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Article

Mindfulness Training at School: A Way to Engage Adolescents with Sustainable Consumption?

Tina Böhme ^{1,*}, Laura S. Stanzus ¹, Sonja M. Geiger ¹, Daniel Fischer ^{2,3}  and Ulf Schrader ¹

¹ Technische Universität Berlin, Division of Economic Education and Sustainable Consumption, Marchstr. 23, 10587 Berlin, Germany; stanzus@leuphana.de (L.S.S.); sonja.m.geiger@tu-berlin.de (S.M.G.); schrader@tu-berlin.de (U.S.)

² Institute for Environmental & Sustainability Communication (INFU), Leuphana University of Lüneburg, Scharnhorststr. 1, 21335 Lüneburg, Germany; daniel.fischer@uni.leuphana.de

³ School of Sustainability and Julie Ann Wrigley Global Institute of Sustainability, Arizona State University, P.O. Box 875502, Tempe, AZ 85281, USA

* Correspondence: tina.boehme@tu-berlin.de; Tel.: +49-175-450-2550

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Abstract: A central challenge in research on education for sustainable consumption (ESC) is to develop new approaches to engage adolescents with sustainable consumption (SC) in a way that addresses not only the cognitive but also the socio-emotional and behavioral levels. Mindfulness-based interventions (MBIs) that foster awareness, (self-)reflection, and ethical values could potentially leverage learning processes in ESC. The present study was the first one to investigate the potential effects of a consumption-specific MBI on sustainable consumption behavior (SCB) in the areas of nutrition and clothing. The eight-week long intervention was carried out with 15-year old adolescents ($N = 85$) directly at school. A randomized pre-post waitlist control group design with mixed methods was applied. The study revealed the strong effects of the adapted MBI on precursors of SCB and further effects not directly related to but potentially conducive for SCB. Actual behavioral effects were minor. Substantial inter-individual differences and inconsistencies between qualitative and quantitative results imply case-related effects that do not allow generalizable conclusions to be drawn. Nevertheless, the results of this pilot study indicate that combining mindfulness training with ESC formats appears to be a feasible and fruitful approach to engage adolescents with SC. Future practice and research should consider more diverse target groups, other consumption areas, and longer periods for interventions and their evaluation.

Keywords: education for sustainable consumption; sustainable consumption behavior; mindfulness training; adolescents; school; randomized controlled intervention study; mixed methods

1. Introduction

Finding progressive and inclusive ways to promote sustainable development is an ongoing matter of urgency [1] and changes in consumption behaviors are seen as an essential lever on the road to sustainable development [2]. Sustainable consumption behavior (SCB) can be referred to as individual acts of people living today to satisfy their needs without in turn compromising the ecological and socio-economic conditions for the satisfaction of needs of other people and future generations [3]. Implementing education for sustainable consumption (ESC) as a part of education for sustainable development (ESD) into educational institutions has been a highly relevant strategy in order to advance SCB and achieve the sustainable development goals (SDGs) and targets formulated in the 2030 Agenda for Sustainable Development [2,4].

ESC aims at empowering learners to understand the environmental and socio-economic consequences of their behavior and, based upon this understanding, make responsible consumption

decisions and take action accordingly [2,5]. However, researchers and practitioners have been challenged by the gap that persists between the high levels of pro-environmental knowledge, attitudes, or intentions (referred to as *pre-stages of SCB* in what follows) and actual behavior (e.g., see References [6–8]). Knowing and understanding about sustainable development issues is important, but clearly not enough to empower people to really change established and often routinized consumption patterns (see also References [9,10]). Rather, a large body of scholarly work shows that a complex variety of psychological and social factors, such as personal and social norms, values, and emotions, determine pro-environmental and pro-social behavior (for reviews and meta-analyses see References [11–14]).

To overcome the knowledge/attitude–behavior gap, ESC approaches should refrain from focusing on cognitive learning goals and the development of abstract knowledge only. Instead, a major trajectory in ESC research and practice is to advance more sophisticated ESC formats that are able to effectively address a broader range of domains and competencies. Recent ESD policy reports [15,16] suggest specific learning objectives for each and every SDG that consider not only a cognitive, but also a socio-emotional and a behavioral domain. A broader appreciation of the interrelatedness of cognitive, emotional, and motivational dispositions underpinning human behavior is also part of the debate about key competencies for sustainable consumption (SC) [17–20].

Adolescents represent an important target group for ESC since adolescence is a crucial time to intervene in the formation of unsustainable consumption habits and establish alternative ways of responsible living [21,22]. Adolescents transit from living within their family households and only partly being responsible for their consumption actions to leaving their family households and taking over an increased or even full responsibility for their consumption choices. Moreover, they are at a stage in life characterized by more advanced reflective thinking, reasoning, and decision-making with regard to their socialization as consumers [23]. Implementing innovative and holistic ESC formats directly into formal and informal learning settings at school appears to be promising since adolescents spend large parts of their daytime at school [24].

In recent years, (E)SC researchers have begun to consider mindfulness as potentially helpful to promote SCB [25–27]. Mindfulness has its origins in about 2500-year-old Buddhist practices [28] and has become a popular topic not only in the educational field, but also in a variety of other societal and scientific domains. Most recent research that focuses on mindfulness as a facilitator of lasting individual or social transformation is informed by a more comprehensive understanding of mindfulness. It explicitly embraces cognitive aspects like attention and conscious awareness *and* socio-emotional or ethical qualities, such as benevolence and compassion, originally inherent in mindfulness philosophy [29–31]. Thus, mindfulness can be defined as “the unbiased awareness that emerges through intentionally and continuously paying attention to subjective momentary experience with an open, accepting, benevolent, and compassionate attitude” [32] (p. 6).

Mindfulness was introduced to the Western context as a secular practice aimed at reducing stress and promoting health and wellbeing within clinical, sub-clinical, and healthy populations. The most well-known and widespread secular mindfulness-based group program is Kabat-Zinn’s Mindfulness-Based Stress Reduction (MBSR) [33], which has been shown to effectively increase mental and physical wellbeing [34,35]. Mindfulness-based interventions (MBIs) have also been applied in educational settings and shown to have a positive influence on several cognitive, emotional, and social variables in children and adolescents (for reviews and meta-analyses see References [36–39]). Despite these promising findings, research on school-based MBIs is still in its early phase and suffering from a number of constraints. In particular, small group sizes, non-suitable study designs, and numerous unstandardized MBI formats impair the informative value of reviews and meta-analyses that only focus on quantitative studies. Qualitative and mixed-methods studies are rare although strongly needed to explore the effects of different MBIs in different contexts (see also Reference [40]).

Despite the given lack of empirical evidence, MBIs that foster awareness, (self-)reflection, and ethical values are considered promising approaches to advance learning processes in ESC and

support behavior change towards more sustainability. The literature review on mindfulness and sustainable consumption by Fischer et al. [25] suggests that a key contribution that mindfulness can potentially make to the promotion of SC is its capacity to disrupt routines and automatic behavior, increase coherence between attitudes and behavior, enhance non-materialistic values, promote wellbeing, and leverage pro-social behavior and compassion. Another literature review on the mindfulness–sustainability relationship by Wamsler et al. [26] corroborates these findings. In addition, Wamsler et al. highlight the positive influence of mindfulness on the human–nature connection, interrelatedness with others, as well as on deliberate, flexible, and adaptive responses to climate change [26]. While these reviews suggest that mindfulness could possibly contribute to SCB, in cross-sectional studies, it has also been shown that the diverse facets of mindfulness relate differently to SCB and its correlates [27,41]. Hence, (E)SC researchers are called upon to consider mindfulness as a multi-faceted construct. Moreover, it is proposed to investigate more diverse target groups and employ more sophisticated research approaches including longitudinal, mixed methods, and intervention designs to overcome existing methodological flaws in the literature [25].

First attempts have been made to infuse sustainability into the design of mindfulness-based formats, but their implementation so far remains confined to the higher education system [42,43]. Given the promising potential of mindfulness to promote SC, its proven feasibility in the school context, and the fact that adolescents represent a crucial target group for ESC, it is surprising that, to date, no study has investigated the effects of a school-embedded MBI focused on SCB in adolescents.

In order to address this research gap, we designed, implemented, and evaluated a consumption-focused mindfulness-based intervention in the context of ESC. The intervention focused on the consumption areas of nutrition and clothing. These two areas encompass everyday behaviors highly relevant in terms of ecologic and socio-economic impact and could potentially show changes in an eight-week long intervention with adolescents [3]. The aim of the present study was to assess the potential effects of the intervention (1) on SCB in the areas of nutrition and clothing as well as (2) on pre-stages of SCB (e.g., attitudes and intention), and (3) other variables not directly related to SCB (e.g., wellbeing and compassion). This study was part of the larger transdisciplinary research project BiNKA (German acronym for *Education for Sustainable Consumption through Mindfulness Training*) funded by the German Ministry for Education and Research (BMBF). In the BiNKA project, three different target groups were addressed: adolescents at school, university students, and employees. The school-embedded intervention as well as the applied measures were especially developed and adapted for use with adolescents. Thus, this article only reports the results from the BiNKA school study (see further publications on BiNKA website <http://achtsamkeit-und-konsum.de/en/publications2/>).

2. Methods

2.1. Study Design and Procedure

A partly integrated mixed methods model [44,45] was used to account for the explorative character of the present study that sought to capture the potential effects of the MBI on SCB as holistically as possible. Quantitative and qualitative methods were integrated (1) on the level of research model with common, integrated research questions; (2) on the level of data analysis through deductive and inductive development of categories; and (3) on the level of results by consolidating the results of both study parts.

The entire grade 10 (three classes with between 27 and 29 students each) of a private secondary school in Berlin took part in the present intervention study that followed a randomized waitlist control design. The students of each class were randomly assigned to an intervention group (IG) and a control group (CG) respectively. The groups received the intervention successively, where the IGs participated first while the CGs attended normal class. The CGs received the intervention after the IGs had finished. All participants (both IGs and CGs) filled in pencil and paper questionnaires one week before the IGs started the intervention and within one week after the IGs had finished (quantitative pre-post

measure). Filling in the questionnaires took between 30 and 45 min each time. Moreover, qualitative interviews of 25 to 60 min length were carried out with 14 randomly selected IG participants after the intervention (four to five out of each class). The interviews were audiotaped and transcribed verbatim. Data acquisition (both questionnaires and interviews) and the intervention were carried out at school during normal school days. Informed consent was retrieved from all parents. The students were informed about the intervention study in advance, too, but were unaware of the consumption focus of the intervention. Participation was mandatory for the students but with the opportunity to withdraw from the training at their own request at any time. The intervention was carried out between February and March of 2017.

2.2. Participants

Initially, 85 students entered the study. 15 students dropped out due to absence at the pre- or post-measurement time point ($n = 5$ and $n = 6$, respectively), or due to not having sufficient German skills to fill out the questionnaire ($n = 4$). Attendance of at least five training sessions was set as a pre-condition to enter data analyses, which was met by all non-dropouts. The remaining 70 students ($n_{IG} = 39$, $n_{CG} = 31$) had a mean age of $m_{age} = 15.3$ years ($SD = 0.5$, range 14–17), 27 of them were female, and 28 of them had had prior meditation experience (mostly one-time experiences). It can be assumed that the participants were already confronted with sustainability and global issues before the study, since ESD and the SDGs were firmly anchored in their school curriculum. At the time of the study, the students were in the middle of the preparation for their junior high school exams at the end of grade 10 (MSA).

Six female and eight male students were selected for the interviews. Their age, gender, and prior meditation experience resembled the distribution in the entire sample. The participation rate of all interviewees in the course was high. The rating of their overall satisfaction with the course and the times of meditation practice per week were as mixed, as was the whole IG sub-sample. See Tables 1 and 2 at the end of the results section for an overview of sample characteristics and control variables.

2.3. Intervention

The consumption-specific mindfulness-based intervention (“BiNKA training”) was structured according to the well-established MBSR program [33,46] and taught by a certified MBSR trainer. The intervention consisted of eight weekly group sessions of 90 min, one half-day session of four hours (“Day of Mindfulness”), and 15 min of daily meditation practice at school or at home supported by audio files recorded and provided by the trainer. The first four weeks of the training focused more on mindfulness-specific topics and the establishment of a meditation practice, whereas the second half of the training increasingly addressed consumption-related topics and exercises (see Reference [47] for more information concerning the training development and contents, and Reference [48] for some practical exercises).

Different exercises formed part of the training. An emphasis was put on teaching different kinds of meditation such as body scan, breathing meditation, and loving-kindness meditation (“metta”):

- *Body scan*: A mindfulness exercise where participants are guided to move through their bodies with their awareness and feel into every body part, step by step, and just perceiving without judging.
- *Breathing meditation*: A mindfulness exercise where the awareness is focused on the breath felt in the body, e.g., in the belly. Participants are invited to just observe thoughts and emotions that come up and to let them go and refocus on the breathing again and again.
- *Metta meditation*: A mindfulness exercise for cultivating kindness, compassion, and love, in a first step for oneself, thereafter for other human beings, animals, and nature. Internally, sentences like, “May all the beings in the world be happy” are repeated many times. This exercise was referred to as “heart-opening” meditation throughout the study.

Moreover, imaginary journeys, mindful movements, and discussions about mindfulness- or consumption-related topics were included as guided exercises. Additionally, the participants were invited to practice mindfulness in their everyday lives (e.g., mindful eating and mindful shopping) and to do small tasks at home and during sessions in a booklet they were handed out. Two example exercises that combined mindfulness and consumption in the areas of clothing and nutrition were:

- *Jeans journey*: Originally an ESC-format that was transferred into the context of mindfulness. It is an imaginary journey through the different stages of the production of a pair of jeans, from cotton picking to selling it in a shop. Participants are invited to concentrate on sensual perceptions like the feeling of fabric of their clothes on their skin during the journey.
- *Mindful eating*: A mindfulness exercise to practice eating in silence and without any distraction. The focus is on the color, the texture, the smell, and the taste of their food. Mindful eating was practiced in the course (in conjunction with the so-called “raisin exercise”, a classical exercise out of the MBSR program that was practiced using a mandarin with the students), during the Day of Mindfulness, and at home.

2.4. Measures and Analysis

2.4.1. Quantitative Study

Prior to data analysis, all questionnaires were manually checked for answering patterns and, if detected, the entire scale was set missing for that case. Reversed items were recoded and internal consistency for all applied measures was checked. If Cronbach's α was below 0.5, confirmatory factor analyses were calculated in order to investigate the factor structure of the scale. Means of scales or subscales were calculated for pre- and post-measures. Afterwards, zero-order correlations of all scales for the pre-means as well as 2×2 ANOVAs with a measurement point in time (pre-post) and experimental group (IG-CG) were run for the measures listed below. Data were analyzed using the software IBM SPSS Statistics 25.

- *Sustainable consumption behavior* (SCB) in the areas of nutrition and clothing was assessed using the Young Consumers' Sustainable Consumption Behavior (YCSCB) scale [49] that is based on the cube model of SCB [3]. The nutrition subscale spans 14 items (Cronbach's $\alpha = 0.77$; e.g., “I buy organic food products.”), the clothing subscale has 13 items (Cronbach's $\alpha = 0.87$; e.g., “I choose clothing items from fair trade production.”). Items were assessed on a seven-point Likert scale with every second option labelled as “never” (0), “sometimes” (2), “often” (4), and “always” (6).
- *Sustainable consumption attitudes* in the areas of nutrition and clothing were assessed by two self-constructed subscales that reflected the main consumption aspects covered in the respective SCB scales (nutrition: $n = 8$, Cronbach's $\alpha = 0.65$, e.g., “Fair food pricing for local producers and farmers is important.”; clothing: $n = 6$, Cronbach's $\alpha = 0.79$, e.g., “To borrow or swap clothes with others is a good thing to do.”). Items were assessed on a seven-point Likert scale with every second option labelled as “completely disagree” (0), “rather disagree” (2), “rather agree” (4), and “completely agree” (6).
- *Material values* were assessed using the German Material Values Scale—Youth (G-MVS-Y; [50]), which was developed and validated based on the German adult version [51] of the original scale on value orientation for materialism by Richins and Dawson [52]. The G-MVS-Y spans 10 items (Cronbach's $\alpha = 0.88$, e.g., “The things you own predicate a lot about how successful you are.”) and was assessed on the same Likert scale as SC attitudes (see above).
- *Compensatory consumption* was measured by a scale by Lange, Choi, and Ademczyk [53]. It encompasses nine items (Cronbach's $\alpha = 0.81$) on impulsive and compulsive buying that is unconsciously triggered to compensate for unfulfilled needs (e.g., “Sometimes I realize that something within me has pushed me to go shopping.”). Items were assessed on the same Likert scale as SC attitudes (see above).

- *Wellbeing* was assessed by the core module taken from the guidelines on how to measure subjective wellbeing by the OECD [54]. It spans five items (Cronbach's $\alpha = 0.76$) on general life satisfaction, meaningfulness of one's actions in life, and emotional aspects (e.g., *"How happy have you felt over the last four weeks?"*). Items were assessed on an 11-point Likert scale used by the OECD ranging from *"not at all"* (0) to *"completely"* (10).
- *Mindfulness* was measured by the German translation of the Comprehensive Inventory of Mindfulness Experiences—Adolescents (CHIME-A, [55]), which again was based on the German CHIME for adults by Bergomi, Tschacher, and Kupper [56]. The CHIME-A originally spans 25 items, which parse into eight sub-facets of mindfulness. In the present study, the following three subscales that reflect mindful awareness were considered relevant in terms of their correlation with SCB [41]: *"Awareness of Internal Experiences"* (three items, Cronbach's $\alpha = 0.74$, e.g., *"When my mood changes, I notice it straight away."*), *"Awareness of External Experiences"* (three items, Cronbach's $\alpha = 0.78$, e.g., *"I notice details in nature (like the colour of the sky, or the shape of trees and clouds)."*), and *"Acting with Awareness"* (three items, Cronbach's $\alpha = 0.65$, e.g., *"I get distracted by memories or daydreams."*). Analyses were based on the mean values of the three subscales, respectively. The items were assessed on the same Likert scale as SCB with the instruction to consider the past two weeks when answering the question.
- *Mindful eating* was measured by a short version of nine items of the Mindful Eating Questionnaire by Framson et al. (MEQ; [57]), reflecting the four factors disinhibition awareness, distraction, and emotional response. The items were assessed with the instruction to consider the past two weeks using a seven-point Likert scale where only the extremes were labelled, with *"almost never"* (0) and *"almost always"* (6). Cronbach's α for the nine items revealed an unsatisfying value of 0.39. Confirmatory factor analyses suggested a two-dimensional model instead of a unidimensional one and the exclusion of two items (CFI = 0.961, TLI = 0.938, and RMSEA = 0.05). Thus, the following analyses were run for the two sub-factors respectively, one reflecting emotional aspects (four items, Cronbach's $\alpha = 0.69$, e.g., *"When I'm sad, I eat to feel better."*), the other one reflecting more cognitive aspects (three items, Cronbach's $\alpha = 0.54$, e.g., *"Before I eat, I take a moment to appreciate the colors and smells of my food."*).
- *Compassion* was measured using a scale taken from Shiota, Keltner, and John [58]. It spans five items (Cronbach's $\alpha = 0.78$) and addresses the behavioral aspect of wanting to help others (e.g., *"If I see someone suffer or in need, I feel the strong urge to take care of that person."*). The same Likert scale as for SC attitudes was used (see above).
- *Connectedness to nature* was assessed using the Connectedness to Nature Scale—Adolescents (CNS-A), which was developed and validated by Götting et al. [59] based on the German version [60] of the original Connectedness to Nature Scale by Mayer and Frantz [61]. The scale spans 10 items (Cronbach's $\alpha = 0.88$, e.g., *"All living beings in the world are connected and I feel like a part of it."*), which were assessed on the same Likert scale as SC attitudes (see above).

2.4.2. Qualitative Study

The interviews took place in silent rooms at school and were carried out by two interviewers (seven interviews each). To ensure objectivity between the two interviewers and check the quality of the interview guideline, both interviewers were present at the first two interviews, one leading the interview, the other one taking part as a silent observant, respectively. In retrospect, only minor linguistic changes were made to the guideline, so that the first interviews were comparable with the following interviews and were therefore included in the overall analysis.

The interview guideline was semi-structured [62] with 21 main questions (including sub-questions) and optional questions to dig deeper whenever necessary. The guideline was partly informed by the quantitative questionnaire and consisted of three parts: In the first part (A), participants were asked open questions about their personal experience with the course and the course elements. The second part (B) contained more specific questions about wellbeing, consumption,

and mindfulness. In the third part (C), participants were asked about their attitude towards nature and the environment. Specific questions concerning the effects of the course elements and the influence of parents and peers were included, too. At the beginning of each interview, participants were asked for their consent to the recording and reminded of their voluntary participation and the right to refuse answers or to end the interview at any time.

Data were analyzed using structured content analysis after Kuckartz [63] and the software package MAXQDA. Deductive and inductive methods were combined to develop the coding scheme. Deductive categories were derived directly from the research questions and the interview guideline. Inductive categories were added during the coding procedure using in vivo coding to account for unexpected effects. Inter-coder reliability was ensured through communicative validation after Flick [64]. Three independent coders coded the first interview and then compared the assigned categories between them. Deviating and unclear codings were discussed and clarified in order to ensure a standardized coding of the remaining material, which was then carried out by two student assistants. Coding rules allowed multiple categories to be assigned to one text passage. Coded text passages were then paraphrased and summarized by a senior researcher for each category and for each case (i.e., participant), respectively. To elucidate whether the effects were individual phenomena or applied to a larger part of the group, the number of statements about certain effects in the sample was also recorded.

3. Results

The results are structured according to the main objectives of the study: (1) effects of the MBI on SCB, (2) effects on pre-stages of SCB, and (3) further effects not directly related to SCB. For each subsection, the quantitative results are reported first, followed by the qualitative results including the evaluation of the training elements. For a short summary and an overview of quantitative and qualitative effects including quantitative descriptives, see Section 3.4 and Tables 1 and 2 at the end of results section. First order correlations of all variables at pre-intervention points are displayed in Table A1 in the Appendix A.

3.1. Effects on SCB

The quantitative study across the whole cohort revealed a significant two-way interaction between the group and measurement point in time for food-related SCB ($F(1,67) = 5.13$, $p = 0.027$, $\eta_p^2 = 0.071$; see Figure 1), but not for clothing-related SCB ($F(1,67) < 1$).

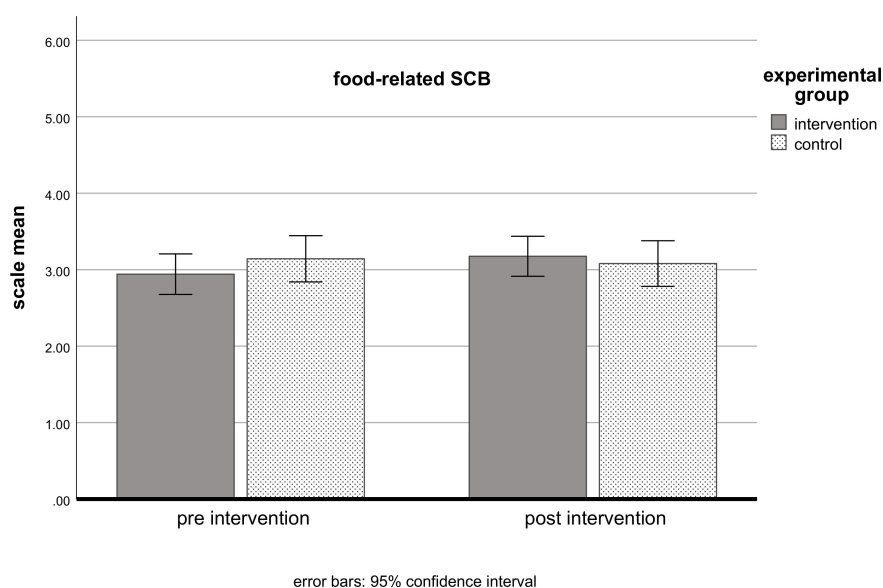


Figure 1. Two-way interaction effect on food-related SCB.

In the interviews, 2 out of 14 participants mentioned effects on consumption behavior, one each in the consumption areas of food and clothing. One person abstained from eating meat for one month and explicitly referred to the discussions during the training as a driver of this decision. He also encouraged his parents to buy more Fairtrade products.

“Not the EXERCISES, but more the things, like mindful eating, that has become a bit more clear to me, because we talked about it more. [...] and that’s why I’m trying to be a vegetarian for a month now, [...] because of the discussions about factory farming.” IG3SCHU12

Another person decided to repair a pair of riding boots that she would have had thrown away before taking the training. Moreover, she stated that she and her family now paid more attention to SC in their everyday life and had actively searched for background information about certain brands or products. For that person, the training as a whole had influenced this behavior change. No other behavioral effects were mentioned in the interviews.

“[...] now I had three pairs of riding shoes and one pair was pretty broken, and I would have said: Okay, nobody needs them anyway and I would have thrown them away. But now I repaired them a little bit with my dad and then someone really wanted to have them and uses them now. [...] And before the course I would have said: [...] They can be thrown away now.” IG3SCHU2.

3.2. Effects on Pre-Stages of SCB

In the quantitative study, no significant two-way interactions between the group and measurement point in time were found for SC attitudes (food and clothing: $F(1,67) < 1$), material values ($F(1,67) < 1$), or compensatory consumption ($F(1,68) < 1$).

In the qualitative study, several effects were described by the participants. The majority of the participants stated that the training had increased their *awareness* of SC issues (mostly of what they already had known prior to the training) and given them impulses for deeper *reflection* of the topic and their own behavioral patterns. Some interviewees also mentioned their strengthened *intention* to explicitly pay more attention to what they buy/eat and to consume more sustainably in the future.

“[...] it’s just been brought back to your awareness where it comes from, well we already know that. But you forget that at some point and you no longer think about it. Yes. And then you get reminded of it, so to speak.” IG2SCHU10

“I see sustainable consumption has become more important to me now than before. So, it just became clearer to me again that one should pay attention to it.” IG3SCHU2

The course elements most often mentioned in relation to these effects on pre-stages of SCB were the discussion exercises and the jeans journey. Other elements mentioned by the interviewees as stimulating were the tasks in the booklet, the questionnaires, the mindful shopping exercise, and the course as a whole.

“[...] we once had a session where we should think about where our pants actually come from, how many of such stages they actually go through and what happens AFTER we have used them. And I actually found that quite interesting, because [...] if you go to H&M and you buy your pants there, you know somehow where they come from, from children for children, but... you never make it that CONSCIOUS.” IG1SCHU8

The three kinds of meditation were mentioned much less in terms of consumption-related effects. Two participants stated that the heart-opening meditation (“metta”) had changed their perception of SC and that the body scan had had an influence on their increased awareness and reflection of SCB. The other interviewees did not relate the meditations to SC.

“[...] I think, if you would do it [heart-opening meditation] at several schools, I think [...] that you could achieve something like this [sustainable consumption].” IG2SCHU2

“It was just that we did the body scan and then I was relaxed and listened more to these topics afterwards.” IG3SCHU12

Two persons stated potentially counterproductive effects of the intervention regarding pre-stages of SCB. One participant indicated that he felt encouraged to attach value to sustainability, which for him meant having more pleasure and not to be too strict in his consumption decisions. He also explained that the course made him aware of the importance of being mindful with people in his immediate surrounding rather than with people in Bangladesh, for example. Both developments could have a potentially negative effect on SCB in that case.

“For example, it was said, “Sustainable consumption—take your time for it!” And I just thought that one should just enjoy and that was just confirmed again and that, yes. I think that’s good now and I thought it was good before and now it’s definitely going to happen. And now I’ve convinced others that [...] it is good to enjoy and one should not be stiff and say, “yes, I must live sustainably now—whatever may come.” IG2SCHU7.

“[...] this understanding for example of what mindfulness is, e.g., food and where does our clothes come from—that for me has fallen behind a bit. [...] because this mindfulness towards ME or towards others. I kind of put a little bit of focus on that. So now is the time to be mindful in the IMMEDIATE surroundings. Because I think it’s just a lot more powerful than [...] saying I want to somehow (—) change my clothes to be mindful towards people in Bangladesh, for example. I think it gets there very filtered and if you are more friendly to people here, with a smile towards them, I think that’s just much more intense and you get the direct feedback”. IG2SCHU7

Another single participant pointed out that in her opinion, the topic of consumption was generally too present and, thus, the consumption focus of the training was too strong:

“[...] in the meantime I simply find this topic so uninteresting because it’s a constant issue. We should consume less, we should consume less. [...] I found it interesting the first few times actually [...] but now somehow it is a topic, which has been discussed so often. At school or in general, that it just [...] doesn’t take effect with me anymore.” IG1SCHU8

3.3. Further Effects Not Directly Related to SCB

The quantitative analyses revealed a significant two-way interaction between the group and measurement point in time for compassion ($F(1,64) = 4.67, p = 0.034, \eta_p^2 = 0.068$; see Figure 2). However, no significant interaction effects were found for wellbeing ($F(1,64) = 2.17, p = 0.145, \eta_p^2 = 0.033$), mindful awareness ($F(1,67) < 1$), mindful eating ($F(1,65) < 1$), or connectedness to nature ($F(1,68) = 2.36, p = 0.129, \eta_p^2 = 0.034$).

The interviews, on the other hand, revealed several effects that may be indirectly related to consumption. All interviewees stated effects on their *wellbeing* in terms of increased relaxation, decreased stress, and regained energy.

“[...] I was just happy, after the meditation I felt so good. [...] I was just full of energy. I was also a bit tired (Int: Mhm), but when this tiredness faded, I was very energetic [...] I had energy for school, for sports, well. For example, on Thursday [note: after Day of Mindfulness], after that I went climbing and climbed really difficult routes because I was just so (Int: Mhm) very focused [...].” IG2SCHU4

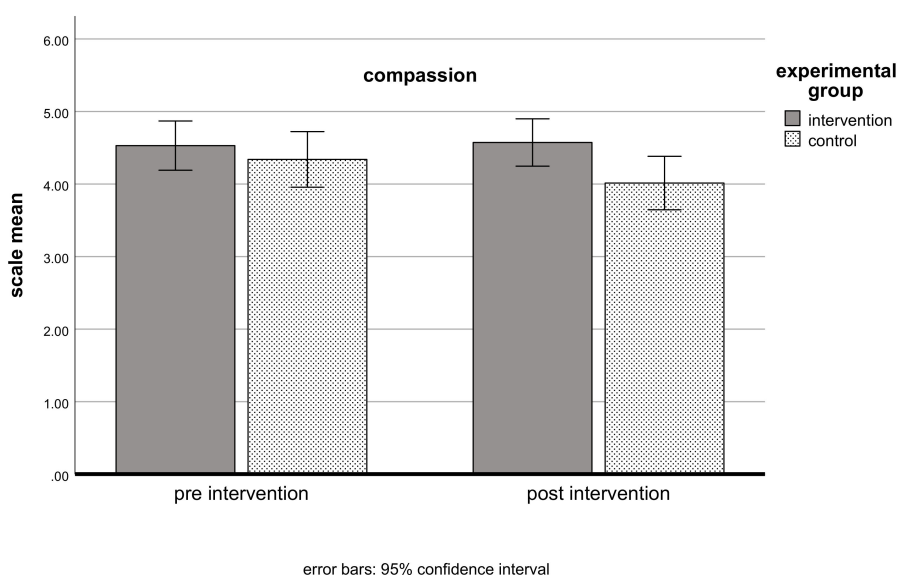


Figure 2. Two-way interaction effect on compassion.

The majority of them mentioned body scan and the breathing meditation as sources for the increased wellbeing, while some of them also credited the heart-opening meditation, the Day of Mindfulness, or the course as a whole.

“It was very relaxing to just concentrate on the different parts of the body. [...] This meditation time was more like, uh, a short break from all the hustle and bustle.” IG2SCHU10

“[...] I did have the feeling that when you were tense somehow and then tried (–) to “breathe it out,” so to speak, or to concentrate on that then, uh (–) that it somehow had an effect, I thought it was blatant.” IG3SCHU14

However, one participant stated that the effects of meditation on her wellbeing depended on her mood before meditation. When she went into meditation in an unhappy mood, she felt worse afterwards. Especially the heart-opening meditation made her wallow in self-pity on more than one occasion.

“[...] I usually felt better afterwards, but there were moments when I felt worse afterwards. Where I felt really bad, because during the meditation I was suddenly like this: Hey, who is actually doing me something good or I, hm, whom, whom am I actually doing something good and does it also come back or is it just one-sided. And somehow I drifted a bit into self-pity sometimes.” IG1SCHU2

More than half of the participants stated that the training had affected their *perception and self-reflection*. The awareness of internal and external perceptions was increased (e.g., becoming aware of thoughts, bodily sensations, or details in the surroundings), the reflection of needs deepened, and the participants regained focus and concentration more easily. The meditations in general, especially the body scan, and the training as a whole were seen to have led to these effects.

“Mentally, I’d say you were just a little like tidied up, I don’t know. You just [...] reflected about yourself again, [...] and just perceived yourself more and what you need or don’t need right now or what you want to do now and that helped you a bit, I’d say.” IG2SCHU11

Almost half of the participants reported effects of the training on *mindful eating*. They paid more attention to *what* they ate and *how* because of participating in the course. In addition, enjoyment of food and eating became more important. Some of the participants stated that they had tried mindful

eating at home with their family and that they intended to eat mindfully more frequently in the future. Exercises considered to be particularly beneficial to mindful eating were the mandarin exercise, the Day of Mindfulness, and the course as a whole.

“[...] we were supposed to close our eyes and then we got something in our hands, such a mandarin and we were supposed to eat it consciously, so we unpacked it and didn't know what it was, and then we ate it. [...] Since then, when I eat something [...], I TRY to really pay attention to what I eat. And to really like enjoy it.” IG1SCHU8

For half of the participants, the interviews revealed effects related to *communication and interaction* with others, mostly as a result of their increased (self-)perception. Some stated that they could perceive and regulate their emotions more easily and that this take-away from the course had already had a direct influence on how they argued with parents or siblings for example. Some others mentioned that they had learned to listen more mindfully and that they cared more for what others had to say and were more open to it. Moreover, one person reported that she felt more connected to nature. These effects were mostly related to the course as a whole.

“[...] because now I have learned [...] especially with negative feelings, to just perceive them somehow [...] well it's not that, [...] that I have less negative feelings, but to simply notice them [...] and that helps me to deal with them in a better way. So, it was especially noticeable in the middle of the course that I argued a lot less with my little brother.” IG1SCHU8

“I am definitely more open to other people and I also have the feeling that if you pay attention to it a little bit, then other people will also open up towards you. And that makes it easier to be mindful towards others.” IG2SCHU7

“Um, yeah, after the course I perceived more elements so to speak. Like the wind whistled through my hair or how the Sun came out or single rays of sunshine were on me, I think you/so I felt connected to nature in a very DIFFERENT way.” IG2SCHU6

3.4. Summary of Quantitative and Qualitative Effects

The quantitative analyses revealed significant two-way interactions between the group and measurement point in time for SCB in the area of food as well as for compassion. For the latter, the effect was evoked by a decrease in the control group only. All other measures did not reveal any substantial or significant effects.

The qualitative analyses of 14 semi-structured interviews with randomly selected participants revealed strong effects on pre-stages of SCB and other variables not directly related to SCB. Actual behavioral effects, on the other hand, were minor. Nearly all interviewees reported an improvement of their awareness, their wellbeing, and their ability to reflect on consumption issues. Moreover, about half of the interviewees showed effects on self-perception and -reflection, mindful eating, and social aspects such as interaction and communication with others. Only two participants stated changes in actual behavior.

The quantitative results for all applied measures as well as the qualitative effects for all interview cases are displayed in Tables 1 and 2.

Table 1. Means, standard deviations, and results of the two-way ANOVAs with repeated measures and experimental group as a between-subject factor for all applied measures.

Measure	Group	n	Pre		Post		F (df)	p *	η _p ²
			M	SD	M	SD			
Times of participation	IG	39	–	–	7.8	1.2	–	–	–
Satisfaction with course ¹	IG	39	–	–	5.8	2.6	–	–	–
Weekly medi-tation practice ²	IG	39	–	–	2.7	1.6	–	–	–
SCB									
<i>food</i>	IG	39	2.94	0.77	3.18	0.77	5.13 (1,67)	0.027 *	0.071
	CG	30	3.14	0.93	3.08	0.88			
<i>clothing</i>	IG	39	2.36	1.00	2.80	0.91	0.49 (1,67)	0.484	0.007
	CG	30	2.20	0.97	2.51	0.89			
SC attitudes									
<i>food</i>	IG	38	4.26	0.79	4.09	0.94	0.41 (1,67)	0.625	0.004
	CG	31	4.25	0.82	4.18	0.86			
<i>clothing</i>	IG	38	4.49	1.15	4.56	1.19	0.18 (1,67)	0.894	0.000
	CG	31	4.38	1.10	4.48	1.03			
Material values	IG	38	2.07	0.96	2.27	1.03	0.06 (1,67)	0.811	0.001
	CG	31	2.43	1.30	2.58	1.26			
Compensatory consumption	IG	39	2.06	1.01	2.28	1.26	0.44 (1,68)	0.507	0.006
	CG	31	2.43	1.12	2.51	1.02			
Wellbeing	IG	38	6.03	1.52	6.26	1.35	2.17 (1,64)	0.145	0.033
	CG	28	5.60	2.24	5.20	1.70			
Mindfulness									
<i>MA-internal</i>	IG	39	3.92	1.07	3.81	1.15	0.00 (1,67)	0.966	0.000
	CG	30	4.14	1.25	4.04	1.02			
<i>MA-external</i>	IG	39	3.44	1.37	3.50	1.46	0.56 (1,67)	0.458	0.008
	CG	30	3.14	1.57	3.68	1.39			
<i>MA-acting</i>	IG	39	3.58	0.98	3.29	1.07	0.00 (1,67)	0.983	0.000
	CG	30	3.02	1.72	2.73	1.25			
Mindful eating (ME)									
<i>ME-emotional</i>	IG	38	3.32	1.44	2.94	1.31	0.27 (1,65)	0.608	0.004
	CG	29	3.12	1.47	2.89	1.35			
<i>ME-cognitive</i>	IG	38	1.75	1.20	2.18	0.99	0.03 (1,65)	0.873	0.000
	CG	29	1.98	1.08	2.34	1.36			
Compassion	IG	37	4.53	1.07	4.57	1.08	4.67 (1,64)	0.034 *	0.068
	CG	29	4.34	0.99	4.02	0.86			
Connectedness to nature	IG	39	2.99	1.28	2.81	1.22	2.36 (1,68)	0.129	0.034
	CG	31	3.02	1.27	3.27	1.34			

Note. IG = intervention group. CG = control group. n = number of participants. M = group mean. SD = standard deviation. F(df) = F-values and degrees of freedom. * p-value < 0.05. η_p^2 = effect size/partial eta-squared.

¹ On a scale from 0 ("Could really have done without it") to 10 ("total success, anytime again"). ² Times per week. SCB = sustainable consumption behavior. SC = sustainable consumption. MA-internal = awareness of internal experiences. MA-external = awareness of external experiences. MA-acting = acting with awareness.

Table 2. Summarizing overview of characteristics of interview participants and qualitative effects.

Token	Age	Sex	Meditation Experience	Times of Participation	Satisfaction with Course *	Weekly Meditation Practice **	I. SCB ¹	II. Pre-Stages of SCB ²			III. Further Effects ³		
								Intent.	Aware./Reflect.	WB	Percept./Reflect.	ME	Comm./Interact.
IG1SCHU2	15	Female	Yes	9	8	5			X	X/O	X	X	X
IG1SCHU6	15	Female	Yes	9	4	1			X	X	X	X	X
IG1SCHU8	15	Female	Yes	8	7	3			X/O	X	X	X	X
IG1SCHU9	15	Male	No	8	6	2			X	X	X		
IG2SCHU1	16	Male	No	9	6	3			X	X	X		
IG2SCHU2	16	Female	No	8	4	2		X	X	X		X	
IG2SCHU4	16	Male	Yes	9	8	2				X			
IG2SCHU7	15	Male	Yes	8	4	3		O	O	X	X	X	X
IG2SCHU10	15	Female	Yes	7	2	1			X	X			X
IG2SCHU11	15	Male	No	9	8	1			X	X	X		
IG3SCHU2	15	Female	Yes	9	6	1	X	X	X	X	X		X
IG3SCHU7	15	Male	No	8	3	4				X			X
IG3SCHU12	15	Male	No	8	4	3	X	X	X	X		X	
IG3SCHU14	16	Male	No	8	4	4			X	X	X		

Note. * On a scale from 0 (“Could really have done without it”) to 10 (“total success, anytime again”). ** Times per week. ¹ Effects on sustainable consumption behavior. ² Effects on pre-stages of sustainable consumption behavior. ³ Further effects not directly related to sustainable consumption behavior. Intent. = intention to change behavior. Aware./Reflect. = awareness and reflection. WB = wellbeing. Percept./Reflect. = perception and self-reflection. ME = mindful eating. Comm./Interact. = communication and interaction. X = positive effect. O = potentially counterproductive effect.

4. Discussion

The aim of the present study was to identify the potential effects of a consumption-specific MBI on SC. The intervention was carried out with about 15-year-old adolescents directly at school and a randomized waitlist control design was used. To account for the explorative character of this pilot study, a partly integrated mixed methods model with quantitative and qualitative methods was applied. In sum, no generalizable conclusion can be drawn for the entire sample. Nevertheless, the results point to a number of impacts of the MBI on SC (especially its pre-stages) at an individual level as well as to further case-specific influences of mindfulness training. In what follows, the results will be discussed considering the effects on SCB and its pre-stages, as well as further effects not directly related to SCB.

Regarding SCB, a small quantitative interaction effect was found for the consumption area of food but not for clothing, whereas the qualitative study revealed two single effects, one in each consumption area. Thus, behavioral effects were rather sparse, but can be cautiously interpreted as first indications of a potential influence of the MBI on actual consumption behavior. Taking into account the qualitative findings, both cases with behavioral effects mentioned that the intervention had affected their intention to change their consumption behavior. According to behavioral theories like the “Theory of Planned Behavior”, the formation of such intentions can be seen as an important pre-condition for behavior change [65]. Nevertheless, effects of the MBI on intention were sparse in general. There are several possible explanations for this finding. One should take into consideration that consumption behavior in adolescents is strongly influenced by their social surroundings (families and peers), as well as their available budget. In the present sample, the school had a curriculum oriented towards sustainability and global issues, and the prior level of awareness and pro-environmental behaviors in the students and their families may have already been relatively high. For example, the interviews revealed that many parents already bought organic and Fairtrade products, therefore their children already consumed sustainably to a certain extent, even though not necessarily on purpose. Moreover, buying secondhand clothes or swapping clothes was an already well-established routine among the students, especially among the female participants. This behavior seemed to be motivated by factors like low costs, having fun, and going with the Berlin trend, and not necessarily by sustainability reasons. Nevertheless, these circumstances could be reasons for seeing no need to change their consumption behavior. Moreover, most of the students mentioned that SC was important to them, but that they did not know what to do to bring change forward. Some also said that they did not feel responsible for bringing about changes towards sustainability. Future intervention studies might have to treat people differently according to the pre-behavioral stage of behavior change they are in as it is suggested in environmental and health psychology approaches [66,67].

Despite the sparse effects on intention and behavior, the qualitative findings suggest that the MBI was effective in raising many students’ awareness for SC in general, bringing prior knowledge back into awareness, and giving them impulses to reflect on the topic and their SC behaviors and attitudes. This was contrasted by quantitative null-effects for the measures of SC attitudes, material values, and compensatory consumption. The null-effects could be explained by a ceiling effect in SC attitudes (i.e., the students already rated their SC attitudes high at pre-intervention measurement) and floor effects for material values and compensatory consumption (i.e., students already started low in these measures). At best, the increase in SC-related awareness and reflection in a sample with highly pro-sustainable and non-materialistic values may result in more sustainable consumption behaviors in the future. Nevertheless, the consumption focus of the MBI may also bore or put off students because of their prior levels of SC knowledge or values, which could be either high or low. It remains an open question for which target group a consumption-focused MBI might be more suitable.

Regarding the different course elements, the students did not directly relate the meditations to the effects in SCB or its pre-stages. Instead, especially the jeans journey, which combined mindfulness and ESC, and the in-course discussions were mentioned. This can be seen as an indicator for the appropriateness of the consumption focus of the MBI and that a standard MBSR course would not

have shown the same SC-related effects. Combining mindfulness-based and ESC formats, as well as facilitating SC-related discussions in the protected setting of a mindfulness course where the students can express their feelings and opinions without stress or the pressure to perform, appears to be very promising and should be extended in future intervention studies. The strong qualitative effects found for wellbeing and further effects not directly linked to SCB support this suggestion.

For all interviewed students, the course was a source for wellbeing in terms of increased relaxation, decreased stress, and regained energy. In many cases, this came along with an improved ability to focus and concentrate, which is in line with the results of a meta-analysis on MBI studies at school that found the strongest effects for cognitive performance and stress resilience [38]. Both aspects are important pre-conditions for comprehensive listening and insight in learning settings. Moreover, earlier research shows a positive relationship of wellbeing and SCB [68]. Nevertheless, the null-effect on the wellbeing measure in the quantitative study did not support the findings in the qualitative study. This could be because the applied measure covered different aspects of wellbeing like general life satisfaction, perceived meaningfulness, and emotional aspects. In addition, the students were preparing for their junior high school exams and might have benefited more from the MBI in terms of their cognitive performances and their ability to cope with pressure as reflected in the qualitative findings. One interviewee also mentioned that her wellbeing after the meditation depended on the mood with which she entered the meditation, i.e., a bad mood was even reinforced through meditation sometimes. Even if this was just a single case, it shows that not everyone will benefit from the meditation practice with regard to their emotional wellbeing.

In the qualitative study, almost all participants mentioned effects of the MBI on their perception, self-awareness, and -reflection, which in turn affected their ability to better regulate emotions, as well as their communication and interaction patterns with others. These effects can be interpreted as a potential pathway between mindfulness and the development of cognitive and socio-emotional key competencies as aimed for in ESC [15,17,18]. The qualitative effects were contrasted by quantitative null-effects for the mindful awareness facets, which were similar to the effects found in the adult study of the BiNKA project. Mindfulness scholars are discussing appropriate definitions and measurements of mindfulness and underline the importance of not only using quantitative measures for this highly individual practice and experience [30,40,69]. Moreover, other intervention studies with adolescents have also failed to find significant quantitative effects in general (e.g., Reference [70]), which might not only be due to the wrong “recipe” concerning the interventions as suggested by Johnson et al. [70], but also to the lack of appropriate scales. The small interaction effect found for compassion was only provoked by a decrease in the control group, whereas the intervention group did not rise in compassion. A recent review and meta-analysis on the relationship of meditation and compassion and/or pro-social behavior reveals that the effects of meditation on these variables are very limited due to methodological biases and theoretical problems in this research field [71].

In addition, about half of the interviewees mentioned effects on mindful eating, whereas the quantitative study found no effects on that variable. The quantitative null-effect must be interpreted with caution, since the scale suffered from psychometric problems (see methods) and, analogous to the measurement of mindfulness, sophisticated scales for adolescents are still missing. In general, with regard to SC, finding effects on mindful eating is two-folded. On the one hand, mindful eating might be an effective low-threshold pathway between mindfulness and SCB. On the other hand, most often participants refer to changes in *how* they eat, which does not mean they change *what* they eat, i.e., they perceive more details when eating and enjoy their food more, but do not necessarily eat more sustainably. That mindful eating practices do not necessarily make people eat more sustainably is also shown by the adult data of the BiNKA project [72]. One explanation could be that the practice of mindful eating as well as mindfulness in general might encourage people to live more in the present moment and to accept and enjoy their present situation in life as it is. However, this could also bear the risk of narrowing perspectives and preventing participants from putting things they want to do into practice (e.g., changing their behavior towards more sustainability). People might even show less

pro-social behavior because they are more self-oriented in the here and now as reflected in one single interview case. Future studies should explore this two-folded relationship between mindfulness and SC in greater depth.

The study presented is subject to some limitations. First, an 8-week long MBI is seemingly too short to change well-established behavioral patterns. Moreover, in our study, the originally intended daily meditation practice of 15 min at school or at home could not be realized as planned due to organizational (school) and motivational (students) constraints. Longer and continuous formats to build up and ensure a regular mindfulness practice should be implemented and investigated in future studies. Second, the participants were unaware of the consumption focus and their participation was not self-chosen. Samples that were not as saturated regarding SCB knowledge or target groups, which were actively seeking to change their consumption behavior, might have been affected in a different way if the consumption focus was made explicit already in the process of recruiting. Third, only two specific consumption areas (food and clothing) were investigated. Future research should also cover other consumption areas relevant for adolescents (e.g., electronic entertainment) or design more comprehensive programs (as an example, see the project of “Mindful Climate Action” by Barrett et al. [42]). Fourth, the results of the present study cannot be reliably attributed to the *consumption-focused* MBI having used a waitlist control group design. In future studies, MBIs without a consumption focus, such as a standardized MBSR training or other ESC formats, should be included as active control settings. Fifth, for future research with adolescents, quantitative measures for this target group should be further refined and adapted focusing on shortness. In addition to this, incentives for participation in the study should be considered to motivate the participants, especially if participation at school is mandatory. Lastly, as an exploratory pilot study, our sample was very small and not representative. Studying more diverse target groups with regard to age, type of school, cultural context, etc., might be fruitful to further substantiate the evidence base on the effects of mindfulness on SC among adolescents.

5. Conclusions

The present study aimed at investigating how mindfulness could possibly contribute to SCB in adolescents and ESC at school. Our study revealed the strong effects of the adapted MBI on pre-stages of SCB (awareness and reflection), whereas the effects on the intention to change behavior and actual consumption behavior were minor. Moreover, further effects not directly linked to, but potentially important for, a behavior change towards sustainability were detected (e.g., wellbeing, self-reflection, mindful eating, communication, and interaction). In conclusion, mindfulness seems to bear the potential to influence adolescents’ SCB on an indirect and individual level. However, the inconsistency between qualitative and quantitative results, as well as other methodological drawbacks and limitations of this pilot study, do not allow for drawing generalizable evidence.

Nevertheless, regarding ESC at school, combining mindfulness training with ESC formats appears to be a feasible and fruitful approach to engage adolescents with SC. Teaching ESC formats, discussing consumption-related topics in a mindfulness-based setting, and/or implementing mindfulness meditation into ESC curricula should, thus, be further pursued in educational research on SC. Future practice and research should seek to extend the time constraints of an eight-week course as used in this study, and explore how longer and more regular mindfulness practice in schools can fuel SCB. Moreover, consumption areas other than food and clothing, as well as different target groups, should be addressed to holistically assess the potential of mindfulness to build bridges towards a more sustainable future.

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Appendix A

Table A1. Correlations of pre-mean values of all measures.

	SCB-f	SCB-c	SCA-f	SCA-c	MV	CC	WB	MA-int	MA-ext	MA-act	ME-emo	ME-cog	CP	CN
SCB-f	1	0.703 **	0.544 **	0.520 **	−0.507 **	−0.248 *	−0.027	0.185	0.482 **	−0.026	0.031	0.107	0.265 *	0.354 **
SCB-c		1	0.504 **	0.617 **	−0.562 **	−0.209	−0.079	0.080	0.536 **	−0.245 *	0.003	0.069	0.371 **	0.490 **
SCA-f			1	0.685 **	−0.416 **	−0.006	−0.058	0.136	0.418 **	−0.034	−0.106	0.128	0.244 *	0.319 **
SCA-c				1	−0.449 **	0.018	−0.107	0.091	0.567 **	−0.153	−0.065	0.063	0.222	0.513 **
MV					1	0.623 **	0.063	−0.075	−0.322 **	−0.029	0.004	0.036	−0.182	−0.284 *
CC						1	0.018	−0.002	−0.135	−0.120	0.018	0.083	−0.147	−0.069
WB							1	0.178	−0.073	−0.011	−0.070	0.164	−0.135	−0.257 *
MA-int								1	0.274 *	−0.192	−0.046	0.128	0.268 *	−0.003
MA-ext									1	−0.214	−0.258 *	0.234	0.418 **	0.608 **
MA-act										1	0.109	−0.268 *	−0.384 **	−0.262 *
ME-emo											1	−0.054	−0.122	−0.207
ME-cog												1	0.153	0.206
CP													1	0.026
CN														1

Note. SCB = sustainable consumption behavior; SCA = sustainable consumption attitudes; f = food; c = clothing; MV = material values; CC = compensatory consumption; WB = wellbeing; MA-Int = mindfulness—awareness of internal experiences; MA-Ext = mindfulness—awareness of external experiences; MA-Act = mindfulness—acting with awareness. ME-emo = mindful eating—emotional; ME-cog = mindful eating—cognitive; CP = compassion; CN = connectedness to nature. ** p -value < 0.001. * p -value < 0.05.

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