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"Why (Should) I Do Something for the Environment?" Profiles of Flemish Adolescents' Motivation Toward the Environment

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Abstract: The Motivation Toward the Environment Scale (MTES), developed in Canada, measures people's self-determined motivation for doing something for the environment. Answering the call by its original developers, this study further validated the MTES within a sample of 779 Dutch-speaking senior secondary school students, aged 17 to 19, in the north of Belgium. More specifically, reliability and construct validity of a Dutch translation of the MTES were verified. To this measure, confirmatory factor analysis was used, and the hypothesized simplex structure was tested through correlation analyses. Results confirmed the reliability of the MTES and a five-scale version of the MTES, excluding identified motivation, is introduced. This variable-centered approach was complemented by the adoption of a person-centered approach for identifying MTES profiles. Using cluster analysis, four meaningful MTES profiles emerged, with amotivation scoring medium to high in all but one. Theoretical implications of the findings and suggestions for interventions and further research are discussed.

Keywords: MTES; identified motivation; amotivation; self-determination theory; MTES profiles

1. Introduction

Human activity is universally recognized as being one of the major factors that contribute to climate change. Internationally, political concern and a willingness for changing human activities to stem climate change is increasing [1]. Consequently, the importance of scientific research on the causation of environmental behavior of individual citizens can hardly be overestimated. Going beyond merely describing observed behavior, academic fields such as environmental psychology and environmental education have focused on what factors influence (intended) environmental behavior.

Hungerford and Volk [2] reviewed research into how environmental behavior is shaped. They found no evidence for the assumption that more knowledge would alter attitudes or grow awareness of environmental problems, which would then motivate people to change their behavior. They concluded that this traditional simple linear model did not capture the complexity of behavioral change. They found that empowerment and ownership are critical to responsible behavior. Empowerment makes individuals feel capable of making a difference. People "own" environmental issues when they find them extremely important. This resonates with research into goals and motivation.

According to Sheldon and Elliot, the kinds of goals that people select affect the extent to which they are capable of maintaining efforts to attain them. The more people feel ownership when pursuing a goal reflecting their interests and values (i.e., in concordance with their self), the more they are likely

to put sustained effort into achieving it [3]. Deci and Ryan further explored how different regulatory processes that underlie the pursuit of such goals, relate to the quality of behavior. This makes their Self-Determination Theory (SDT) well-suited to explain (lack of) sustained effort [4]. Before moving on to motivation toward the environment, we provide a brief review of SDT.

Self-Determination Theory

Deci and Ryan distinguish intrinsic and extrinsic goals. The former relates to basic need satisfaction and is perceived as more important to the individual per se, whereas the latter is associated with getting approval from others or external signs of worth (e.g., wealth, fame). Attainment of intrinsic goals is more strongly related to well-being than extrinsic aspirations, since these are less linked to basic need satisfaction [4]. SDT further posits that goal-directed activities can differ in the level to which they are (not) self-determined. Two types of motivation can thus be ordered onto a continuum from autonomous to controlled, whereas amotivation is a third type that stands somewhat apart as it expresses a lack of motivation, be it self-determined or not [5]. As Figure 1 shows, amotivation lacks any kind of motivation, extrinsic or intrinsic. Amotivated individuals neither feel competent nor in control. In fact, there is no regulation at all and they feel helpless. Hungerford and Volk [2] also found that the locus of control is an important variable involved in environmentally responsible behavior. When this locus of control is internal, the individual expects to be successful. External locus of control means that people expect they will not be able to make a difference [2]. Extrinsic motivation, which is the least autonomous type of motivation, can vary in the degree to which it is autonomous [4,5]. In its most extreme form, people behave in a certain way in order to avoid a sanction or to get a reward (external regulation). If these externally sanctioned values become partially internalized, the individual engages in activities wanting to feel proud or avoiding feelings of guilt (introjected regulation). People may also find the result worthwhile (identified regulation), without engaging in activities for the pleasure of that behavior in itself [4]. When values have become an integrated part of the self, the motivation is still extrinsic, since people triggered by integrated regulation do not act for the pleasure this provides in itself. Finally, intrinsic motivation occurs when individuals engage in activities purely out of interest. They feel competent and find pleasure in the activity per se. In fact, administering external rewards or threats can be deleterious to intrinsic motivation [5].

According to Vansteenkiste, Lens, and Deci, intrinsic and identified motivation together can compose autonomous motivation, since people act out of free will. Similarly, introjected and external motivations make up controlled motivation [6]. Introjected motivation is controlled from within the self (internally), through feelings of guilt or pride. Conversely, with external motivation, control is exercised through punishment and reward systems external to the individual [7,8]. In addition to autonomy and competence, relatedness also affects intrinsic motivation positively, albeit less powerfully. When people feel connected to others, loved and cared for, and allowed to love and care for others, they are more likely to maintain intrinsically motivated behaviors [4].

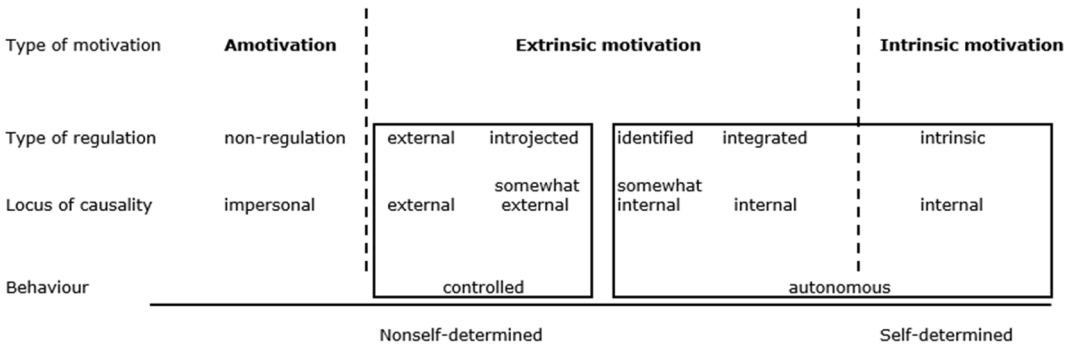

Figure 1. The self-determination continuum, based on Deci and Ryan [4,5], Ryan and Deci [8], and Vansteenkiste, Lens, and Deci [6].

Almost 20 years ago, Deci and Ryan's self-determination theory or SDT [5] was applied to motivation for environmental behavior [9]. One of the perspectives was to develop and validate a questionnaire that also resulted in a measuring instrument, the Motivation Toward the Environment Scale (MTES). Pelletier et al. [9] reported on four studies that contributed to the construction of the MTES. They asked why respondents were doing things for the environment. Samples were taken from populations of randomly selected citizens in the Cornwall area of the province of Ontario, Canada (study 2), and university students (studies 1, 3, and 4). Convergent and discriminant validity of the MTES was confirmed by Villacorta and colleagues [10] within a population of Canadian college students of a university in a multicultural and multilingual city. They called for a validation within a population of students in a secondary education setting in order to further gain insight into the validity of the MTES in a population other than university students.

SDT offers insight into what factors may influence the quality of motivation [4]. A higher quality of motivation might also lead to a better quality of (sustained) pro-environmental behavior. According to Chawla [11], education becomes an important source of environmental commitment in the junior high through university years. She also found that the influence of family and experience of natural areas is associated more with childhood (i.e., up to 18 years of age). Starting the university years, friends become more important sources [11]. Therefore, research into motivation toward the environment is required and especially relevant in adolescents as they will grow up to be the citizens and decision-makers of the future. Since it is these individuals' motivation that will guide their behavior and the decisions they make concerning the environment, the focus of attention is drawn both toward a personal and a collective level.

To our knowledge, research in this field has uniquely made use of a variable-centered approach. Nevertheless, a person-centered approach may offer more possibilities for diagnosis of and distinction between motivational profiles, revealing the interplay of different motives within an individual. Consequently, the combination of both approaches may yield complementary information [7]. Responding to the call for research within secondary school students outside Canada [10], and the suggestion to add a person-centered approach [7], this study will offer a combination of variable-centered and person-centered approaches to motivation toward the environment within secondary school students in Flanders, the Dutch-speaking Community of Belgium.

Canada and Flanders do not only differ geographically, with Flanders covering only 0.1% in surface (i.e., 13,522 km^2) compared to Canada (9,984,670 km^2). Both also show differences in the degree to which the environment is focused on at a societal level: where the Canadian administration protected 8.4% of its total surface in 2003 [12], Flanders only arrived at a joint effort of 3.4% between government and registered private initiatives in 2011 [13].

1.1. This Study

Answering Villacorta and colleagues' [10] call for a further validation of the MTES in a population other than college students in Canada, we aim to find out whether the MTES can reliably and validly be applied within secondary school students in Flanders. Furthermore, we will seek evidence for MTES profiles, using a person-centered approach as suggested by Vansteenkiste et al. [7]. Both aims may forward theoretic insight, making the following questions central in this study:

Research question 1: Is the MTES a reliable and valid scale for measuring the different types of motivation (SDT) toward the environment within senior secondary students in Flanders?

Research question 2: Which MTES profiles toward the environment can be distinguished within senior secondary students in Flanders?

1.2. Literature Review

Since the different types of regulation in SDT lie along a continuum of self-determination, subscales are expected to form a simplex pattern in which scales that are adjacent show a stronger positive correlation than scales that are theoretically more distant, eventually correlating

negatively. The three types of motivation, i.e., intrinsic, extrinsic, and amotivation, have been widely confirmed within various domains, such as academic behavior [14,15], and motivation toward the environment [9,16,17]. Regardless of some breaches that were found in the simplex structure, the concepts of SDT have produced measuring scales. These scales, tapping into motivation for behavior, were deemed valid and reliable in various domains. One of these is environmental behavior.

1.2.1. Motivation Toward the Environment

Reviewing research into environmental behavior, Pelletier and colleagues concluded that correlates with environmental behavior such as attitudes and knowledge, had not succeeded in explaining why people failed to act pro-environmentally. Consequently, they proposed a motivational approach and more specifically suggested applying SDT to the environmental domain. The core question was why people do things for the environment. Their research included development of the MTES, an instrument for assessing people's underlying motivation for environmental behavior [9]. The MTES was further validated by Villacorta et al. [10], and more recently also by Boeve-de Pauw and Van Petegem [16].

Since SDT describes motivational types that show some presence of motivation in more detail, with five types ranging from completely autonomous to completely controlled, whereas lack of motivation is represented only in one type, i.e., amotivation, the latter merits more consideration. Moreover, Pelletier et al. [17] noted that although people expressed stronger concern for the environment, they did not show more frequent, nor more difficult pro-environmental behavior. Consequently, they emphasized the need to look into individuals' reasons for not engaging in pro-environmental behaviors. This led to the development of an instrument tapping into amotivation toward the environment, i.e., the Amotivation Toward the Environment Scale (AMTES). They further defined amotivation toward the environment, suggesting four kinds of beliefs might be underlying amotivation: global helplessness, strategy, capacity, and effort beliefs. When people are intimidated by scale and severity of the environmental situation, they may not act pro-environmentally because of global helplessness beliefs. They fail to see how their contribution could have a positive effect on such a large-scale problem. Individuals who expect certain strategies to be ineffective could be amotivated because of these strategy beliefs. They expect that their behavior would not produce the desired outcome. People doubting their abilities to perform certain pro-environmental behaviors, would be amotivated because of negative capacity beliefs. Consequently, even if a person believes a certain course of action to be effective, they may still be doubtful that they themselves are capable of producing the required behaviors. Finally, effort beliefs might also induce inactivity. Individuals may feel up to the activities and believe them eventually to produce positive results. However, they think they are incapable of producing and sustaining the required effort to engage in certain behaviors and integrating these into their lifestyle. Generally, Pelletier et al. [17] found evidence for a preliminary instrument for tapping into people's amotivation. In order to determine how people can be supported so they can overcome their amotivation toward the environment, insight into why people fail to do something for the environment is essential. This could inform environmental education and awareness campaigns.

The conceptualizations of both motivation and amotivation toward the environment were achieved using a variable-centered approach [9,17]. Such an approach focuses on the effects of motivational dimensions on people's behavior and performance [7]. Still, since individuals may show different types of motivation at the same time, a person-centered approach would enable one to categorize them in groups with members sharing a similar motivation profile. The insight gained from such research might offer complementary information and enable change agents to design motivational interventions to suit each particular profile [7].

1.2.2. Motives and Profiling

Research into motivation is interested in both the various types of regulation and how these may be interrelated within individuals. Consequently, two approaches are possible, i.e., a variable-oriented

and a person-oriented approach. Neither approach is better than the other, as they yield complementary information [18]. Whereas the variable-oriented approach focuses on separate variables about individuals on average, the person-oriented approach allows one to address inter-individual as well as intra-individual differences [19]. Vansteenkiste et al. [7] applied this approach for studying motivation profiles for learning within high school and college students. Based on scores for autonomous and controlled motivations as described in SDT, they found four motivation profiles: a high quality (high autonomous, low controlled), a low quality (low autonomous, high controlled), a high quantity (high scores on both), and a low quantity profile (low scores on both). They confirmed the predicted most optimal learning patterns of the high quality group in comparison to the other three. In contrast to Vansteenkiste and colleagues [7], Ratelle et al. [20] also included amotivation when studying motivation profiles for learning within high school students. They found evidence for three motivation profiles. The first consisted of students scoring high on controlled and amotivation, but low on autonomous motivation. A second category showed high controlled and autonomous motivation and low amotivation. Finally, a third profile consisted of moderate levels of autonomous and controlled motivation, but low amotivation.

2. Methods

2.1. Participants and Procedure

Participants in the current study were 779 students in their last year of secondary school, who came from 36 different schools across Flanders. In Belgium, education is the responsibility of the Flemish, French, and German-speaking Communities. Since the aim of this study was to verify reliability and validity of a Dutch version of the MTES, we selected participants in the Dutch-speaking provinces in the north of Belgium (Flanders). Of these students 563 (72.3%) were male, 203 (26.0%) female, and 13 (1.7%) did not disclose their gender. Convenience sampling provided the data for the current study. Data were gathered in 2011 within a context of research on students' motives for their academic orientation in Science, Technology, Engineering, and Mathematics, i.e., STEM-oriented courses. Consequently, the MTES items were added at the end of the questionnaire, which consisted of 114 questions. This may account for a high percentage of missing cases (26%). In Flanders, more male than female students opt for STEM-courses [21]. This overrepresentation of male students was also reflected in our sample's gender distribution.

Communication with schools occurred solely through one person per school. This person was responsible for administering the questionnaires, that were filled mostly online in a computer room within a class context. Instructions for correct administration included limiting help to technical assistance, since no further explanation concerning content of the questions was allowed. In the questionnaire on motives for academic orientation, the 24 questions of the MTES were the last items, originally (in 2011) added with the intention to explore some reliability and validity questions concerning the MTES. Schools were asked to aim for 25 students or one complete class. Students were guaranteed anonymity.

2.2. Measures

The MTES [9] consists of 24 items measuring the six types of motivation distinguished in the SDT [4,5]. There are four items per motivation type. Participants rate the degree to which they agree with each item on a seven-point Likert scale (1 = "does not correspond at all" to 7 = "corresponds exactly"). All items are possible answers to the question "Why are you doing things for the environment?", tapping into intrinsic motivation, integrated, identified, introjected, external regulation, and amotivation. Since participants were students in Dutch-speaking schools, a Dutch translation of the MTES was administered. First, two researchers translated the MTES into Dutch independently. Then, consensus was sought between them. Finally, the Dutch version was translated into English again, and this text was compared to the original English MTES. This procedure was followed for

reasons of content validity in order to ensure there were no discrepancies between the original version and the back translation [22]. Table 1 shows the subscales and example items.

Table 1. MTES subscales with example items answering the question "Why are you doing things for the environment?" [9].

Subscales Motivation Toward the Environment	Items	Example Items in English
Intrinsic	4	For the pleasure I experience when I find new ways to improve the quality of the environment.
Integrated	4	Because being environmentally conscious has become a fundamental part of who I am.
Identified	4	Because I think it's a good idea to do something about the environment.
Introjected	4	Because I would feel bad if I didn't do anything.
Externally regulated	4	To avoid being criticized.
Amotivation	4	I can't see what's in it for me.

2.3. Analyses

All analyses were performed using the statistical software package R version 3.2.2. Missing data were looked into in search of possible reasons for not answering some or any of the MTES items. Then, preliminary analyses were done to assess departures from basic assumptions of univariate normality. Values of skewness and kurtosis were examined for all items of the MTES. We also provide descriptive statistics such as mean values and standard deviations per motivation type and per item.

The instrument used to measure students' motivation toward the environment was a Dutch translation. Hence, a validity check was deemed necessary [22]. In order to answer the first research question internal consistency of the six subscales was examined by calculating Cronbach's alpha. Consequently, a confirmatory factor analysis (CFA) was performed to assess construct validity of the MTES. A simplex pattern was verified using standardized scores of correlations on a motivation type level. We verified how models could be improved using modification indices (MI). When the largest MI exceeded value 100 and the suggested alteration to the model could be justified theoretically, the model was modified [23]. To evaluate the model fit, multiple fit indices were used with minimum values around .95 for the Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI). For Root Mean Square Error of Approximation (RMSEA), threshold values lower than 0.05 were considered a close fit, and values below 0.08 were deemed a reasonable fit [24]. In addition, the lowest values of Akaike's Information Criteria (AIC) and Bayesian Information Criteria (BIC) were taken into account when comparing two models.

For answering the second research question, we performed a hierarchical cluster analyses to establish the optimal number of clusters. We first distinguished and removed univariate outliers, i.e., values more than three standard deviations below or above the mean, and multivariate outliers, i.e., individuals with high Mahalanobis distance values. Furthermore, only complete cases were used for the hierarchical clustering analyses (n = 550). Starting from a dissimilarity matrix based on the calculation of Euclidean distances, we proceeded with assessing linkage using Ward's agglomeration method. The latter is a holistic method used in order to group cases into clusters with minimal within-group variation. Examination of the dendrogram further guided evaluation of optimal number of clusters at several stages of clustering (heights). We also considered the distributions of cases per cluster for each of these cluster solutions to establish how evenly cases were distributed over the clusters. The thus retained cluster centers were then used as non-random starting points in an iterative, non-hierarchical k-means clustering procedure to further fine-tune the preliminary cluster solution in order to define each cluster. This clustering method randomly assigned cases to clusters, reassigning

them to the nearest cluster center in multiple runs until clusters showed optimal within-group homogeneity and between-group heterogeneity [25,26]. Additionally, the optimal number of clusters to be retained was based on a priori theorizing, parsimony, a pseudo screeplot plotting the within-group sum of squares for various numbers of clusters, and the explanatory power of the cluster solution [27]. Explanatory power per cluster was deemed acceptable when the explained variance of the constituting variables reached a 50% threshold value [28]. Finally, analysis of variance with post-hoc tests (ANOVA, post-hoc bonferroni) allowed us to verify if clusters within a certain solution differed significantly from each other. Thus, we aimed to arrive at a cluster solution in which students within a cluster were most alike, while clusters were on average most different from one another on the variables of interest, i.e., various types of motivation according to SDT [4].

3. Results

779 students were asked to fill the questionnaire, that consisted of closed questions only. MTES items were scored on a 7-point Likert-scale. Unfortunately, only 578 fully filled questionnaires were returned. Some technical problems in the schools may have made it impossible for groups to finish the (online) questionnaire. The fact that entire groups returned incomplete answers seems to point in that direction. Some schools also had an extremely multi-lingual population. Language problems have probably made it unfeasible for some students to finish within the time limits. We also noticed a gradual increase in missing items towards the end of the questionnaire. This could be an indication of mental fatigue, especially for the students who indicated they did not speak Dutch at home. One item (MTES10) showed a higher number of missing cases (148 as compared to 131 to 140, gradually increasing towards the end of the questionnaire). In CFA analysis (see Section 3.1.3) this item also emerged as problematic.

3.1. MTES Reliability and Validity

In order to answer our first research question, we verified the reliability and validity of a Dutch version of the MTES within senior secondary students in Flanders. Within a 95% confidence interval, the assumption of normality was deemed acceptable for all 24 items.

3.1.1. Reliability and Descriptives

Table A1, in the Appendix A, provides a summary of means, standard deviations, and Cronbach's alphas. Items were possible answers to the question: "Why are you doing things for the environment?" Respondents were asked to score their (dis)agreement with each answer on a 7-point Likert scale ranging from "does not correspond at all" to "corresponds exactly". The six subscales represented the types of motivation as described in the SDT [4]. Sumscores of items MTES1 to MTES4 provided the overall scores for intrinsic motivation, items MTES5 to MTES8 for integrated motivation, MTES9 to MTES12 for identified motivation, MTES13 to MTES16 for introjected motivation, MTES17 to MTES20 produced the sumscore for external regulation, and items MTES21 to MTES24 did for amotivation. All six subscales showed high reliability, with alphas ranging from 0.87 to 0.93. This means that the items that tapped into these types of motivation showed strong internal consistency between answers. Highest positive answers were given for amotivation (M = 4.63, sd = 1.41). Students indicated strongest agreement with the following statements: "I wonder why I'm doing anything about the environment, since the situation isn't improving" (MTES21); "I feel that doing something for the environment is a waste of time" (MTES22); "I can't see how my efforts to be environmentally friendly are helping the environment" (MTES23); and "I can't see what's in it for me" (MTES24). Respondents agreed least with answers indicating external regulation (M = 3.09, sd = 1.43). Statements in this type of motivation were: "Because other people would be mad if I didn't do anything about the environment" (MTES17); "For the recognition I get for it from others" (MTES18); "Because my friends insist that I do" (MTES19); and "To avoid being criticized". The second lowest score was observed with integrated motivation (M = 3.71, sd = 1.44), where "Because taking care of the environment is an integral part of my life"

(MTES5) and "Because being environmentally conscious has become a fundamental part of who I am" (MTES8) both scored lowest. Looking more closely at identified motivation, item MTES10 ("Because it is the way I have chosen to contribute to the environment") showed a much lower score (M = 3.92, sd = 1.54) than the other three answers (MTES 9: "Because it is a sensible thing to do something for the environment"; MTES11: "Because it is a reasonable thing to do something for the environment"; and MTES12: "Because I think it is a good idea to do something about the environment"). With the exception of amotivation (α = 0.87), identified regulation showed the lowest reliability (α = 0.89). We also noted that individual respondents' answers differed greatly from each other, with standard deviations for each item and subscale all around or exceeding 1.4, ranging from 1.39 for identified motivation to 1.50 for introjected motivation.

3.1.2. Validity: Covariances and Simplex Pattern

As shown in Table 2, when observing covariances between the latent factors in the CFA, the simplex pattern was largely confirmed, except for covariances of intrinsic motivation with integrated (0.80; p = 0.00) and identified motivation (0.85; p = 0.00). With exception of the negative covariance between latent factors identified motivation and amotivation (−0.08; p = 0.085), all covariances and Pearson's correlations were significant ($p < 0.001$).

Table 2. Pearson's correlations between MTES subscales (above diagonal), and covariances between all six MTES's latent factors in the CFA (standardized scores).

MTES	Intrinsic	Integrated	Identified	Introjected	External	Amotivation
intrinsic	–	0.76 ***	0.75 ***	0.72 ***	0.41 ***	−0.18 ***
integrated	0.80 ***	–	0.68 ***	0.70 ***	0.58 ***	−0.28 ***
identified	0.85 ***	0.76 ***	–	0.72 ***	0.31 ***	−0.09 ***
introjected	0.77 ***	0.75 ***	0.80 ***	–	0.48 ***	−0.21 ***
external	0.42 ***	0.62 ***	0.32 ***	0.46 ***	–	−0.61 ***
amotivation	−0.15 ***	−0.28 ***	−0.08	−0.18 ***	−0.65 ***	–

*** $p < 0.001$.

3.1.3. Validity: Confirmatory Factor Analyses (CFA)

Confirmatory factor analyses were performed for several models. We looked at modification indices to determine if the original 24-item model of the MTES could be improved. In the course of examining various models, modification indices repeatedly indicated item MTES10 ("Because it is a way I have chosen to contribute to the environment") was problematic. Because identified motivation also broke up the simplex pattern, we were especially interested in a five-factor model without identified motivation. As shown in Table 3, comparison of fit indices also pointed at a five-factor solution that included intrinsic, integrated, introjected, externally regulated, and amotivation. This model (see Figure 2) consisted of twenty items, equally distributed over five subscales (i.e., intrinsic, integrated, introjected, externally regulated, and amotivation). Except for this model, all models showed disturbances in the simplex pattern with identified motivation breaking up the pattern.

Table 3. Summary of model fit indices of various factor solutions in the confirmatory factor analysis.

Model	CFI	TLI	RMSEA	AIC	BIC
1 factor (all items, except amotivation's)	0.692	0.656	0.188	34,689.960	34,862.647
2 factors (autonomous and controlled, excl. amotivation)	0.744	0.712	0.172	34,135.489	34,312.493
3 factors (autonomous, controlled, and amotivation)	0.745	0.717	0.152	40,053.977	40,272.468
4 factors (= excl. identified and amotivation)	0.958	0.948	0.081	26,874.201	27,039.865
5 factors (= excl. amotivation)	0.933	0.920	0.090	32,093.479	32,309.337
5 factors (= excl. identified)	0.954	0.945	0.072	33,032.563	33,248.781

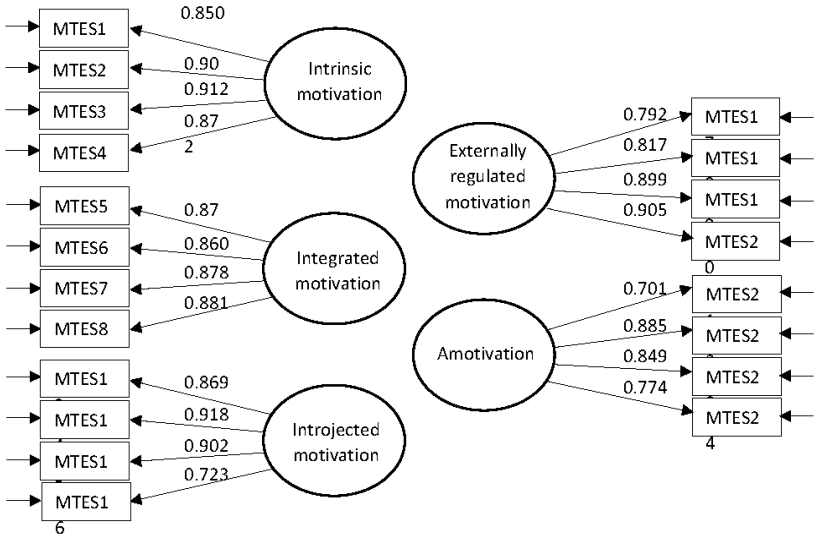

Figure 2. Confirmatory factor analysis of a model excluding identified motivation, with standardized factor loadings.

3.2. MTES Profiles

For answering our second research question, sumscores were calculated for amotivation, intrinsic motivation, integrated, introjected, and external regulation. No univariate outliers were found, but eight multivariate outliers were removed. Criteria determining the optimal number of clusters were:

- the similarity of cases within a specific cluster (i.e., homogeneity within groups),
- discriminative value between clusters,
- parsimony,
- explanatory power of cluster solutions, and
- a priori theorizing.

First, a hierarchical cluster analysis was performed in order to assess possible numbers of clusters at various stages of aggregation. These suggested a 7-, 6-, 4-, 3-, and 2-cluster solution. We further examined solutions with two to seven clusters. We then proceeded to assess homogeneity within clusters for various cluster solutions to determine what cluster solution showed optimal similarity within groups. In addition, parsimony was taken into account. A pseudo screeplot (Figure 3) indicated a clear drop in reduced within-groups sum of squares between a five- and a six-cluster solution, which indicated that adding more than five clusters would not result in increased homogeneity within the groups. In sum, hierarchical cluster analysis pointed towards a three-, four-, or five-cluster solution.

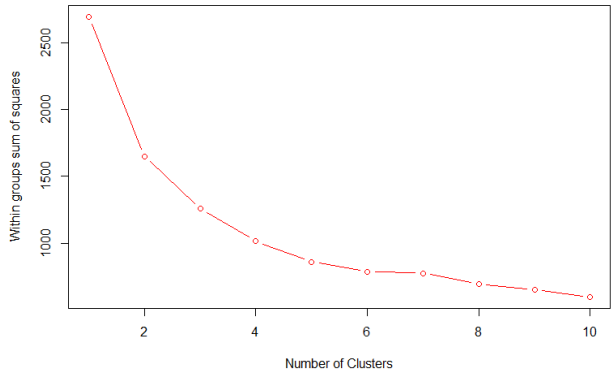

Figure 3. Pseudo screeplot showing within groups sum of squares for 1 to 10 clusters.

In order to further determine an optimal number of clusters, we performed a k-means cluster analysis. We also examined the discriminant value between clusters and explanatory power for cluster solutions ranging from seven to two clusters, bearing in mind that solutions with five clusters would probably be the maximal number for reasons of parsimony. Post-hoc tests indicated that only in a two- and a four-cluster solution, all cluster pairs differed significantly.

Explanatory power was then assessed by calculating explained variance per MTES subscale. Explained variance ranged from 74.2% (introjected regulation) in a seven-cluster solution to 12.6% (amotivation) in a solution with two clusters. With the exception of a two- and a three-cluster solution, all solutions' clusters explained at least 50% of variance of the motivational subscales, which was the threshold value. Consequently, four, five, six, and seven clusters all showed sufficient explanatory power.

Reviewing the criteria set to determine the optimal number of clusters, only a four-cluster solution showed positive results on all criteria. This solution had shown optimal within-group homogeneity with all four clusters also differing significantly, explaining between 55.4% (amotivation) and 65.3% (intrinsic motivation) of variance in motivation types.

Moreover, it was also considered parsimonious, since it was the most economical solution meeting the criteria of within-cluster similarity, between-cluster discriminant value, and explanatory power. As can be seen in Table 4, the four-cluster solution revealed significant results with a first cluster containing 24% of all cases (n = 132; 24.1% of male; 23.3% of female) scoring low on all motivation types, except amotivation. The second cluster represented 49% of students (n = 268; 52.8% of male; 38.7% of female) with moderate scores on all five MTES subscales. Containing 18% of cases (n = 99; 12.7% of male; 31.3% of female), cluster three showed high scores on all subscales except externally regulated motivation. Finally, cluster four was the smallest group, including 9% of students (n = 51; 10.4% of male; 6.7% of female). This group scored high on all motivation types except amotivation. Similar proportions of both genders were found in the unmotivated group, whereas a larger proportion of female respondents (31.3%) were members of the inconsistently motivated group as compared to the proportion of male respondents (12.7%). The consistently motivated group was the smallest for both genders, albeit proportionally slightly more populated by men (10.4%) than women (6.7%). Figure 4 visualizes a four-cluster solution.

Table 4. Number of cases per cluster (n), means, and standard deviations per type of motivation (sumscores) per cluster for a four-cluster solution.

		Motivation									
		Intrinsic		**Integrated**		**Introjected**		**Externally Regulated**		**Amotivation**	
	n	**Means**	***SD***	**Means**	***SD***	**Means**	***SD***	**Means**	***SD***	**Means**	***SD***
Cluster 1	132	8.66	4.13	7.75	3.47	8.10	4.02	6.79	3.11	21.71	5.37
Cluster 2	268	15.80	2.99	15.49	2.87	15.90	2.73	14.65	3.39	16.45	2.86
Cluster 3	99	20.92	3.77	19.35	4.27	20.64	4.91	8.69	4.28	24.97	2.66
Cluster 4	51	22.61	3.61	22.45	3.47	22.39	3.55	21.55	3.58	10.53	4.07
F-value		266.98		299.85		254.49		323.17		278.92	
df		3		3		3		3		3	
p (< 0.05)		0.000		0.000		0.000		0.000		0.000	

Taking into account all criteria, our findings pointed to four clusters being an optimal solution. One group, which we call "consistently motivated", showed high scores on all types of motivation except for amotivation. A second profile was found with moderate scores on all subscales, i.e., the group of "moderately motivated". Cluster three, the "inconsistently motivated", scored high on all types of motivation except for externally regulated motivation. Finally, a fourth group consisted of students showing low scores on all motivation types except amotivation. We called them "the unmotivated".

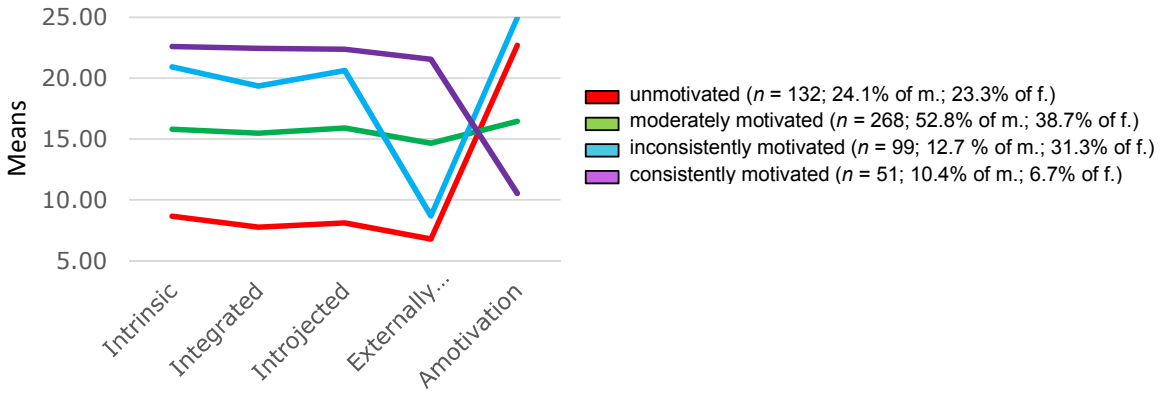

Figure 4. Graphic representation of motivational mean scores per cluster for a four-cluster solution.

4. Discussion

As suggested by Villacorta et al. [10], the present study focused on a further validation of the MTES [9] within a population of students in a secondary education setting outside Canada. We assessed if the Dutch version of the MTES could be considered a reliable and valid instrument for tapping into the motivation of Flemish senior secondary school students in Belgium, Europe. This population is of particular interest, since this is the stage when people are on the verge of making important decisions for themselves and becoming the new decision-makers in society. Additionally, we sought to answer the question whether MTES profiles could be distinguished, expecting that a person-oriented approach would yield complementary information [7].

4.1. Reliability and Validity of the MTES

In line with Pelletier and colleagues [9] and Villacorta et al. [10], our data suggested that all subscales of the MTES reliably tap into the different types of motivation. Still, differences in strength of the different motivation types showed when comparing Canadian to Flemish populations. With the exception of integrated motivation in Villacorta and colleagues' [10], both Canadian studies [9,10] generally found higher intrinsic, integrated, and identified motivation than did Boeve-de Pauw and Van Petegem [16] in Flanders. Since our results were very much in line with the latter's, this may point to differences between Canada and Flanders. Furthermore, our Flemish population scored considerably higher on external regulation and amotivation than was reported in both Canadian studies. Our results indicated higher amotivation than did Boeve-de Pauw and Van Petegem's, which may be due to an overrepresentation of male respondents in the current study. Still, bearing in mind that Boeve-de Pauw and Van Petegem [16] only found small to medium differences in amotivation between male and female respondents, this may only partially explain this difference.

When looking at construct validity, measurement of identified motivation seemed problematic, since it did not seem to distinguish clearly from integrated motivation. This is in line with findings by several previous studies in academic motivation (e.g., [15,20,29,30]). In several of these domains, the simplex pattern was found to be flawed, mostly in the correlations between integrated, identified, and introjected regulations (e.g., [9,15,16,20,29–31]). Several hypotheses were put forward in explanation. In their study on motivation for learning a second language, Noels, Pelletier, and Vallerand [32], discussed earlier findings of their team on integrated and identified motivation. When first constructing the French version of the Academic Motivation Scale, Vallerand and colleagues [33] had found no clear distinction between identified and integrated regulation. This led them to hypothesize that their population was probably too young to have achieved a sense of integration regarding school activities. Based on these findings, Noels et al. [32] decided not to include integrated motivation in their study on motivation for learning a second language.

Stover et al. [30] saw identified regulation correlating higher with extrinsic than with intrinsic motivation in a sample of Argentine adolescents. They sought an explanation referring to Cokley et al. [31]. When validating the Academic Motivation Scale, Cokley and his colleagues found higher correlations between intrinsic and introjected regulation, than between intrinsic and identified motivations within a United States student sample [29]. They argued that introjected regulation might be more autonomous than SDT would suggest. Interestingly, Ratelle et al. [20] found these breaches in the simplex pattern within high school, but not within college students.

Whereas researchers previously sought to explain this discrepancy by pointing at the age of their population [33], or suggested redefining introjected regulation as more autonomous than the original SDT would expect [29], we suggest a deeper examination of identified regulation in itself. A hypothesis worth verifying is that the explanation may lie in the time delay this instrumental aspect might imply. Differences in time delay between the behavior and the final goal this behavior seeks to attain indirectly, might make a difference in the strength, the level of energy, and the determination needed to maintain this (instrumental) type of motivation. Identified regulation might differ from all other types of motivation in this. Findings by Villacorta and colleagues [10], who studied motivation for learning in high school and college students, showed differences in the simplex pattern. Identified motivation broke up the pattern in a sample of high school students, but not in that of college students. This may possibly support our hypothesis, since the temporal distance between behavior and outcomes differed between these two populations. If students engage in learning activities for getting a diploma in order to find a better-paid job, college students are facing a smaller temporal distance than high school students. This might explain the unstable position of identified regulation on the continuum from more autonomous to more controlled behavior. Comparison with all other types of motivation could perhaps support this. With intrinsic motivation, the effect is immediate, as the pleasure of the behavior itself is the goal. Integrated motivation, too, shows a rather simultaneous occurrence of behavior and satisfaction of congruence with the self. With introjected motivation, the behavior leads to feelings of guilt or embarrassment quite quickly. As for external motivation, punishments or rewards are expected to follow without much delay. Identified motivation seems different in this respect. As the behavior is instrumental, the individual acts in order to reach another goal, which can be attained either shortly after the activity or be delayed. In a context of motivation toward the environment, this time delay might have a rather strong effect, since pro-environmental behavior deployed now, may not even produce the desired effects within the individual's lifetime. Milfont, Wilson, and Diniz [34] found that psychological distance is related to people's level of environmental concern and intention to act pro-environmentally. Temporal, social, spatial, and uncertainty dimensions of distance emerged as factors that affected people's attitudes and behavior toward the environment. This may also be the case for motivation toward the environment. Since our sample consisted of students on the eve of entering higher education or a professional activity, also the uncertainty dimension may explain the higher level of amotivation in our sample. Further research is necessary to test this assumption.

Moving our attention towards amotivation, we saw no reason to exclude this type of motivation from the MTES. The high scores we found for amotivation, were a reason for our interest, since our respondents indicated they agreed rather strongly with statements tapping into amotivation (M = 4.63, sd = 1.41; 42% were member of profiles with high amotivation scores). In sum, we conclude that for our sample of senior secondary school students in Flanders, the Dutch version of the MTES was found a valid and reliable instrument for tapping into motivation toward the environment when including five subscales: intrinsic, integrated, introjected, externally regulated, and amotivation.

4.2. MTES Profiles

As shown in Figure 4, a moderate to high level of amotivation was found in three out of four profiles, including the group of individuals who showed a high level of autonomous and internally controlled motivation. According to Gawronski and Brannon, the latter may find themselves in a highly uncomfortable position, showing feelings of aversion to this inconsistency [35] between being

intrinsically motivated as well as showing considerable levels of amotivation. Spence, Poortinga, and Pidgeon already pointed at that phenomenon and its possible connection with climate change [36]. Although this finding seems unexpected, insights in amotivation developed by Pelletier et al. [17] may offer some explanation. Even when a person is intrinsically motivated, performing pro-environmental behavior may still be hindered by global helplessness beliefs, since the global scope of the problem (and as we suggested earlier, possibly also temporal distance) can be intimidating, producing a paralyzing effect. The same people may also doubt their ability to adopt effective strategies, as well as their capacity to influence climate change positively. Finally, they may think it impossible to keep up the effort necessary. The concept of global helplessness may again touch on the temporal and spatial dimensions of psychological distance [34,36]. Our findings of simultaneous occurrence of high intrinsic motivation and strong amotivation within the same person may hint at why people who are concerned and aware of environmental issues, still fail to act [17].

Pelletier, Baxter, and Huta [37] suggest fostering self-determined motivation in people, since they were found to deploy more effective strategies for reducing cognitive dissonance, i.e., the incongruence between a pro-environmental attitude and lack of pro-environmental behavior. They recommend providing accurate information and suggestions for concrete steps that could lead to a solution. Moreover, offering opportunities for autonomy, relatedness, and competence is repeatedly described as promoting more autonomous motivation (e.g., [4,37]).

4.3. Limitations and Suggestions for Further Research

The present study shows some limitations. An earlier data collection offered opportunities for our research. The data were gathered with research into STEM students' academic or professional career orientations in mind. The MTES items were added in order to explore certain reliability and validity issues. Consequently, the MTES items were added at the end of the questionnaire. This may account for a high percentage of missing cases (26%), which possibly biased results. Furthermore, the focus was on STEM education at data gathering. STEM courses are traditionally more favored by male students in Flanders [21]. This was also reflected in our sample in which female respondents (26.2%) were underrepresented in comparison to male respondents (72.3%). Finally, our research was limited to studying construct validity. Our purpose was to use the MTES for finding profiles, since the external validity of the Dutch version of the MTES had already been established by Boeve-de Pauw and Van Petegem [16].

Our focus was on last grade secondary students. They are looking at major changes in their academic or professional career. It would be interesting to find out if this instability in their personal situation causes feelings of insecurity and doubt. If further research would confirm our hypotheses about time delay, this might call for adding extra dimensions, i.e., temporal distance and uncertainty. It would be interesting to investigate whether temporal distance and uncertainty influence the level of autonomy in identified motivation, or the strength of amotivation. Future research may want to focus on gaining deeper insight in identified and amotivation toward the environment.

5. Conclusions

In sum, our evidence suggested that a five-scale version of the Dutch MTES (including intrinsic, integrated, introjected, external, and amotivation) is both a reliable and valid instrument for measuring senior secondary school students' motivation toward the environment in Flanders. Furthermore, four MTES profiles emerged: two smaller groups of consistently motivated and inconsistently motivated students, a large group of moderately motivated students (nearly one in two), and a relatively large group of unmotivated students (one in four). Low levels of amotivation were only found within consistently motivated individuals, who also scored high on external regulation.

Since evidence in this study indicated that senior secondary school students show distinct motivation profiles, environmental awareness and change programs can build on these findings. Such programs have the option either to differentiate approaches, catering for each separate profile,

or to focus on promoting membership of the most desirable, i.e., the consistently motivated profile, which showed low levels of amotivation. Still, since such a vast portion of adolescents were amotivated, all programs are well-advised to provide opportunities for autonomy, relatedness, and competence [4]. Additionally, change agents would do well providing their target audience not only with essential and relevant knowledge about climate change, but also with viable solutions for mitigation in terms of supporting their efficacy, strategy, and effort beliefs [17]. Based on our findings concerning identified motivation, we suggest intervention programs focus on making the effect of actual behavior visible in a relatively short time. This would allow people to enjoy the fruits of their efforts, which may boost their effort beliefs so that they feel less helpless and more self-determined. Moreover, in order to promote a more intrinsic motivation, elements of fun should be introduced in pro-environmental activities. Thus, participants would experience that behaving pro-environmentally in itself provides joy and well-being.

Furthermore, we would like to call for inclusion of amotivation in research into motivational profiles, since a vast proportion of respondents (91%) showed moderate to high levels of amotivation, and even self-determined and internally controlled individuals showed high levels of amotivation, possibly preventing them from behaving pro-environmentally.

This study has contributed to a cross-cultural validation of the MTES, generally finding it a useful instrument for tapping into motivation toward the environment. Adding a person-oriented approach to a variable-oriented approach provided complementary information, showing that the inclusion of amotivation in a cluster analysis produces interesting information for environmental awareness and change programs.

Author Contributions: W.S., J.B.-d.P., and V.D. contributed to the conception and design of the work. P.V.P. and J.B.-d.P. collected the data. W.S. and J.B.-d.P. analysed and interpreted the data. W.S. drafted the manuscript. All authors participated in the revision and final approval of the manuscript.

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Appendix

Table A1. Descriptives for items and subscales (Cronbach's alphas: means, and standard deviations of the Dutch version).

	Scale/Item		Mean	*SD*
MTES	Intrinsic motivation	$\alpha = 0.93$	3.86	1.46
MTES1	For the pleasure I get in mastering new ways to help.		3.71	1.69
MTES2	For the pleasure I get in improving the quality of the environment.		4.00	1.59
MTES3	Because I like the feeling I get when doing things for the environment.		3.89	1.55
MTES4	For the pleasure of contributing to the environment.		3.85	1.56
	Integrated regulation	$\alpha = 0.92$	3.71	1.44
MTES5	Because taking care of the environment is an integral part of my life.		3.68	1.60
MTES6	Because it seems to me that taking care of myself and taking care of the environment are inseparable.		3.72	1.59
MTES7	Because it is part of the way I have chosen to live my life.		3.72	1.58
MTES8	Because my environmental awareness has become a fundamental part of who I am		3.68	1.62
	Identified regulation	$\alpha = 0.89$	4.26	1.39
MTES9	Because it is a sensible thing to do something about the environment.		4.43	1.61
MTES10	Because it is the way I have chosen to contribute to the environment.		3.92	1.54
MTES11	Because it is a reasonable thing to do something about the environment.		4.18	1.63
MTES12	Because I think it is a good idea to do something about the environment.		4.43	1.65

Table A1. *Cont.*

	Scale/Item		Mean	*SD*
	Introjected regulation	$\alpha = 0.91$	3.82	1.50
MTES13	Because I think I'd regret not doing something about the environment.		3.85	1.68
MTES14	Because I'd feel guilty if I didn't do anything about the environment.		3.90	1.65
MTES15	Because I'd feel bad if I didn't do anything about the environment.		3.75	1.64
MTES16	I'd be ashamed not to do anything about the environment.		3.75	1.80
	External regulation	$\alpha = 0.91$	3.09	1.43
MTES17	Because other people would be mad if I didn't do anything about the environment.		3.23	1.61
MTES18	For the recognition I get for it from others.		3.21	1.60
MTES19	Because my friends insist that I do.		2.97	1.62
MTES20	To avoid being criticised.		3.03	1.63
	Amotivation	$\alpha = 0.87$	4.63	1.41
MTES21	I wonder why I'm doing anything about the environment, since the situation isn't improving.		4.51	1.64
MTES22	I feel that doing something about the environment is a waste of time.		4.79	1.63
MTES23	I can't see how my efforts to be environmentally friendly are helping the environment.		4.63	1.65
MTES24	I can't see what's in it for me.		4.59	1.73

Table A2. The Dutch version of the MTES with descriptives (Cronbach's alphas, means, and standard deviations).

	Scale/Item		Mean	*SD*
MTES	Intrinsic motivation	$\alpha = 0.93$	3.86	1.46
MTES1	Voor het plezier dat ik ervaar wanneer ik nieuwe manieren leer kenen om het milieu te helpen.		3.71	1.69
MTES2	Voor het plezier dat ik ervaar wanneer ik de kwaliteit van het milieu verbeter.		4.00	1.59
MTES3	Omdat ik hou van het gevoel dat ik krijg wanneer ik dingen doe voor het milieu.		3.89	1.55
MTES4	Voor het plezier dat iets doen voor het milieu me geeft.		3.85	1.56
	Integrated regulation	$\alpha = 0.92$	3.71	1.44
MTES5	Omdat zorg dragen voor het milieu een integraal deel uitmaakt van mijn leven.		3.68	1.60
MTES6	Omdat het voor mij lijkt alsof zorg dragen voor mezelf en zorg dragen voor het milieu onlosmakelijk met elkaar verbonden zijn.		3.72	1.59
MTES7	Omdat het een deel uitmaakt van de manier waarop ik gekozen heb mijn leven te leiden.		3.72	1.58
MTES8	Omdat mijn milieubewustzijn een fundamenteel deel is gaan uitmaken van wie ik ben.		3.68	1.62
	Identified regulation	$\alpha = 0.89$	4.26	1.39
MTES9	Omdat het verstandig is om iets te doen voor het milieu.		4.43	1.61
MTES10	Omdat het de manier is waarop ik gekozen heb om bij te dragen aan het milieu.		3.92	1.54
MTES11	Omdat het rationeel is om iets te doen voor het milieu.		4.18	1.63
MTES12	Omdat ik denk dat het een goed idee is om iets te doen voor het milieu		4.43	1.65
	Introjected regulation	$\alpha = 0.91$	3.82	1.50
MTES13	Omdat ik denk dat ik het me zou berouwen als ik niets deed voor het milieu.		3.85	1.68
MTES14	Omdat ik me schuldig zou voelen als ik niets deed voor het milieu.		3.90	1.65
MTES15	Omdat ik me slecht zou voelen als ik niets deed voor het milieu.		3.75	1.64
MTES16	Ik zou me schamen voor mezelf als ik niets deed voor het milieu.		3.75	1.80
	External regulation	$\alpha = 0.91$	3.09	1.43
MTES17	Omdat andere mensen boos zouden als ik niets deed voor het milieu.		3.23	1.61
MTES18	Voor de erkenning die er voor krijg van anderen.		3.21	1.60
MTES19	Omdat mijn vrienden erop staan dat ik dat doe.		2.97	1.62
MTES20	Om te vermijden ik bekritiseerd zou worden.		3.03	1.63

Table A2. *Cont.*

	Scale/Item		Mean	*SD*
	Amotivation	$\alpha = 0.87$	4.63	1.41
MTES21	Ik vraag mezelf af waarom ik dingen doe voor het milieu, de situatie wordt er immers niet beter op.		4.51	1.64
MTES22	Ik heb het gevoel dat iets doen voor het milieu tijdverspilling is.		4.79	1.63
MTES23	Ik zie niet in hoe mijn inspanning om milieuvriendelijk te zijn iets kunnen betekenen voor het milieu.		4.63	1.65
MTES24	Ik zie niet in wat er voor mij persoonlijk inzit.		4.59	1.73

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