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Sustainable food choice motives: The development and cross-country validation of the Sustainable Food Choice Questionnaire (SUS-FCQ)

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ABSTRACT

In view of all kinds of sustainability concerns related to our current diet, it is essential to gain a good understanding of the sustainability motives consumers have for selecting their food. A comprehensive and validated scale to measure sustainability motives within the full range of food choice motives could contribute to this understanding, especially as sustainability is a multi-faceted concept in which the different aspects can sometimes be conflicting. The current paper aims to 1) develop the Sustainable Food Choice Questionnaire (SUS-FCQ) that covers the full concept of sustainability, 2) test which dimensions of sustainable food choice motives can be distinguished and 3) validate the scale as part of the Food Choice Questionnaire in multiple countries. An online survey was completed by 5,116 respondents from five European countries (The Netherlands, Denmark, Czech Republic, France and Italy). The scale was developed with a Dutch sub-sample and validated in all included countries. Exploratory factor analysis followed by confirmatory factor analyses resulted in a two-factor solution. A 'general sustainability' dimension (6 items, covering environmental, ethical and animal welfare aspects) and a 'local & seasonal' dimension (3 items) were identified. The Sustainable Food Choice Questionnaire shows to be reliable and valid in the five included countries and can be used as an addition to the Food Choice Questionnaire developed by Steptoe and colleagues (1995). The scale is suitable to gain a better understanding of the position of sustainability motives against other motives in consumers food choices and can be used for country comparisons.

1. Introduction

Current western diets are associated with a range of sustainability issues, such as a high environmental burden, animal welfare problems, and ethical concerns. Food choices have a large impact on the sustainability of current diets (Aleksandrowicz, Green, Joy, Smith & Haines, 2016; Aschemann-Witzel, 2015; Carlsson-Kanyama & González, 2009; Temme et al., 2014; Van de Kamp, Seves & Temme, 2018). As food consumption is one of the main contributors to the environmental impact of households, with a contribution of 20–30% in the EU (Aleksandrowicz et al., 2016; Smil, 2000; Tukker & Jansen, 2006), it is crucial to get an understanding of consumers' dietary behaviours in achieving sustainability goals.

Understanding food choices is complex, because of the diversity of factors that play a role, such as socio-demographic factors, attitudes, values, norms, consumption context and cultural context (e.g. Ajzen, 1991; Furst, Connors, Bisogni, Sobal, & Falk, 1996; Schwartz, 1994; Stok et al., 2017). The complexity in determinants also holds for understanding sustainable diets (Johnston, Fanzo & Cogill, 2014). Insights in food choice motives are of added value in understanding food choices, beyond the abovementioned factors (Dowd & Burke, 2013; Verain, Onwezen, Sijtsema & Dagevos, 2016a). Food choice motives refer to consumers' motives, reasons or motivations for choosing or eating food (Onwezen, Reinders, Verain & Snoek, 2019) and are more closely related to specific food choices as compared to more general and stable factors such as values (Van Trijp & Fischer, 2010). The importance of insights in consumers' food choice motives have been shown in the context of sustainable food consumption (Tobler, Visschers & Siegrist, 2011; Verain, Dagevos & Antonides, 2015; Verain et al., 2016a). Some food choice motives, such as environmental concern, can support sustainable food choices, whereas other motives can be perceived as barriers for sustainable choices (e.g. when sustainable food is perceived as

Abbreviations: (SUS-FCQ), Sustainable Food Choice Questionnaire.

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less tasty or less convenient). In addition, different types of sustainable food choices can be explained by different underlying motives (Tobler et al., 2011; Verain et al., 2015). These possible conflicts and trade-offs between several food choice motives, make it important to study sustainability motives within a broad range of possible food choice motives (Johnston et al., 2014; Siegrist, Visschers, & Hartmann, 2015).

1.1. Conceptualisation of sustainable food consumption

Besides the complex nature of food choices, an additional difficulty in understanding sustainable food consumption is the multidimensionality of sustainability (Aiking & de Boer, 2004). Sustainable food consumption covers a wide variety of topics, for instance water usage, animal welfare, food safety, food security, local production, seasonal production, and ethical working conditions (Aleksandrowicz et al., 2016; Aiking & de Boer, 2004; Reisch, Eberie, & Lorek, 2013). Sustainability is often defined as a combination of a social, an environmental, and an economic dimension. Or in other words, people, planet and profit (also called the Triple Bottom Line, Elkington, 1997; United Nations, 1992). The different aspects and dimensions are sometimes in synergy, but can also be conflicting (Johnston et al., 2014; Kloppenburg, De Master, Stevenson & Hendrickson, 2000; The Netherlands Nutrition Centre, 2017; Van Trijp & Fischer, 2010). To give an example, local and seasonal consumption can benefit environmental sustainability, but also protect local economies and crop diversity (Aleksandrowicz et al., 2016). In contrast, fair trade consumption is stimulated in the light of the social dimension of sustainability (equity, child labour), but often requires long-distance transportation which can have a negative impact on the environmental dimension. A commonly agreed upon definition of sustainable food consumption is missing. The definition of sustainable diets given by the FAO is often cited: “diets protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources” (FAO, 2010). This is a broad definition that includes many sustainability aspects, but is still not all-encompassing as aspects that appear in other definitions, such as seasonal, local or regional production, are not represented (e.g. the definition given by the UK UK Sustainable Development Commission, 2005, 2009; Britain, 2008; De Boer, de Witt, & Aiking, 2016; Hoolohan, Berners-Lee, McKinstry-West, & Hewitt, 2013). In broad lines, sustainable food is often defined as a combination of environmental, animal welfare and ethical aspects (Aschemann-Witzel, 2015; LNV, 2009; Reisch, Eberie, & Lorek, 2013; Van Dam & van Trijp, 2011). In the current study, *we define sustainable food as food that is produced, processed, packaged, transported and traded with respect for people, animals and the environment, without compromising future generations.*

The multidimensional nature of the concept of sustainability, and a possible trade-off between these dimensions, makes it important to consider the different dimensions when investigating consumers’ sustainable food choices (Johnston et al., 2014). However, in research on sustainable diets, sustainability is often narrowed down to one of the dimensions, often the environmental dimension (Aleksandrowicz et al., 2016; Garnett, 2014; Sesini, Castiglioni, & Lozza, 2020). Including multiple dimensions would enable to study trade-offs between different sustainability motives, across the dimensions, and between sustainability motives and other food choice motives, and therefore will increase our understanding of consumers’ sustainability considerations related to their food choices.

When it concerns consumer perceptions of sustainability, there is still a lot to be explored. Consumers show inconsistent and ambiguous interpretations of the concept of sustainability (Barone, Rodrigues, Nogueira, Guimarães, & Behrens, 2020). Generally, consumers have a narrow perception of sustainability, associating it mainly with environmental impact (Barone et al., 2020; Van Loo, Hoefkens, & Verbeke, 2017), and not so much with ethical concerns (Bouwman et al., 2016; Grunert, Hieke, & Wills, 2014). But when consumers freely associate words with the concept of sustainability, often a broad range of aspects is mentioned, including local and seasonal production (Kloppenburg et al., 2000; Verain, Sijtsema, Dagevos, & Antonides, 2017). Consumers differ in their perceptions and prioritizations of sustainability dimensions (Bouwman et al., 2016; Peano, Merlino, Sottile, Borra, & Massaglia, 2019). Peano and colleagues (2019) for example found that consumers considered “preservation of natural resources” the most important sustainability aspect, followed by “decent working conditions” and “accessibility for everyone to healthy and safe food”, and show that five consumer segments can be identified, based on differences in their priorities. In addition, Bouwman and colleagues (2016) found different priorities across cultures, with for example animal welfare as the top priority in Denmark, use of natural resources in the Netherlands and seasonal and local foods in France.

Balderjahn and colleagues (2013a) identify two streams of research when it concerns the multidimensionality of sustainability in the understanding of consumers. One stream argues that sustainability can be seen as a unidimensional construct, because consumers do not differentiate between the underlying dimensions (Balderjahn et al., 2013). Results of a study by Van Dam and Van Trijp (2011) underpin this, by showing that although light users of sustainable products can cognitively distinguish several sustainability dimensions, these distinctions appear irrelevant when it concerns their motivations. Their research shows that considering sustainability as a single dimension enables a better understanding of sustainable food purchases then when sustainability is considered as having a more complex structure. A study by Grunert and colleagues (2014) also confirms the unidimensional view on sustainability, revealing that concerns for the environmental and ethical aspects of sustainability load on a single motivational dimension.

Another line of research stresses that to get a deep understanding of sustainable food consumption, it is important to distinguish the various facets of sustainability (Balderjahn et al., 2013a). In a study by Hanss and Böhm (2012) on understanding of sustainability by Norwegian consumers, five sustainability dimensions arose: an environmental, a social, a developmental, an economic and a temporal dimension. Also, the qualitative work of Barone and colleagues (2019) showed that associations of consumers with sustainability reflect the multidimensionality and complexity of the concept, with environment, health and nutrition, behaviour, production and economy and sustenance as the main categories of associations. In short, it is unclear whether sustainability should be treated as a single or a multi-dimensional concept when it concerns consumers’ sustainability motivations in food selection.

1.2. The need for a scale to measure sustainable food choice motives

Due to the abovementioned inconsistent findings there is a need for a scale that is able to capture the full concept of sustainable food within a broad range of food choice motives. Such a scale would benefit our understanding on the position of sustainability motives of consumers in selecting their food and is currently missing in the literature. The Food Choice Questionnaire (FCQ), developed by Steptoe, Pollard and Wardle (1995), can be regarded as the vested method for measuring food choice motives. The FCQ consists of 36 items, measuring the importance of nine distinct food choice motives: health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity and ethical concern. In the FCQ, sustainability motivations are underrepresented (Lindeman & Väänänen, 2000). The ethical concern dimension partly captures sustainability, but this dimension is not performing well and is limited in scope (Fotopoulos, Krystallis, Vassalo, & Pagiaslis, 2009; Sautron et al., 2015). Ethical concern is measured with three items: “Comes from countries I approve of politically”, “Has the country of origin clearly marked”, and “Is packaged in an environmentally friendly way”. Later studies adapted the FCQ to further develop the ethical dimension (e.g., Lindeman & Väänänen, 2000; Sautron et al., 2015) or added items such as “Is domestically produced’’, “Carries the Fairtrade

mark'' and "Is organically grown'' (Konttinen, Sarlio-Lähteenkorva, Silventoinen, Männistö, & Haukkala, 2013). Despite the many attempts to measure sustainable food choice motives, all of these scales come with some important drawbacks.

First, in relation to the previous point, several scales focus on a particular aspect of sustainability, lacking to cover the full range of sustainable food choice motives. To mention some, Ozcaglar-Toulouse, Shiu and Shaw (2006), Siriex (2008) and Balderjahn, Peyer and Paulssen (2013b) studied motives in relation to fair trade products, Siriex, Grolleau and Schaer (2008b) and Hasselbach and Roosen (2015) studied motives related to local food and Vanhonacker, Verbeke, Poucke, and Tuyttens (2007) focussed on animal welfare. Renner, Sproesser, Strohbach and Schupp (2012) developed a scale to measure a broader range of sustainability motives (organic, fair trade and environmentally friendly production, packaging and transport), but environmental concern, in the way it was operationalised by Steptoe and colleagues (1995) is missing in this scale as is animal welfare. Similarly, the scale developed by Lindeman and Väänänen (2000) includes different facets of sustainability, but is not comprehensive either. The scale includes ecological welfare (including subscales for animal welfare and environmental protection), political value and religion. Although this scale is an important addition to the FCQ in measuring sustainability motives, it does not cover the full range of sustainability dimensions. Fair trade, local production and seasonal production are for example not covered (Roininen, Arvola, & Lähteenmäki, 2006; Siegrist et al., 2015; Sirieix, 2008; Sirieix et al., 2008). Finally, Onwezen and colleagues (2019) developed a single item scale to measure the original FCQ dimensions, and added items for environment, animal welfare and social justice, but items on local and seasonal consumption are missing.

Second, several of these scales might be suitable for measuring sustainability motives, but do not integrate these motives with other food choice motives, making the scales unsuitable for studies that aim to position sustainability motives in relation to other food choice motives. Previous research shows the importance of looking at the priorities in consumer motives, instead of absolute importance, highlighting the relevance of including various motives allowing for relative comparisons (Konttinen et al., 2013; Verain et al., unpublished results). For example, the scale developed by Sautron and colleagues (2015) includes a broad range of sustainability aspects, but only a subset of the food choice motives included by Steptoe and colleagues (1995) is represented, which makes the scale less suitable to get a full understanding of the position of sustainability motives in relation to other food choice motives. In addition, the Consciousness for sustainable consumption scale developed by Balderjahn and colleagues (2013a) is worth mentioning. Although it is not framed as a scale to measure motives, it is closely related. This scale measures beliefs and importance of many attributes that cover the economic, social and environmental aspects of sustainability. However, this scale is not suited to compare sustainability motives against other food choice motives either.

Third, several studies and scales focus on a single product or sector (Balderjahn et al., 2013a), and are not suitable to measure general sustainability motives. The scale developed by Sautron and colleagues (2015), for example, includes a range of items on environmental limitations (e.g. not buying meat), ethics and environment (e.g. production waste, respect for working conditions) and traditional and local production (e.g. proximity of production, support for small-scale producers). However, besides measuring general motives, product category level motives were also considered and used together in the same analysis. Even though it is important to consider the product-category level in researching motives (Verain et al., 2015), it can also lead to different outcomes and results in a complicated and lengthy scale. Similarly, Verain, Sijtsema and Antonides (2016b) used a scale that included a broad range of sustainability motives, but measured them on a product-category level and therefore not being able to relate the findings to sustainable food choices in general.

And finally, most of these scales are developed in a single country and are not validated in other countries, making them (up to now) inappropriate for country comparison (e.g. Sautron et al., 2015). Literature shows that both the dimensionality of food choice motives as well as the understanding of the concept of sustainability are culture-dependent (Bouwman et al., 2016; Cunha, Cabral, Moura, & de Almeida, 2018; Fotopoulos et al., 2009), which underscores the relevance of validating a scale on sustainability motives in multiple countries.

The fragmentation of the way sustainability is operationalized and the drawbacks related to these existing scales show the need for a comprehensive scale to measure sustainable food choice motives. To fill the above-mentioned gaps, the current paper aims to 1) develop the Sustainable Food Choice Questionnaire that covers the full concept of sustainability, 2) test which dimensions can be distinguished and 3) validate the scale as part of the original Food Choice Questionnaire in multiple countries. It adds to the current literature by including all aspects related to the concept of sustainability and by testing the disagreement in literature whether sustainable food choice should be treated as uni- or multidimensional. Additionally, it has the advantage over some of the existing scales that it can be well aligned with and should be used in addition to the food choice questionnaire, the golden standard in measuring food choice motives. Therefore, it could be used to research the position of sustainability motives against other food choice motives. This way the Sustainable Food Choice Questionnaire can function as a standard in research on sustainable food consumption allowing comparison of data from different food groups, populations, and countries.

2. Methods

2.1. Procedure and respondents

Data were collected through an online survey in five European countries: The Netherlands, Denmark, Czech Republic, France and Italy. The survey was part of the Horizon 2020 project SUSFANS (www.susfans.eu; Rutten et al., 2018), and included questions on perception, motives, attitudes and behaviour related to sustainability and healthiness of food (Bouwman et al., 20161[1]). In this study, only the relevant measures to develop the scale on sustainable food choice motives and measures to test for discriminant, convergent and predictive validity were included.

The questionnaire was translated from English with forward and backward translation by professional translators and checked on understandability and use of jargon by native speaking researchers from the SUSFANS consortium. The draft questionnaire was tested in a quantitative pilot in the Netherlands ($N = 100$) and Czech Republic ($N = 100$).

Respondents were recruited by MSI-ACI, a market research company. Informed consent was obtained at the level of the market research agency. The authors of this paper only had access to anonymised data sets. The minimum age to be eligible for participation was 18 years and quota were set to get a balanced sample on gender, age, education and degree of urbanisation. A total of 5,116 respondents was recruited: 1,021 in the Netherlands, 1,021 in Denmark, 1,038 in Czech Republic, 1,018 in France, and 1,018 in Italy. 73 participants were excluded from the analyses because they showed no dispersion on a whole range of items, suggesting that they did not seriously filled out the questions.

[1] The report by Bouwman and colleagues (2016) and the current study are based on a larger dataset in the SUSFANS project with the same sample. The report by Bouwman and colleagues (2016) shows descriptive analyses, partly on the same variables. The analyses that were used in the current paper for the scale development were not part of the report.

2.2. Measures

General food choice motives: Steptoe and colleagues (1995) developed the food choice questionnaire to measure general food choice motives and consists of 36 items with up to six items per dimensions. Several researchers used a version with fewer items since this still provides good reliabilities and makes the scale easier to answer for respondents (e.g. Fotopoulos et al., 2009). We used a shorter version of the food choice questionnaire that was very similar to Onwezen and colleagues (2019) and consisted of 25 items. Cronbach's alphas of the subscales for the total dataset were 0.85 for convenience, 0.85 for weight control, 0.86 for natural content, 0.83 for mood, 0.81 for sensory appeal, 0.73 for familiarity, and 0.84 for health. The correlation between the price items was 0.61 (Cronbach's alpha could not be calculated with two items). Respondents were asked to indicate for each item to what extent these aspects were important to them for the food they eat on a typical day (1 = not at all important, 7 = very important).

Sustainable food choice motives: 18 items were used to measure sustainable food choice motives: the items developed by Lindeman and Väänänen (2000) on animal welfare and environmental protection, and a range of self-developed items on the sustainability dimensions including animal welfare, environmental impact, fair trade, local and seasonal (see Table 1). These items were based on previous studies by Verain and colleagues (2015; 2016a) and sustainability perceptions tested in the pilot survey. Similar to the general motives, respondents were asked to indicate for each item to what extent these aspects were important to them for the food they eat on a typical day (1 = not at all important, 7 = very important). Small adaptations in terminology were made after checking the factor structures and reliability (Cronbach's alpha) of the pilot data.

Attitude towards sustainable food: Attitude towards sustainable food was measured with six bipolar items. Three items for cognitive attitude (worthless-valuable, useless-useful and harmful-beneficial) and three for affective attitude (unattractive-attractive, bad-good, annoying-nice) that were based on Crites, Fabrigar and Petty (1994). The items loaded on a single factor, explained 80% of the variance and had a Cronbach's alpha of 0.950.

General sustainability interest: General sustainability interest was measured with eight items that have been developed for health interest by Roininen, Lähteenmäki and Tuorila (1999) and adapted for sustainability. Respondents were asked to rate on a 7-point scale (1 = totally disagree, 7 = totally agree) to what extent they agreed with the eight items. An example of an item is 'The sustainability of food has little impact on my food choices' (reversed). Factor analysis resulted in two underlying factors but since this was due to reversed items we forced the items onto a single factor, explaining 45% of the variance (Cronbach's alpha = 0.824).

Socio-demographic variables: the following socio-demographic characteristics were asked: gender, age, educational level, and income.

Pro-environmental lifestyle: General pro-environmental lifestyle scale has measured with a scale developed by Withmarsh and O'Neill (2010). Respondents were asked to indicate the frequency (1 = never, 7 = always) by which they performed 17 sustainable actions such as turning of lights, car sharing, and recycling. The items were combined into one scale, explaining 32% of the variance (Cronbach's alpha 0.857).

Sustainable food consumption: These 21 items were based on measurements developed by Verain and colleagues (2015) of the consumption of sustainable food products with the addition of items on fair trade, and local and seasonal products. Respondents were asked to indicate for a range of sustainable food products how many days a week they consumed these for their main meal. Factor analysis identified four underlying factors with a total explained variance of 67% (Bouwman et al., 2016)The first factor included the consumption of: organic and fair trade products (organic meat; organic vegetables; organic fruit; organic dairy; fair trade vegetables; fair trade fruit: Cronbach's alpha 0.903), the second seasonal and local products (local/regional products; seasonal vegetables; seasonal fruits: Cronbach's alpha 0.779), the third meat replacement (a vegetarian burger; fish, eggs or cheese instead of meat; pulses, tofu or other plant-based products instead of meat; hybrid meat (where part of the meat is replaced by a plant product); a vegetarian meal items: Cronbach's alpha 0.830), and the fourth free range products, products with a sustainability logo and small portions of meat and dairy products (products with a sustainability logo; meat with a sustainability logo; dairy with a sustainability logo; free range meat; free range dairy; small portion of meat instead of regular or large portions; small portion of dairy instead of regular or large portions: Cronbach's alpha 0.875) .

Table 1
Factor loadings of the sustainability items based on exploratory factor analysis in The Netherlands.

	Component 1: General sustainability	Component 2: Local & Seasonal
General sustainability		
Animal welfare		
Is produced without animals being in pain. *	**0.956**	−0.155
Is produced in an animal friendly way.	**0.911**	−0.058
Is produced with respect for animal rights. *	**0.882**	−0.021
Is produced with sufficient space for the animals.	**0.866**	−0.020
Is a free-range product.	**0.784**	0.049
Ethical concern		
Is produced without exploitation.	**0.885**	−0.071
Is produced without child labour.	**0.833**	−0.121
Is traded in a fair way.	**0.692**	0.159
Environmental welfare		
Is prepared in an environmentally friendly way. *	**0.735**	0.198
Is produced in an environmentally friendly way.	**0.720**	0.177
Is produced without disturbing the balance of nature. *	**0.716**	0.188
Is produced with minimal CO2 emissions.	**0.650**	0.231
Is packaged in an environmentally friendly way. *	0.632	0.286
Local and seasonal		
Is a local/regional product.	-0.021	**0.889**
Is a seasonal product.	-0.092	**0.878**
Comes from close by (little transport distance).	0.091	**0.769**
Excluded		
Has a Fair Trade logo.[a]	0.177	0.588
Is produced organically.[b,c]	0.300	0.551

Note. Underlined terms are the final items after scale reduction. Cronbach's alpha: 0.962 / 0.924 for general sustainability (all 13 items / 6 items after reduction) and 0.853 for local and seasonal (3 items).
Note. The reliabilities of subscales for animal welfare (5 items, alpha of 0.93), ethical concern (3 items, alpha of 0.87), and environmental welfare (5 items, alpha of 0.93) were high enough to warrant the use of these subscales separately if the context of the research requires that only one aspect is considered.
* Item fromLindeman and Väänänen (2000)
[a] Item deleted due to reduction of the Cronbach's alpha of the scale.
[b] Item deleted due to significant loadings (0.30 or above) on more than one factor.
[c] From a technical perspective, organic food production is not considered to have a lower environmental impact, it was added here since consumers perceive it as environmentally friendly.

2.3. Data analysis

2.3.1. Factor structure and underlying dimensions sustainable food choice motives

Similar to Lindeman and Väänänen (2000) and Sautron and colleagues (2015) we performed Exploratory Factor Analysis (EFA) followed by Confirmatory Factor Analysis (CFA) to define the underlying dimensions of sustainable food choice motives. EFA was conducted on the Dutch subsample and we randomly divided the sample into two subsamples, so we could use one sub-sample for the EFA (n = 501) and the other sub-sample for CFA (n = 501). For the other countries, only CFA was performed so these samples were not split into two. Convergent and discriminant validity were tested on the total sample of all the countries combined and for each country separately.

Exploratory factor analysis using principal components estimation was performed on the 18 sustainable food choice motive items. Oblique rotation was used, as correlation between factors was expected. The number of factors to retain was based on a combination of criteria: Eigenvalues ≥ 1, inspection of the scree plot, and the meaningfulness of the factor (Conway & Huffcutt, 2003). To determine the meaningfulness, we followed four rules of interpretability similar to Sautron and colleagues (2015): (1) each retained factor must be composed of at least three items; (2) items highly correlated with a factor must weakly correlate with other factors (0.30 or lower); (3) items highly correlated with the same factor must embody the same concept; and (4) items correlated with different factors must embody different concepts.

The structure resulting from the EFA was checked with consecutive CFA. CFA was performed using AMOS 23. To test the factor structure of the items for sustainable food choice motives in combination with the other items of the Food Choice Questionnaire (Steptoe, et al., 1995), we performed the CFA on the total FCQ: the general food choice motives and the sustainable food choice motives combined. The model fit of the factor structure from the EFA was compared to the model fit of the baseline model (with one factor structure for all sustainability items) using Chi-square. The best performing model was then evaluated on the fit indices. We used the Goodness of Fit Index (GFI), the Bentler-Bonett Non-standard Fit Index (NFI), Tucker-Lewis Index (TFI), and Adaptive Fit Index (CFI) that are generally considered to indicate a good fit when larger than 0.9. Also, Root Mean Square Error (RMSEA) was used and the thresholds for this fit measure differed between<0.05 (Schmitt, 2011) and<0.07 (Hu & Bentler, 1999; Steiger, 2007). Finally, CMIN / DF (normalized Chi-square to degree of freedom) was used. Also the criterion for acceptance of the Chi-square estimate with degrees of freedom (χ^2/df) varied from<2 to<5 (Bentler, 1989; Schumacher & Lomax, 2004; Ullman, 2001; Schmitt, 2011).

2.3.2. Discriminant, convergent, and predictive validity

Correlations were computed of the sustainability motives with other FCQ motives, and with attitudes towards sustainable food, general sustainability interest, sustainable food interest, and pro-environmental lifestyle to measure convergent and discriminant validity. Predictive validity was assessed with five stepwise regressions. The four factors of sustainable food intake and pro-environmental lifestyle were used as the dependent variables. Demographics were included as the independent variables in the first step and food choice motives were added in the second step. Demographics were added as confounders since age, gender, and socio-economic status have been related to both food intake and food choice motives.

3. Results

3.1. Factor structure

EFA using all sustainability items showed two factors (Table 1). Factor 1 consists of 13 items related to animal concerns, environmental issues and ethical concerns and was therefore labelled as “General sustainability”. Factor 2 consists of three items related to local and seasonal food together with the fair trade logo item and was labelled “local and seasonal”. All items loaded higher than 0.5 on one of the factors, indicating that all items can be considered practically significant (Hair, Black, Babin, Anderson, & Tatham, 2006). Therefore, all items were considered in the interpretation of the factors. In addition, all items had loadings below 0.30 on the other factor except the item “is organic”. This item was therefore excluded from further analysis. The eigenvalues of the two factors were 10.8 and 1.5 and explained 68.6% of the variance. Both factors were reliable, indicated by a high Cronbach’s alpha. For the local and seasonal factor the alpha improved from 0.837 to 0.853 when the fair trade logo item was deleted. For this reason, and since the item did not seem to embody the same concept as the other items in the factor, it was deleted. Convergent validity of both sustainability dimensions was found, as all items had loadings above 0.50 on the corresponding factor (Brown, 2006; Kline, 2010). Factor loadings greater than 0.50 are necessary for practical relevance (Hair, Black, Babin & Anderson, 2014).

3.2. Scale reduction

The high number of items in the first factor and the high Cronbach’s alpha suggest that scale reduction would be appropriate and given the length of the full FCQ it is also practically useful to reduce the number of items. Similar to the original FCQ we chose a maximum of 6 items per dimension (Steptoe et al., 1995). For each aspect of general sustainability, two items were included to cover the whole spectrum of sustainability. An additional reason for this approach is that it enables the possibility to exclude an aspect of sustainability when it is not relevant or cannot be included, for example animal welfare for a study on vegetables. The following criteria were applied to make the selection of items: 1. Different aspects of sustainability were included to cover animal welfare, environmental impact, and fair trade; 2. Items with the highest loadings in the EFA were included resulting in the selection of six items that are underlined in Table 1.

3.3. Confirmatory factor analysis in the five countries

The results of the exploratory factor analysis were confirmed for each of the countries separately with a confirmatory factor analysis (CFA) in AMOS 23. Two models were tested to confirm the two-factor structure and fit indices were compared: One with a single factor structure where all sustainability items loaded on one factor and one with a two-factor structure based on the EFA (‘general sustainability’ and ‘local and seasonal’). In contrast to the EFA, the CFA was done for the total FCQ including all different motives such as health, convenience and price to confirm the performance of the sustainability factors in combination with other motives. All motives were included as latent variables in one single multifactorial model. In both models the selection of 6 items for ‘general sustainability’ were included rather than the full list of items. For The Netherlands, the model with the two factor structure performed significantly better than the one factor structure. Chi-square was 1917.6 and 1556.8 for the 1-factor and 2-factor models respectively. Degrees of freedom were 491 and 482. Resulting in a $\Delta\chi2$ of 360.8 at $\Delta DF = 9$ which is highly significant ($p < 0.001$). For the two-factor model, fit indices were around the minimally acceptable thresholds (CMIN/DF = 3.230 , TLI = 0.885, GFI = 834, NFI = 0.864, CFI = 0.901, and RMSEA = 0.067). Based on modification indices the error terms were correlated within the factors for all motives which resulted to better fit indices (see Table 2).

The two factor solution based on the Dutch subsample also performed better compared to the 1 factor solution in the other European countries with $\Delta\chi2$ of 465.06 in Denmark, $\Delta\chi2$ of 606.8 in the Czech Republic, 383.0 in France, and 403.7 in Italy all significant for $\Delta DF = 9$ at $p < 0.001$. Also Fit indices in Denmark, Czech Republic, France, and Italy were above thresholds (see Table 2). Cronbach’s alphas for the

Table 2
Fit indices of the two-factor sustainability model per country.

	CMIN/DF	TLI	GFI	NFI	CFI	RMSEA
The Netherlands	2.782	0.908	0.869	0.892	0.927	0.060
Denmark	3.674	0.924	0.904	0.919	0.940	0.052
Czech Republic	2.963	0.950	0.926	0.941	0.960	0.044
France	3.227	0.944	0.914	0.937	0.956	0.047
Italy	3.279	0.949	0.905	0.943	0.959	0.048

Note. Fit indices used were CMIN / DF = Chi-square to degree of freedom, TLI = Tucker-Lewis Index, GFI = Goodness of Fit Index, NFI = Bentler-Bonett Non-standard Fit Index, CFI = Adaptive Fit Index, and RMSEA = Root Mean Square Error

'general sustainability' factor were 0.918 for Denmark, 0.924 for Czech Republic, 0.924 for France, and 0.928 for Italy. Alphas for the 'local and seasonal' factor were as follows: 0.823 for Denmark, 0.830 for Czech Republic, 0.847 for France, and 0.860 for Italy.

3.4. Discriminant, convergent, and predictive validity

The two sustainability factors correlated 0.625 with each other showing convergent validity, although the correlation was only moderate (Hinkle, Wiersma & Jurs, 2003), implying that 'general sustainability' and 'local and seasonal' are distinct concepts and each sustainability dimension measures unique aspects of sustainability. Correlations between the 'general sustainability' and the 'local and seasonal' factor and other dimensions of the FCQ were all significant (Table 3). Correlations were low with price, high with naturalness and moderate with the other motives, none of the correlations was very high (<0.9) showing discriminant validity. Looking at the results per country, the magnitude of the correlations was slightly different but patterns were similar.

Additionally, significant correlations were found of the 'general sustainability' and the 'local and seasonal' factor with attitudes towards sustainable food, general sustainability interest, and pro-environmental lifestyle (Table 4). Again, similar patterns were found in the 5 countries.

Associations between sustainable motives and sustainable food consumption were computed to assess predictive validity. Four separate regression analyses were run with the consumption of (1) *organic and fair trade* products (2) *seasonal and local* products (3) *meat replacers*, and (4) free range products, products with a sustainability logo, and small portions of meat and dairy products (*logo, free range and small portions*) as the outcome measures. Higher scores on 'general sustainability' and 'local and seasonal' were associated with a higher consumption of all sustainable food groups except for the seasonal and local products. In contrast, the consumption of seasonal and local products was associated with the 'local and seasonal' motive but not with the 'general sustainability' motive (see Table 5). The findings for local and seasonal consumption were the same in all countries but for the other consumption measures some country differences were found[2]. Higher scores on 'general sustainability' and 'local and seasonal' were also associated with a higher score on pro-environmental lifestyle (Table 5).

4. General discussion

Current diets come with a range of sustainability concerns, and an understanding of consumers' sustainability motives in selecting their food is needed to support a transition towards more sustainable diets. The Food Choice Questionnaire is often used to measure consumers' food choice motives, but sustainability motives are not well represented. A comprehensive and validated scale to measure sustainability motives within the full range of food choice motives in different countries is missing. Such a scale is important in getting a better understanding of the position of sustainability motives in relation to other food choice motives. In the current study, the Sustainable Food Choice Questionnaire (SUS-FCQ) has been developed to fill this gap and is shown to be a reliable and valid scale to measure a broad range of sustainability motives and can be used in multiple countries. The possibilities and limitations of using the SUS-FCQ are discussed below.

4.1. Local and seasonal form a separate dimension of sustainability

The main result of the current study is that we found two dimensions of sustainability motives. The first dimension combines environmental, ethical and animal welfare aspects, and was labelled 'general sustainability'. The literature is ambiguous in whether sustainability should be treated as a single dimension. This research adds to the literature by showing that environmental, ethical and animal welfare aspects can be treated as a single dimension regarding consumer motivations. This is in accordance with the work of Lindeman and Väänänen (2000) who found that environmental welfare and animal welfare were two subscales of a single sustainably dimension. Also Sautron and colleagues (2015) found a single motivational dimension combining ethics and environmental aspects. However, environmental, ethical and animal welfare aspects are also often perceived as different dimensions of sustainability, especially in policy (Elkington, 1997; Reisch et al., 2013). And also in the perceptions of consumers on what sustainability entails, different dimensions can be identified. Van Loo and colleagues (2017) for example found an environmental factor and a societal factor. These differences can be explained by the work of van Dam and van Trijp (2011), who show that although consumers can cognitively distinguish the different dimensions of sustainability, these distinctions disappear regarding their food purchase motivations. Grunert and colleagues (2014) confirmed this unidimensionality of environmental and ethical concerns in consumers' motivations.

The second motivational dimension was formed by items on seasonal and local production and was labelled 'local and seasonal'. Seasonal and local consumption are often neglected in definitions of sustainable food consumption (FAO, 2010), or are researched separately from other sustainability aspects (e.g. Siriex et al., 2008). In some definitions of sustainability local and seasonal are explicitly mentioned (UK Sustainable Development Commission, 2005, 2009), however, in many definitions local and seasonal could be gathered under the environmental dimension, as local and seasonal production is considered more sustainable in terms of emissions due to shorter transportation distances and unheated greenhouses (Siegrist et al., 2015). Local and seasonal consumption could be an important mitigation strategy, as research has shown the potential benefit of consuming local and seasonal food for the environment (MacDiarmid, 2014). For example for the UK the avoidance of foods from heated greenhouses and food that has been transported by air could reduce emissions by 5% (Hoolohan et al., 2013). We add to the literature by showing that in consumers' motivations, local and seasonal production is something different than (environmental) sustainability, and is therefore important to consider separately. This is in accordance with the work of Sautron and colleagues (2015), who identified a dimension for traditional and local production. An explanation for the separate dimension of local and seasonal in addition to the dimension of sustainability could be that it is perceived differently by consumers. It is shown that sustainability is perceived as something that is distant to the self (Spence, Poortinga, & Pidgeon, 2012), while local and seasonal can be seen as more close to the self in distance or time. As such, a product's locality and seasonality may be more concrete than the other sustainability dimensions. Interestingly, the factor analysis on the

[2] The consumption of meat replacers was not related to 'general sustainability' in The Netherlands and Denmark and not with 'local and seasonal' in Italy, France, and Czech Republic. The consumption of products with a sustainability logo and small portions was unrelated to both 'general sustainability' and 'local and seasonal' in Italy and Czech Republic. Organic & fair trade food consumption was unrelated to 'local and seasonal' in Italy and Czech Republic.

Table 3
Correlations between sustainability factors and other FCQ dimensions.

	General sustainability	Local & seasonal	Convenience	Weight control	Naturalness	Mood	Price	Sensory appeal	Familiarity	Health
General sustainability	1									
Local & seasonal	0.682	1								
Convenience	0.335	0.318	1							
Weight control	0.546	0.514	0.422	1						
Natural content	0.737	0.702	0.319	0.571	1					
Mood	0.553	0.527	0.515	0.554	0.554	1				
Price	0.249	0.250	0.508	0.314	0.267	0.407	1			
Sensory appeal	0.488	0.437	0.542	0.440	0.501	0.625	0.439	1		
Familiarity	0.428	0.496	0.522	0.445	0.435	0.593	0.442	0.493	1	
Health	0.688	0.620	0.419	0.683	0.747	0.628	0.336	0.576	0.447	1

Note. Al correlations significant at $p < 0.001$. Data from all five countries (n = 5043).

Table 4
Correlations between sustainability factors and sustainable attitude and behavior measures.

	Sustainability	Local and seasonal	Attitude sustainable food	General sustainability interest	Pro-environmental lifestyle
Sustainability	1				
Local and seasonal	0.682	1			
Attitude sustainable food	0.463	0.327	1		
General sustainability interest	0.585	0.488	0.372	1	
Pro-environmental lifestyle	0.535	0.520	0.373	0.474	1

Note. All correlations are significant at $p < 0.001$. Data from all five countries (n = 5043).

Table 5
Regression analysis with sustainable consumption as outcomes and demographics and sustainable motives as predictors (standardized regression weights (β) and p-values).

	Sustainable food consumption Organic & Fair Trade		Seasonal & local		Meat replacers		Meat replacers		Meat replacers		Pro-environmental lifestyle Free range, logo, small portions	
	β	*p*	β	*p*	β	*p*	β	*p*	β	*p*	β	*p*
Step 1. Demographics[a]												
Denmark	0.236	0.000	−0.123	0.000	−0.058	0.002	0.107	0.000	−0.088	0.000		
The Netherlands	0.066	0.000	−0.155	0.000	−0.014	0.446	−0.003	0.871	−0.031	0.071		
France	0.177	0.000	0.036	0.040	0.039	0.033	0.118	0.000	0.086	0.000		
Italy	0.236	0.000	0.149	0.000	0.130	0.000	0.014	0.482	0.199	0.000		
Education level	0.045	0.006	0.048	0.002	0.043	0.009	−0.027	0.102	0.058	0.000		
Income	0.092	0.000	0.046	0.002	0.008	0.593	0.078	0.000	0.019	0.192		
Gender	−0.015	0.304	−0.156	0.000	0.020	0.166	−0.027	0.075	−0.107	0.000		
Age	−0.075	0.000	0.165	0.000	−0.153	0.000	−0.007	0.622	0.083	0.000		
Step 2. Sustainability motives												
General sustainability	0.202	0.000	0.020	0.262	0.102	0.000	0.163	0.000	0.349	0.000		
Local & seasonal	0.173	0.000	0.349	0.000	0.135	0.000	0.171	0.000	0.257	0.000		

[a] Countries are included as dummies with The Czech Republic as reference.

sustainable food consumption items also result in a separate factor for the consumption of local and seasonal food (see 2.2. Measures). Apparently, local and seasonal products are different from other sustainable products not only regarding motives but also regarding behaviour. In several studies on the perception of consumers with regard to sustainable food consumption, the association with local and seasonal production has been shown (e.g. Bouwman et al., 2016; Lazzarini, Visschiers, & Siegrist, 2017; Verain et al., 2017). Lazzarini and colleagues (2017) for example found that production distance was very important in the perception of the environmental and social sustainability. Additionally, local and seasonal also appeal to authenticity, which in turn evokes positive feelings among consumers. Consumer demand for local and seasonal products may be a counter-reaction toward globalization and the industrialization of food production (Fernández-Ferrín et al., 2018). In this respect, Steenkamp and de Jong (2010, p. 20) state that consumers have a preference for locally produced products as a beacon to "survive in a rapidly changing world in which old certainties seem to crumble and new cultural influences are feared or rejected." These findings suggest that it is important not to overlook local and seasonal production when studying sustainability from a consumer point of view.

4.2. Validity of the SUS-FCQ in multiple countries

Confirmatory factor analyses show that the two-factor structure for sustainability motives within the Food Choice Questionnaire holds for all included countries (the Netherlands, Denmark, Czech-Republic, France and Italy). More specifically, the analyses show that the two-factor structure results in acceptable fit indices in all countries and performs better than a one-dimensional factor including all sustainability items, thereby showing cultural validity of this two-dimensional operationalisation of sustainable food choice motives and the potential

for country comparisons.. Moreover, this indicates that consumer perceptions of different sustainability motives are relatively uniform across all investigated countries, suggesting

a relatively homogeneous European motivational dimensions and confirming the importance of considering local and seasonal production as a separate aspect of sustainability.

The SUS-FCQ shows good reliability and convergent, discriminant, predictive and cultural validity. The correlation between the two sustainability dimensions shows convergent validity, although the correlation is only moderate (Hinkle et al., 2003), implying that 'general sustainability' and 'local and seasonal' are distinct concepts. Discriminant validity of the 'general sustainability' and the 'local and seasonal' factor was found with all other food choice motives. The correlation between sustainability motives, naturalness and health was the highest and this is not surprising as it has been discussed in literature before (Fotopoulos et al, 2009; Lockie, Lyons, Lawrence, & Grice, 2004; Pieniak, Verbeke, Vanhonacker, Guerrero, & Hersleth, 2009; Pula, Parks, & Ross, 2014; Román et al., 2017; Steptoe et al., 1995). For example, in their paper on naturalness, Román et al. (2017) found that consumers who attach higher importance to the naturalness of foods show also greater willingness to eat ecological or organic foods. Sautron and colleagues (2015) even identified a second-order factor representing motivations for healthy and environmentally friendly consumption by combining health, ethics and environment, traditional and local production, and absence of contaminants. Similarly, Steptoe and colleagues (1995) explored the possibility to merge dimensions, and found a factor combining health, natural content, weight control and ethical concern. Similar to Steptoe and colleagues (1995) we do not favour to combine dimensions into higher order factors, as it reduces information which is unfortunate when we want to get a better understanding of the position of sustainability motivates in relation to other food choice motives. And finally, the correlations between the 'general sustainability' and the 'local and seasonal' factor with related concepts, namely attitudes towards sustainable food, general sustainability interest, and pro-environmental lifestyle, reveal that the sustainability motives correlate with related vested sustainability constructs.

Practical relevance of the two sustainability factors is shown by their predictive validity on food intake. Both 'general sustainability' motives and 'local and seasonal' motives were found to be positively associated with intake of organic and fair trade products, meat replacers, and free range products, products with a sustainability logo, and small portions of meat and dairy products. The consumption of seasonal and local products was positively associated with 'local and seasonal' motives, but not with 'general sustainability' motives. Some small differences between countries were observed. Generally, it seems that for Italy and Czech Republic consumption of the four different types of sustainable product groups was less related to the 'local and seasonal' motives, implying that in these countries these are more independent consumption motives, possibly related to the relative importance of local, traditional produce in these countries (Guerrero et al., 2009). Nevertheless, future research should further investigate how the two sustainability motives relate to specific consumption differences across countries and regions.

4.3. Practical implications

The findings of this study provide several practical implications. First, the fact that in consumers' food purchase motivations environmental, ethical and animal welfare aspects form a single dimension implies that in communication and marketing practitioners/ managers do not necessarily have to make a distinction between these different aspects of sustainability. For instance, introducing one hallmark covering all these different sustainability aspects may help guide consumers in making sustainable food choices without bothering them with the cognitive load to further weigh their choice between the, potentially even conflicting, environmental and societal factors underlying the sustainability concept.

More interestingly from a managerial point of view is that the current study showed that in consumers' behaviour and motivations, local and seasonal production is something different than (environmental) sustainability, and that it is therefore interesting from a marketing point of view to emphasize a product's locality or seasonality apart from communicating its environmental or societal sustainability. For example, marketing managers may use the positive feelings that are evoked by products that are local and/or seasonal in their marketing communications. Storytelling can be a relevant instrument in this regard: explaining where the ingredients of a product are sourced or telling how products are processed.

Another interesting practical implication results from the finding that sustainability motives correlate with other food choice motives, especially naturalness and health. This implies that sustainability motives align with other motives as well, something which can be used in marketing communication and product promotion. For example, managers or policy makers that develop promotional materials or marketing programs to encourage buying more sustainable products, also adjacent food choice motives could be emphasized such as a product's naturalness or healthiness. Finally, the fact that these results were found across several countries, and thus showing cultural validity, make these practical implications even stronger.

4.4. Limitations and future research

Future research is needed to further investigate the use and the practical relevance of the SUS-FCQ. First of all it would be interesting to further examine the subscales of the sustainability dimension and their stand-alone performance. The subscales for animal welfare, ethical concern and environmental welfare that are combined in the general sustainability dimension have not been validated as stand-alone scales, but the reliability of the subscales suggests that they could be used separately, for example when a certain sustainability aspect is not relevant in a particular study (e.g. animal welfare in a study on vegetable consumption). Lindeman and Väänänen (2000) draw the same conclusion for their subscales on animal welfare and environmental protection. Some studies focus on one aspect of sustainability and could for example be interested in including only the environmental items as an addition to the FCQ. Second, reliability could further be assessed by checking for test–retest reliability.

Moreover, the SUS-FCQ is a scale to measure sustainability motives in general. We know that food choice motives are product-category specific (Verain et al., 2016b) and context-specific (Verain et al., unpublished results). It could be the case that also the dimensionality of sustainability motives is product-category specific or context specific. Consumers' sustainability motives might be unidimensional on a general level, but not when it concerns a specific context or product category. For example when it concerns meat consumption, animal welfare and environmental welfare aspects might be distinct considerations. These aspects could sometimes be in conflict, for example in selecting organic meat, which is mostly beneficial in terms of animal welfare, but the environmental benefits of organic products are doubtful, depending on the parameter that is investigated (Meier, Stroessel, Junghbluth, Juraske, Schader, & Stolze, 2015; Tuomisto, Hodge, Riordan, & Macdonald, 2012). These kind of trade-offs cannot be researched with the current SUS-FCQ. Besides, the SUS-FCQ is developed as part of the original FCQ, which measure motives related to food consumption, which is not necessarily the same as consumers' motives when buying their food. Several contextual aspects can play a role at the point of purchase, for as time and (social) occasion, the physical context such as brands, prices, promotions, and availability. Food choice is not only driven by motivation, consumers also need to have the opportunity and ability to perform a behaviour. Therefore, answers to motivation questions could be influenced by the consumers' perceived opportunity to consume products with such characteristics. For example some types of

sustainable products may not be available in supermarkets. Future research should therefore investigate to what extent consumers' motivational scored are dependent on contextual factors. In addition, the cultural validity of SUS-FCQ has been shown for five European countries, but from literature we know that (the dimensionality of) food choice motives differ across cultures, specifically when it entails non-western cultures (e.g. Cunha et al., 2018; Wang, de Steur, Gellynck, & Verbeke, 2015). Further research is therefore needed if one wants to implement the SUS-FCQ in other cultures. We are confident that the scale is suitable for country comparison in Europe, due to the selection of our five countries with cultural and geographical spread across Europe. In addition, Markovina and colleagues (2015) confirmed the factor structure of the FCQ across 9 European countries, and Januszewska, Pieniak and Verbeke (2011) across 3 European countries (and the Philippines), showing the comparability in dimensional structure of food choice motives across Europe.

Current conceptualisations and definitions of sustainability define sustainability even more broadly than we have done in this research. For example aspects like affordability and health form part of the sustainability definition by the FAO. We decided not to include these aspects, as they are already covered in the original Food Choice Questionnaire within the dimensions of price and health. And also recycling, which was identified as one of the key factors of environmental sustainability in a literature review by Balderjahn and colleagues (2013a), has not been included in the current study, as it has to do with the disposal phase and not with the food choice itself. Although we envisioned a comprehensive coverage of the concept of sustainability in the SUS-FCQ, doubtlessly other aspects could arise that are not covered. Not even more so because sustainability is an evolving concept, both in definition as well as in consumer perceptions (Barone et al., 2020; Sesini et al., 2020; Siegrist et al., 2015).

5. Conclusion

The Sustainable Food Choice Questionnaire (SUS-FCQ) is developed as an addition to the Food Choice Questionnaire (developed by Steptoe et al., 1995) in order to include the full concept of sustainability. Two sustainability-related dimensions are identified: a 'general sustainability' dimension, including items related to animal welfare, environmental issues and ethical concerns and a 'local and seasonal' dimension. The SUS-FCQ shows good convergent, discriminant, cultural and predictive validity, and therefore is a valid and suitable scale to gain a better understanding of the position of sustainability motives against other motives in consumers' food choices in multiple countries.

CRediT authorship contribution statement

Muriel C.D. Verain: Conceptualization, Methodology, Writing - original draft, Writing - review & editing. **Harriette M. Snoek:** Conceptualization, Methodology, Formal analysis, Writing - original draft. **Marleen C. Onwezen:** Writing - review & editing. **Machiel J. Reinders:** Writing - review & editing. **Emily P. Bouwman:** Conceptualization, Methodology, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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