocities during the Second World War, social distance has been highlighted as being an important factor for low emotional engagement, most prominently by Markowitz and Shariff [75]. An item example of this mechanism is "In regard to my own CO₂ emissions, I don't think I have to care much about people that I don't feel myself connected to or that I'll never have contact with." In sum, 18 items were answered on a 6-point scale and the complete questionnaire is shown in Table 1. The reliability was excellent (Cronbach's $\alpha = 0.94$).

Table 1. Items to assess the propensity to morally disengage from high-carbon behavior with their descriptive statistics from Study 2 ($N = 174$).

Mechanisms and Their Items	<i>M</i>	<i>SD</i>	<i>Skewness</i>	<i>Kurtosis</i>
<i>Moral Justification</i>				
It's all right to have a high-carbon footprint if it's advantageous for me or for my friends and relatives.	2.27	1.23	0.87	0.39
Not talking about my high CO ₂ emissions is justified if it gives a better impression of my friends and me.	1.98	1.13	1.06	0.77
<i>Euphemistic Labelling</i>				
Not mentioning the negative effects of climate change is OK, as long as the personal benefits you derive from a lifestyle that harms the climate outweigh them.	1.80	1.18	1.57	2.01
Until technical solutions for activities that damage the climate have been found, it's all right to pursue them.	2.76	1.46	0.53	−0.54
<i>Advantageous Comparison</i>				
I think the CO ₂ emissions I'm personally responsible for, even if they're higher than the global average, are less of a reason for me to be concerned than those produced by rich people, businesses and industry, and other countries	2.48	1.46	0.71	−0.42
If you look at the CO ₂ emissions levels of countries like the USA and China, we here in Germany don't have to worry so much about ours.	2.59	1.58	0.64	−0.73
<i>Displacement of Responsibility</i>				
Producing a high level of CO ₂ emissions is acceptable if your friends push you to do the things that cause them, like eating meat, driving a lot, or taking plane trips.	1.82	1.16	1.37	1.03
Individuals shouldn't be held personally responsible for their own high CO ₂ emissions levels because, at the end of the day, it's the politicians whose decisions have created the situation.	2.98	1.55	0.32	−1.03
<i>Diffusion of Responsibility</i>				
I shouldn't be held personally responsible for my high CO ₂ emissions because most other people produce levels that are just as high, and given the overall amount, my behavior makes very little difference.	2.54	1.43	0.61	−0.67
Lying about a high CO ₂ emissions level is ok if my friends think it's better to do it.	1.64	1.05	1.83	3.02
<i>Distortion of Consequences</i>				
CO ₂ emissions that are a little above average don't cause a great deal of damage.	2.06	1.28	1.21	0.78
The negative consequences of climate change are limited or perhaps even nonexistent, so I don't have to worry about CO ₂ emissions related to my behavior.	1.89	1.31	1.40	1.03
<i>Social Distance</i>				
In regard to my own CO ₂ emissions, I don't think I have to care much about people who live very far away and whom I'll never have contact with.	1.95	1.32	1.46	1.47
In regard to my own CO ₂ emissions, I don't think I have to care much about people that I don't feel myself connected to or that I'll never have contact with.	1.98	1.31	1.41	1.40
<i>Attribution of Blame</i>				
People already experiencing the negative effects of climate change have contributed to their own situations by choosing to live in unsafe regions, e.g., in regions prone to flooding, or living unsustainably, e.g., having large families in overpopulated areas.	2.03	1.36	1.19	0.44
Because people choose lifestyles that are inappropriate for their areas, e.g., by having a high birth rate or overpopulating flood-prone regions, they share the blame for their suffering from climate change.	2.34	1.34	0.89	0.13
<i>Blamelessness of Unintentional Action</i>				
My lifestyle, which includes driving a car and eating meat, results in unintended side effects related to climate change, such as droughts and floods, but other people simply have to accept this.	2.11	1.29	1.04	0.30
If I happen to cause harm to other people through the high CO ₂ emissions of my vacation flights, it's not really so bad. After all, I didn't do it intentionally.	2.01	1.27	1.28	1.12

Note: The first item per mechanism is part of the MD-HCB.

Moral Competence. The MCT of Lind [67,76,77] was used to measure moral competence. It consists of two scenarios with different moral dilemmas that have to be evaluated on a 9-point scale using 12 arguments for each dilemma (one pro and one contra argument for each of the six levels of moral development; [61]). The original test was slightly adapted linguistically, as it was hard to understand due to the complex wording. Despite the high linguistic level, the MCT was used because there is no other questionnaire for moral development in German that is practicable in an online survey (e.g., the Defining Issues Test, DIT [78], was too extensive). One-third of the sample was given the original questionnaire, and two-thirds were given the newly modified one.

Moral Disengagement General (MD-G). In the absence of a German version, the questionnaire of Moore et al. [34] was translated and used. To measure the propensity to disengage from moral behavior, participants had to answer 16 items on a 6-point scale. The translated MD-G scale had good reliability (Cronbach's $\alpha = 0.85$).

Moral Identity. The questionnaire of Aquino and Reed [47] was translated into German and used for measuring the participants' moral identity. We included only the five items that measure internalization, but not the remaining six items that measure the socially symbolic representation of moral identity. The items were answered on a 5-point scale. The reliability of moral identity was questionable (Cronbach's $\alpha = 0.61$).

Perspective Taking and Empathetic Concern. The subscales of Empathetic Concern and Perspective Taking from the Interpersonal Reactivity Index (IRI) of Neumann et al. [79] were used while other subscales of the IRI (Fantasy and Personal Distress) were not used for this study. Each subscale has seven items, thereby resulting in 14 items to be included. The items were responded on a 5-point scale and the reliabilities of the IRI scales Perspective Taking (Cronbach's $\alpha = 0.75$) and Empathetic Concern (Cronbach's $\alpha = 0.77$) were acceptable.

Idealism and Relativism. The translation of the Ethic Position Questionnaire (EPQ) of Forsyth [57] by Strack and Gennerich [80] was used to identify idealism and relativism in this study's participants. It includes 20 items on a 9-point scale. While the reliability of the idealism scale of the EPQ was still good (Cronbach's $\alpha = 0.86$), the reliability of the relativism scale was only acceptable (Cronbach's $\alpha = 0.79$).

Machiavellianism. Henning and Six [81] constructed a questionnaire with 18 items answered on a 6-point scale to measure Machiavellianism, which was used in this study. The reliability of the Machiavellianism scale was high (Cronbach's $\alpha = 0.88$).

Justice Sensitivity. The ISS-8 scale of Preiser and Beierlein [60] consists of four perspectives (victim, perpetrator, beneficiary, and observer), from which injustice can be perceived. Each perspective was measured by two items, answered on a 6-point scale. The reliabilities of the beneficiary (Cronbach's $\alpha = 0.92$), the perpetrator (Cronbach's $\alpha = 0.88$), and observer sensitivity (Cronbach's $\alpha = 0.70$) were good or even excellent, whereas the reliability of victim sensitivity was questionable (Cronbach's $\alpha = 0.68$).

Moral Pride. To measure authentic and hubristic pride, a scenario by Krettenauer and Casey [39] was translated into German and used. Nine items that anticipate these two forms of moral pride were answered on a 5-point scale. While the reliability of the authentic dimension of moral pride was unacceptably low (Cronbach's $\alpha = 0.08$; this score was higher in the second study; see diagonal of Table 2), the hubristic dimension of moral pride was questionable (Cronbach's $\alpha = 0.69$).

Moral Beauty. The German version of the Engagement with Beauty Scale (EBS-R; [43]) by Dachs and Diessner [82] was used to measure moral beauty. It involves answering six items on a 7-point scale. The reliability of the authentic dimension of moral pride was acceptable (Cronbach's $\alpha = 0.75$).

Social Desirability. To detect test falsification through positive self-presentation and socially desirable response tendencies, the short version of Satow's instrument (SEA; [83]) was used for which participants were required to answer two items on a 4-point scale. The sum score ranges from 2 to 8, whereby a value of 7 or higher indicates a high tendency to distort self-presentation and it is recommended to exclude participants with such a high value. Based on this criterion, we had to exclude one participant in the beginning, after

excluding respondents who were assessed as being too fast. The final sample consisted of $N = 59$ participants, as described above.

Past Low-Carbon Behavior (LCB). Inspired by the CO₂ calculator of the German Environmental Agency [84], 10 climate-relevant behaviors for the year 2019 were queried, each of which could be answered with “yes,” “no,” or “do not know.” To prevent an acquiescence bias (the tendency to answer with “yes” regardless of the question), some items were framed as high-carbon emitting and others as low-carbon emitting. An example of high-carbon behavior is “In 2019, I took a plane.” The answers on the high-carbon items were subsequently reversed, and the relative frequency of LCBs was computed for each person. As the measure can be regarded as a formative measure (the latent construct is formed by the items) instead of a reflective measure (the latent construct is causal for the item responses), internal consistency estimates for reliability coefficients should not be interpreted (e.g., [85,86]).

Future Intention to Engage in LCB. To measure the intention to engage in LCB in the future, the same items as in Past LCB were re-formulated for the year 2021. For example, the item above was re-formulated as “In 2021, I will continue to take a plane.” Again, 10 items were responded to. However, because we asked for intentions rather than actual behavior, answers were given on 6-point scales that expressed the participant’s agreement with the items (ranging from “totally disagree” to “totally agree”). The internal consistency of the scale was Cronbach’s $\alpha = 0.67$.

2.2.3. Design and Procedure

This observational study was conducted online. Additionally, we asked selected participants to self-report their thoughts while answering the questions to gain a deeper insight into the processes that are active while respondents work their way through the survey [87]. This approach can be regarded as a process analysis to ensure content and face validity. The participants were colleagues from the psychological domain (for content validation) and other persons who were not psychologists but members of the target population (for face validation). These participants were asked to think aloud while responding to the questions while we were taking notes. According to their responses, the items were understood and reflected the mechanisms as intended. Hence, no item was excluded or revised prior to the pre-study. The online questionnaire was implemented and made available using SoSci Survey [88].

Because elaborating on moral issues may cause a sequence effect on participants’ answers in other questionnaires, such as the MCT or the LCB questionnaires [89], the study was conducted in the following order: socio-demographic data, MCT, past LCB, MD-HCB, intention to engage in LCB, MD-G, Moral Pride, Moral Beauty, IRI, Moral Identity, Machiavellianism, Justice Sensitivity, Social Desirability. Finally, participants were asked to take part in a voucher lottery to compensate for their efforts. The study was administered in German and the time required for answering all questions ranged from 7 to 30 min, with 15 min being the average. The findings were considered significant in two-sided testing when $p < 0.05$ and all analyses were conducted using R [90].

2.2.4. Results

Modified Moral Competence Test. There were no significant differences between the answers to the original and the newly formulated questionnaires ($M_{\text{original}} = 34.5$, $SD_{\text{original}} = 14.7$, $M_{\text{modified}} = 38.5$, $SD_{\text{modified}} = 18.3$, Welch’s $t = 3.95$, $p = 0.375$). The reliabilities of both versions of the MCT were estimated by assuming both dilemmas to be parallel tests. Therefore, both were scored independently, resulting in a poor parallel test reliability of only $r = 0.30$ for the original, and $r = 0.31$ for the modified MCT.

2.2.5. Discussion

The pre-study was designed to serve two aims. First, we wanted to identify potential drawbacks in the survey design. As the resulting survey was about to be distributed by a

panel provider, the survey volume had to be trimmed so that administering the number of questions would not take more than 20 min. Second, we wanted to gather qualitative feedback on the questionnaires provided, for example, through a free-response option as well as selected subjects thinking aloud while answering the questions.

On the one hand, as expected, the original MCT was criticized for its questions being too complicated to understand, even for participants with an academic background. As we aimed for a representative German sample and expected that not only academic participants would be addressed, we preferred the modified MCT over its original version to assure test fairness for our final survey. On the other hand, the participants objected to the rather esoteric nature of the EBS in assessing moral beauty and thus this questionnaire was excluded for the final adjustment of the survey. Except for these two modifications, the survey for the validation study remained unaltered.

2.3. Study 2: Validation Study

The main study aimed at determining the factorial, predictive, convergent, and divergent validity of the proposed interpretation drawn from the MD-HCB, as well as checking the criterion validity of the interpretations of the MCT for LCB as a subordinate goal.

2.3.1. Participants

For the validation study, 220 German panelists from the platform *meinungsplatz.de* were recruited. *Meinungsplatz.de* is a German survey platform offering a pool of 250,000 active participants from all social strata in Germany and Switzerland for market and opinion research purposes. All participants were compensated for their efforts in accordance with the policy of the panel service.

Quotas concerning age and gender were requested from the panel provider to ensure representativeness regarding these socio-demographic dimensions. Table 2 provides an overview of the overall German age and gender distribution in comparison to the study sample. All federal states of Germany, as well as all education levels, were represented.

Due to quality concerns related to the relative speed index (RSI; cf. [74]), we removed 46 panelists who completed the task too quickly ($RSI > 2$) compared to the majority of the other participants. Moreover, because of social desirability concerns, 12 more participants were excluded due to an increased social desirability score. Therefore, the final sample for the validation study comprised 174 participants: 91 females and 83 males (age $M = 49.9$, $SD = 17.5$, range = 16–80 years). All 16 federal states of Germany (Figure 4A) as well as different educational backgrounds (Figure 4B), and occupations (Figure 4C) were represented in the sample.

Table 2. Proportions of German age groups (in 2018) and the derived sampling goals along with the final sample proportions.

Age Group	Proportion	Sampling Goal	Female	Male
18–25 years	12%	14	10	5
26–35 years	15%	17	17	12
36–45 years	14%	15	12	12
46–55 years	18%	20	16	16
56–65 years	16%	18	14	15
66 years or older	24%	26	22	23

Note: Proportions are based on data from the Federal Statistical Office [91]. We assumed gender to be equally distributed (50:50).

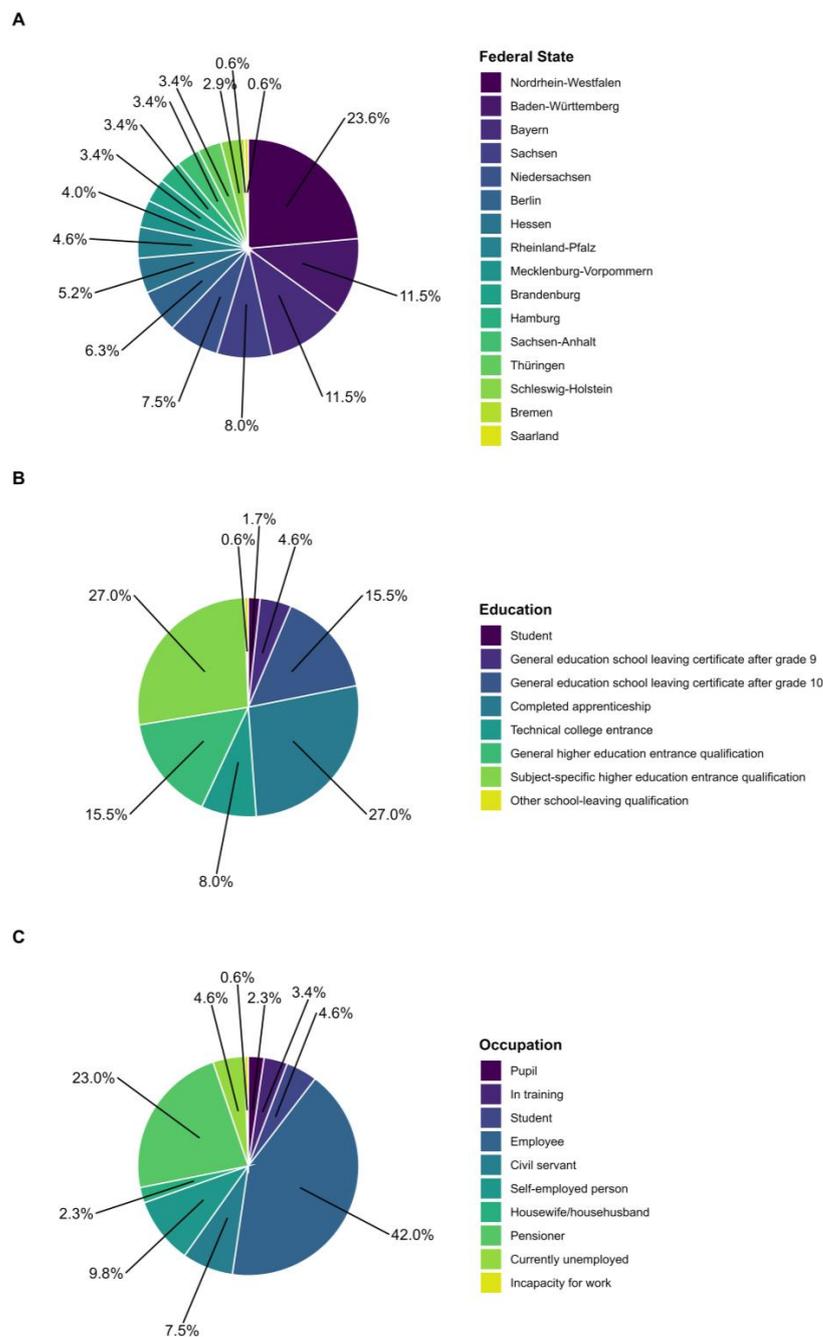


Figure 4. Relative frequencies of federal states, educational backgrounds, and occupations. Note: $N = 174$. Different panels display relative frequencies of (A) federal states, (B) educational backgrounds, and (C) occupations.

2.3.2. Instruments

The same scales were used as in the pre-study, except for Moral Beauty being removed and the original MCT being replaced by its modified version. For the scales to assess idealism and relativism, only the three items with the highest discrimination parameters in the pre-study were selected, respectively, due to the extensive scope of this scale in the pre-study. By taking the three items of idealism and relativism together, six items of the original EPQ were used in the validation study. All reliabilities of the scales used are provided in the main diagonal of the correlation matrix in Table 3.

Table 3. Correlations between the constructs assessed within the validation study ($N = 174$).

Variable	Descriptives		Correlations																		
	<i>M</i>	<i>SD</i>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
1 Moral Disengagement-HCB-18	2.18	1.01	(0.96)																		
2 Moral Disengagement-HCB	2.12	1.06	0.99 ***	(0.94)																	
3 Moral Disengagement	1.86	0.74	0.57 ***	0.57 ***	(0.91)																
4 Moral Competence	14.98	13.43	-0.10	-0.08	0.09	(0.26)															
5 Empathetic Concern	3.81	0.62	-0.38 ***	-0.39 ***	-0.36 ***	0.07	(0.74)														
6 Perspective Taking	3.57	0.59	-0.26 ***	-0.27 ***	-0.21 **	0.18 *	0.40 ***	(0.71)													
7 Moral Identity	4.26	0.65	-0.40 ***	-0.42 ***	-0.33 ***	0.04	0.56 ***	0.42 ***	(0.75)												
8 Machiavellianism	2.73	0.87	0.53 ***	0.51 ***	0.53 ***	-0.16 *	-0.44 ***	-0.28 ***	-0.42 ***	(0.90)											
9 Idealism	7.71	1.63	-0.18 *	-0.17 *	-0.22 **	-0.11	0.13	0.05	0.20 **	-0.22 **	(0.75)										
10 Relativism	5.40	1.89	0.26 ***	0.27 ***	0.38 ***	0.08	-0.19 *	-0.16 *	-0.17 *	0.27 ***	0.13	(0.63)									
11 Victim Sensitivity	3.30	1.47	0.21 **	0.21 **	0.27 ***	0.05	-0.03	-0.08	0.05	0.20 **	0.00	0.19 *	(0.81)								
12 Beneficiary Sensitivity	4.97	1.10	-0.40 ***	-0.40 ***	-0.41 ***	0.06	0.50 ***	0.35 ***	0.54 ***	-0.45 ***	0.23 **	-0.12	0.01	(0.68)							
13 Perpetrator Sensitivity	2.99	1.34	-0.08	-0.08	0.09	0.01	0.24 **	0.04	0.10	-0.12	0.13	0.07	0.36 ***	0.19 *	(0.82)						
14 Observer Sensitivity	4.21	1.17	-0.19 *	-0.20 **	-0.12	0.08	0.34 ***	0.17 *	0.25 ***	-0.20 **	0.13	0.02	0.40 ***	0.30 ***	0.39 ***	(0.79)					
15 Authentic Pride	4.69	0.61	-0.30 ***	-0.31 ***	-0.32 ***	0.09	0.35 ***	0.29 ***	0.47 ***	-0.35 ***	0.22 **	-0.05	0.00	0.37 ***	-0.05	0.17 *	(0.90)				
16 Hubristic Pride	3.18	0.81	0.13	0.11	0.03	-0.27 ***	0.08	0.02	0.17 *	0.26 ***	0.02	-0.02	0.25 ***	0.16 *	-0.02	0.08	0.26 ***	(0.62)			
17 Intention to Engage	4.26	0.83	-0.51 ***	-0.51 ***	-0.24 **	0.08	0.28 ***	0.26 ***	0.29 ***	-0.31 ***	0.04	-0.22 **	-0.09	0.25 ***	0.06	0.18 *	0.16 *	-0.12	-	-	-
18 Past Behavior	0.56	0.18	-0.39 ***	-0.40 ***	-0.17 *	0.10	0.26 ***	0.23 **	0.17 *	-0.29 ***	0.02	-0.21 **	-0.12	0.17 *	0.12	0.19 *	-0.03	-0.22 **	0.77 ***	-	-

Note: All coefficients are Pearson correlations; the main diagonal contains reliabilities estimated by Cronbach's α . Gray columns highlight the associations of focal constructs within the present study. * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

2.3.3. Design and Procedure

Again, an online study was conducted with the help of SoSci Survey [88]. The time investment for answering all questions ranged from 9.9 to 34.3 min, with 19.4 min being the median. The findings were considered significant in two-sided testing when $p < 0.05$. All analyses were conducted using R [90]. CFAs were performed using *lavaan* [92], and network analysis was performed using the R package *glasso* [93].

2.3.4. Results

Sample Representativeness. To test whether the representativeness of the sample was retained after the exclusion of the participants due to the RSI and socially desirable responding, two χ^2 -tests for the goodness of fit for age groups and gender were conducted, respectively. These χ^2 -tests found no significant deviation from the proportions set for the recruiting procedure (see Table 1), either for gender, $\chi^2(1) = 0.37$, $p = 0.544$, or for age group, $\chi^2(5) = 2.67$, $p = 0.751$. Therefore, the sample can be regarded as representative after exclusion.

Factorial Validation of the MD-HCB(-18). The factorial validity of the MD-HCB-18 was assessed by applying a CFA. For the CFA, we used the maximum likelihood estimation with a Satorra-Bentler scaled test statistic and robust standard errors due to significant deviations from normality as indicated by the Mardia test [94].

The model fit criteria for the full congeneric model, which assumes that all items load on a single latent factor, were not ideal in terms of the guidelines proposed by Hu and Bentler [95] with the RMSEA > 0.06 and CFI < 0.95 , scaled $\chi^2(135) = 290.59$, $p < 0.001$, CFI = 0.87, SRMR = 0.05, RMSEA = 0.08, 90% CI [0.07, 0.09], p (RMSEA ≤ 0.05) < 0.001 . Nevertheless, the deviation from a single-factor structure was not large, suggesting that the less-than-perfect fit was due to problems with a few individual items. To overcome this challenge, only the item with the higher loading of the two items used to measure each moral disengagement strategy was selected to form the short and final version of the MD-HCB-18, MD-HCB.

The fit criteria for the reduced congeneric model (MD-HCB) indicated a close fit [96]: The χ^2 -statistic was insignificant, and the RMSEA was not significantly lower than 0.05, scaled $\chi^2(27) = 38.34$, $p = 0.073$, CFI = 0.98, SRMR = 0.03, RMSEA = 0.05, 90% CI [0.01, 0.08], p (RMSEA ≤ 0.05) = 0.494. Restricting all loadings on the latent construct to be equal (the so-called essentially equivalent model) did not significantly reduce the fit of the model, $\Delta\chi^2(8) = 6.55$, $p = 0.585$. However, additionally restricting all residual variances to be equal (the essentially parallel model) resulted in a significantly worse model fit, $\Delta\chi^2(8) = 23.67$, $p = 0.003$. Therefore, an essentially equivalent measurement model was assumed in the subsequent analyses. This measurement model allows for computing the scale values of the MD-HCB scale by simply averaging the items, as the different indicators of the latent construct (i.e., the 9 items) do not significantly differ in the extent to which they reflect the latent construct of moral disengagement in high-carbon behavior (i.e., in their loadings). Notwithstanding the better fit of the 9-item scale and its high reliability (Cronbach's $\alpha = 0.94$), the reliability of the original item scale was extremely high ($\alpha = 0.96$) and it correlated at $r = 0.99$ with the reduced scale; furthermore, its relations to the remaining scales were nearly identical to those obtained with the reduced scale (see Table 1). For these reasons, we used the psychometrically cleaner scale in subsequent analyses and also recommend the reduced scale to be used in future studies.

All items and their descriptive statistics (mean, standard deviation, skewness, and kurtosis) are provided in Table 1.

Convergent and Discriminant Validation. Paralleling the results of Moore et al. ([34]; see also Table 3), the MD-HCB score was closely and positively related to MD-G ($r = 0.57$) and Machiavellianism ($r = 0.51$). Moreover, negative correlations were found for MD-HCB and empathetic concern ($r = -0.39$), perspective taking ($r = -0.27$), and moral identity ($r = -0.42$). While idealism was negatively correlated with MD-HCB ($r = -0.17$), relativism

was found to be positively correlated with MD-HCB ($r = 0.27$). In contrast, MD-HCB was rather unrelated to moral competence ($r = -0.08$).

Beyond these parallels to Moore et al. [34], we also introduced the facets of justice sensitivity and the two dimensions of moral pride into the nomological network. The highest (negative) correlation was found for MD-HCB and beneficiary sensitivity ($r = -0.40$), while the correlations between MD-HCB and observer ($r = -0.20$) and perpetrator ($r = -0.08$) sensitivity were smaller, with the latter being of negligible size. However, we discovered a positive correlation between MD-HCB and victim sensitivity ($r = 0.21$). Correlating MD-HCB with the dimensions of moral pride yielded a positive, yet small, correlation with hubristic pride ($r = 0.11$) and a somewhat larger, but negative, correlation with authentic pride ($r = -0.31$).

Interestingly, the MCT score was only substantially related to hubristic pride ($r = -0.27$) with all other correlations being rather negligibly small. Only Machiavellianism ($r = -0.16$) and perspective taking ($r = 0.18$) were significantly, yet lowly, correlated with the MCT.

The nomological network was further explored and graphically displayed by applying a LASSO network analysis to the covariance matrix of all variables (regularization parameter $\rho = 0.02$). The regularized partial correlations between the constructs are visualized in Figure 5. MD-HCB has a strong negative relation to the criterion intention to engage in LCB. Moreover, the MD-HCB has the highest positive relation to its general pendant, MD-G. Lower direct connections to MD-HCB are found for Machiavellianism and victim sensitivity. Although not directly related, indirect associations to MD-HCB were found for relativism and idealism that were mediated by MD-G. Two of the four dimensions of justice sensitivity, namely observer and perpetrator sensitivity, were mediated by victim sensitivity and correlated with MD-HCB. Interestingly, Machiavellianism was a central node in the nomological network mediating the correlations of the pride-related constructs (authentic and hubristic pride) and beneficiary sensitivity, which itself was a mediator for the empathy-related constructs (perspective taking and empathetic concern), as well as for moral identity.

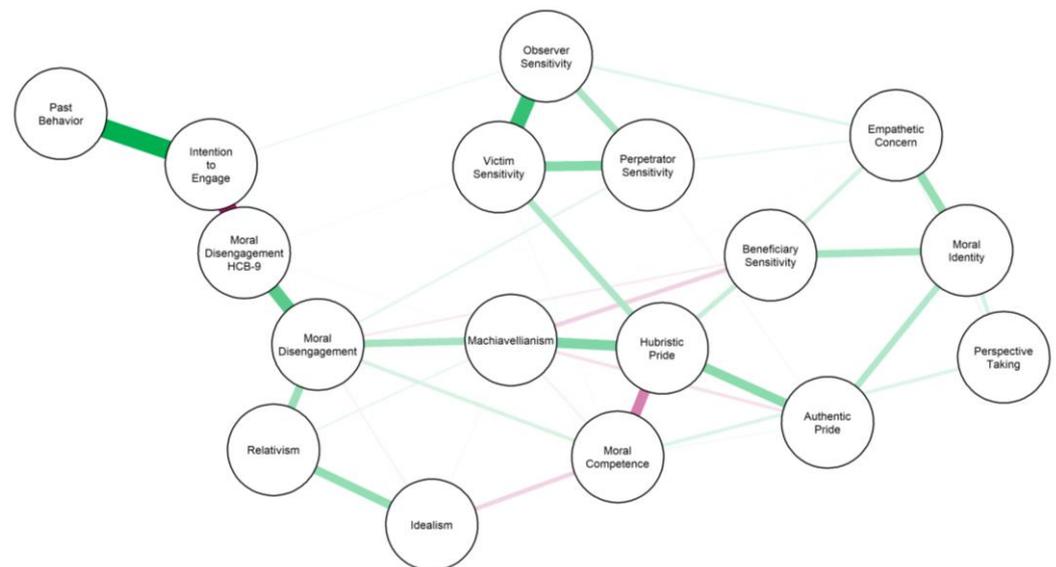


Figure 5. Nomological network of the propensity to disengage morally from high-carbon behavior for the validation study. Note: Green lines correspond to positive associations; red lines correspond to negative associations. The stroke width reflects the strength of the (regularized) partial correlation between two interconnected constructs (the stronger the association, the wider the stroke). $N = 174$.

The MCT was loosely, yet positively, related to MD-HCB. However, moral competence was strongly and negatively linked to hubristic pride and also negatively, but less strongly,

related to idealism. Moreover, moral competence was positively and loosely related to authentic pride. Therefore, the MCT reveals its relationship to the MD-HCB via mediator constructs, mostly hubristic pride and, consequently, Machiavellianism, as well as idealism and, consequently, relativism. No direct association between the MCT and the criteria of intention to engage in LCB or past LCB was found. According to this finding, and the one above regarding the criterion validity of the interpretations drawn from the MCT for predicting LCB, it seems to be a less useful instrument for further investigations in this context.

The relationships with the criteria, past LCB, and the intention to engage in such behavior in the future were further analyzed in the next section in terms of criterion and incremental validation.

Criterion and Incremental Validation. Two hypotheses were tested using two separate two-step hierarchical regression analyses, one for past LCB and one for the intention to engage in such behavior in the future (see Table 4):

Table 4. Regression analyses for past LCB and the future intention to engage in LCB for MD-G vs. MD-HCB in the validation study ($N = 174$).

Variable	Past LCB		Intention to Engage in LCB		
	Model 1	Model 2	Model 1	Model 2	Model 3
Moral Disengagement (General)	−0.17 (−0.21, −0.14)	0.08 (0.04, 0.12)	−0.26 (−0.42, −0.10)	0.12 (−0.04, 0.29)	0.07 (−0.04, 0.18)
Moral Disengagement (HCB-9)		−0.44 (−0.47, −0.41)		−0.67 (−0.78, −0.55)	−0.39 (−0.47, −0.30)
Past LCB					0.63 (0.22, 1.04)
R^2	0.03	0.16	0.07	0.37	0.70
ΔR^2		0.13 *		0.30 *	0.33 *

Note: All coefficients are standardized regression weights with their 95% CI in brackets. * $p < 0.05$ (only for incremental coefficients).

Hypothesis 1 (H1). MD-HCB predicts past LCB and future intentions to display such behavior.

Hypothesis 2 (H2). The predictive power of MD-HCB is significant beyond that of MD-G for both criteria.

In the first step of both analyses, only MD-General was included as the predictor. As shown in Table 3, the MD-G had some predictive power for both past carbon-saving behavior, $R^2 = 0.03$, $F(1, 172) = 5.23$, $p = 0.012$, and future intentions to engage in such behavior, $R^2 = 0.07$, $F(1, 172) = 12.45$, $p = 0.001$.

In the second step of the regression analysis, the MD-HCB scale was entered as a second predictor. This improved the model fit significantly and substantially (past LCB: $\Delta R^2 = 0.13$, $p < 0.001$; future intention to engage in LCB: $\Delta R^2 = 0.30$, $p < 0.001$), supporting Hypothesis 2. In addition, a negative net suppression was found for the regression coefficient of MD-G in the second step of both analyses as it was reduced in size and changed from a negative to a small positive effect. The coefficients of MD-HCB were high and significant for both past LCB and future intentions to engage in LCB, supporting Hypothesis 1. Finally, the coefficient of MD-HCB for predicting the future intentions to engage in LCB was somewhat larger than that for retrodicting past LCB, thereby suggesting the well-known intention-behavior gap (e.g., [97]).

Exploratively adding a third step in the prediction of the intention to engage in LCB by introducing past LCB improved the model fit substantially ($\Delta R^2 = 0.33$, $p < 0.001$). Although past LCB had proven to be the strongest predictor for the intention to engage in such behavior, MD-HCB remained a significant and substantial predictor, while its general pendant, MD-G, decreased to a negligible size. Although it was different from zero, the

estimate of the coefficient for past behavior was rather imprecise, which is reflected in its large confidence interval, $\beta = 0.63$, 95% CI [0.22, 1.04]. Therefore, the effect size of past LCB should be interpreted with this reservation.

Moreover, we hypothesized that a lack of moral competence would predict LCB. Again, two regression analyses were performed (see Table 5), but no substantial or significant contribution of moral competence was found for either past LCB, $R^2 = 0.01$, $F(1, 167) = 1.79$, $p = 0.183$, or for the intention to engage in LCB, $R^2 = 0.01$, $F(1, 167) = 1.98$, $p = 0.161$. Introducing the MD-HCB in a second step yielded a significant and substantial increase in the explained variance for both past LCB ($\Delta R^2 = 0.16$, $p < 0.001$) and the intention to engage in LCB ($\Delta R^2 = 0.35$, $p < 0.001$). Moreover, both coefficients for the MCT were further reduced.

Table 5. Regression analyses for past LCB and the future intention to engage in LCB for MCT vs. MD-HCB in the validation study ($N = 174$).

Variable	Past LCB		Intention to Engage in LCB	
	Model 1	Model 2	Model 1	Model 2
Moral Competence	0.10 (0.10, 0.10)	0.07 (0.07, 0.07)	0.11 (0.10, 0.12)	0.06 (0.05, 0.07)
Moral Disengagement (HCB-9)		−0.40 (−0.42, −0.37)		−0.59 (−0.69, −0.49)
R^2	0.01	0.17	0.01	0.36
ΔR^2		0.16 *		0.35 *

Note: All coefficients are standardized regression weights with their 95% CI in brackets. * $p < 0.05$ (only for incremental coefficients).

3. General Discussion

The results of the studies presented here show that the newly created MD-HCB which measures the tendency to morally disengage in high-carbon behavior contexts, is able to predict both past LCB and the intention to engage in such behavior in the future (both of them measured via self-reports). This not only shows the predictive validity of the interpretations from our questionnaire but also that moral explanations help scientists and practitioners to learn more about high-carbon behavior and to modify such behavior in the future. Analogously to the scale to measure the tendency to morally disengage (MD-G; [34]), MD-HCB is associated with a broad range of constructs that modulate moral behavior, such as justice sensitivity, Machiavellianism, and moral identity. The fact that the MD-HCB better predicted the intention to engage in and past LCB than the MD-G supports the need for a more specific questionnaire in the context of high-carbon behavior. Moreover, the MD-HCB performed as expected in an approach (think aloud method) to ensure the content and face validity of its interpretations (see Study 1, Design and Procedure).

Beyond demonstrating the incremental predictive validity of the new scale for high-carbon behavior, our findings indicate that interindividual differences in the tendency to use cognitive reappraisal strategies in morally relevant contexts improve the prediction and explanation of these behaviors and point to new strategies for changing them. Both the original 18-item and the reduced 9-item versions of the modified and extended moral disengagement questionnaire had high reliability, essentially equal predictive power, and construct (convergent and divergent) validity of its intended interpretation as indicating the proclivity to morally disengage in high-carbon behavior contexts, while the reduced version additionally had a better unidimensional structure (although that of the 18-item version was also close to unidimensionality). These results suggest that in future studies, the reduced version of the scale should be used. Furthermore, the fact that it is more economical in terms of administration provides another compelling reason for using it.

In the process of developing the MD-HCB, we changed the construct dehumanization (of the MD-G) to that of the less harsh-sounding social distance. Inspired by Markowitz and Shariff [75], we also added the category of the blamelessness of unintentional action

to Bandura's [36] eight mechanisms of moral disengagement. With this ninth component, both versions of our questionnaire display good reliability, and despite its abbreviated length, the short version also manifests sound diagnostic properties.

While the ratings of the MD-HCB may appear quite low ($M = 2.12$, $SD = 1.06$), they are nevertheless comparable to those in the study of Moore et al. ([34]; $M = 2.57$, $SD = 0.99$ in the 8-item version; p. 20).

Our second concern was to test the predictive power regarding past LCB and the intention to engage in LCB of a version of the MCT [68] that is slightly linguistically modified. In both studies, moral competence indeed showed weak predictive ability regarding past LCB and the intention to engage in LCB, although the inclusion of the MD-HCB eliminated this deficiency. Moreover, no substantial correlation between the MCT and other constructs in the nomological network that was explored in both studies was found. One possible reason might be the MCT's lack of reliability; however, we must note that Lind [68] argues that the MCT may be an experimental questionnaire, and thus not comparable to those constructed on the grounds of classical test theory. Therefore, the reliability should only be assessed by a test-retest procedure.

However, the two dilemmas of the MCT can be regarded as parallel tests, which render an assessment of their reliability possible. This was achieved by calculating the correlation between them, which indeed indicated their poor reliability. Furthermore, according to Lind [68], the validity of the interpretations drawn from the MCT can only be established by showing the properties of affective-cognitive parallelism, simplex structure, preference hierarchy, and non-simulability. However, the global competence score derived from our slightly simplified MCT variant neither predicted past LCB nor the intention to engage in such behavior, which appeared to reflect the poor criterion validity of its interpretations that cannot be overlooked. Thus, in contrast to our initial expectation, our study results show the MCT to be an inadequate tool for the empirical scrutiny of moral disengagement and high-carbon behavior.

3.1. Limitations

In the absence of German-language instruments for assessment of the constructs in the nomological network of the MD-HCB, some of the questionnaires used were translated from their respective English versions into German without checking the criterion and construct validity of item interpretations in the translated versions. Our attention focused on moral identity [47] and the propensity to morally disengage [27]. Scrutiny revealed, however, that the correlations between the MD-HCB and these constructs were comparable to those found in Moore et al. [34] for the pre-study as well as for the validation study, thus incidentally alluding to the construct validity of their interpretations as indicators of the proclivity to morally disengage in high-carbon behavior. For example, there is no German-language alternative to the MD-G. Moreover, due to the number of questionnaires, the period of the total survey lasted around 20 min. The relatively large exclusion rate of approximately 33% (due to social desirability and too fast responding) may be explained by the circumstance that all of the administered questionnaires require a high level of concentration to be completed, and this timeframe might have been too long for some participants to stay focused. In this context, especially because the topics deal with moral issues which are not everyday subjects, some questions might have been disconcerting (above all, the MCT). In general, the exclusion rate can be explained by the high complexity of the issues and because reactance can arise when confronted with moral issues. This might have led some participants to rush through the survey.

Additionally, we did not control for the questionnaires' sequence effects, which might be expected to occur when considering moral issues. Considering that the sample size used in the main study is rather small, the results of the factor analysis might be unstable and, therefore, generalizing interpretations should be made with caution. Moreover, our study design is based on self-reports. We aimed at minimizing biases due to social desirability

by excluding participants with a tendency towards socially desirable responses. However, this does not unequivocally rule out potential faking tendencies.

The general validity of questionnaire responses and their interpretations for behavioral science questions—and specifically for sustainability questions—is debatable [98], not least because of the frequently observed intention-behavior gap (e.g., [19]). The output variable in this study is actually “only” a self-reported scale based on the General Ecological Behavior Questionnaire, which only measures self-reported behavior. However, in a subsequent study, we assessed the questionnaire in relation to a behavioral instrument: a CO₂ footprint [99]. For future research, we recommend also investigating observable behavior.

One possible reason why the MCT failed to meet the diagnostic criteria of reliability and validity in this study might have been due to our slight simplifications of the wording of items that we deemed overly complex and difficult to understand—even for people with an academic background. According to the results of our pre-study, the modified version and the original version performed equally well, with the modified rendition benefitting from improved comprehensibility.

Two other possible sources of the MCT’s shortcomings are its unconvincing psychometric properties and its conceptualization of moral development. Moral competence is not equivalent to moral development as postulated by Kohlberg [100] as moral competence mainly relies on linguistic skills to process arguments and fully comprehend them. Although moral development is also associated with cognitive development, it does not largely depend on one domain of competence.

Unfortunately, although the MCT is of limited use in the context under discussion, a comparably handy, more comprehensible, and modern instrument for quantitative surveys is not available. Not only is the language of the MCT highly complex but also the context of the dilemmas seems to be outdated.

3.2. Recommendations for Future Research

To clarify the reasons for the low mean ratings obtained in the MD-HCB, which replicates parallel findings to those of Moore et al. [34] on general moral disengagement strategies in organizations, qualitative research methods such as in-depth interviews or focus-group discussions may be helpful. For example, Lincoln and Denzin [101] argue that in-depth interviews are suited to ascertain truthful reporting and are ideally suited to understand the complex reality of individuals as they perceive it, their often-complex motivations, and how these factors influence their behavior. In the case of high-carbon behavior, a qualitative approach may offer the opportunity to obtain comprehensive data about what people know, believe, and feel concerning these behaviors, as well as information about their beliefs and motivations in regard to the climate crisis, and information about how moral disengagement manifests itself in specific situations. It seems conceivable that this research would reveal that some of the disengagement strategies that are given low importance in the questionnaire, such as social distancing or emphasizing the blamelessness of unintended actions (see Table 1), are much more important in concrete situations.

4. Conclusions and Implications

In this article, we have assumed that the propensity to morally disengage concerning high-carbon behaviors (e.g., eating meat, and traveling by plane) is one important factor that prevents individuals from reducing their carbon footprint. We applied Bandura’s theory of moral disengagement and argued that it is appropriate to explain the gap between knowledge and the intention to act accordingly, and therefore, often high-carbon behavior is still evident. We therefore empirically showed that Bandura’s theory can explain the hidden emotional mechanisms and make the different psycho-social mechanisms for justifying high-carbon behavior visible.

The development of our validated instrument on MD-HCB facilitates quantitative research on this topic. As the questionnaire showed an excellent internal consistency (Cronbach’s $\alpha = 0.94$) with high predictive validity for both past low-carbon behavior and

the intention to engage in such behavior in the future, we suggest further testing and using our questionnaire in future studies concerning managerial implications. In general, further research using the MD-HCB can benefit from its brevity and sound psychometric properties. As the items measuring different moral disengagement strategies relevant for high-carbon behavior were highly correlated, more comprehensive questionnaires that measure these strategies are not necessary unless there is a specific interest in a particular strategy. The MD-HCB has in fact already been used to measure moral disengagement in high-carbon behavior in a large-scale survey that focused on the roles of justice sensitivity, moral disengagement, and moral emotions in predicting pro-environmental intention and behavior [99]. Based on our findings, we suggest that future media campaigns designed to increase people's intention to reduce high-carbon behavior could focus on the modification of common moral and cognitive disengagement strategies.

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Institutional Review Board Statement: The survey was designed and conducted in accordance with the Code of Ethics of the World Medical Association (“World Medical Association Declaration of Helsinki”, 2013). All participants gave their informed consent to participate prior to the start of the survey. They were informed about the aim of the study and that they could terminate their participation at any time without negative consequences. Ethical review and approval were not required for these studies in accordance with German legislation and institutional requirements. The study was not preregistered.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author. The data are not publicly available due to privacy reasons.

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