

The relationship between Big Five personality traits (Openness & Neuroticism) and Resistance to innovation

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Introduction

Negative changes in the earth's climate are noted by scientists across the world. According to the latest Intergovernmental Panel on Climate Change (IPCC) Report (2021), global temperature is expected to reach or exceed 1.5°C of warming. Already, climate change is responsible for weather and climate extremes across the world. These global environmental problems we face today are largely the result of human overexploitation of natural resources (European Environment Agency, 2019). We need to produce more with fewer inputs and see waste as a resource to preserve nature's ability to provide for us (European Environment Agency, n.d.).

One way to accomplish this is by innovating. However, between 40-90% of products that are launched to the market fail (Castellion & Markham, 2012; Gourville, 2014). For first-mover products, which are products completely new to the market, the failure rate is 47%. Thus, only half of the companies that pioneer in new product categories succeed (Gourville, 2014). According to Ram and Sheth (1989) one of the main reasons for these high failure rates is resistance from consumers to innovations. Innovation resistance is the resistance offered by consumers to innovations, either because it poses potential changes from a satisfactory status quo or because it conflicts with their belief structure' (Ram & Sheth, 1989). Due to a pro-innovation bias within the scientific literature, for many years, it was believed that all innovations were superior to their existing alternatives, and consumers would thus be disadvantaged by not adopting the innovation (Huang et al., 2021; Leong et al., 2020; Ram, 1987; Talke & Heidenreich, 2013). However, this approach only focuses on the positive aspects of innovations and ignores how new products often come with changes, uncertainties, and risks for the consumer (Ram & Sheth, 1989). Fortunately, nowadays, the importance of topic resistance to innovations is acknowledged and resistance to innovation has gained a lot of attention in recent years (Huang et al., 2021). However, there is still unambiguity on important topics and the amount of literature on some topics is limited.

One point that proves this is that within the innovation literature, no common way is used to measure the construct resistance against innovations (Huang et al., 2021). Often resistance is seen as a single dimension construct. However, recently, several authors have found that resistance should be seen as a multi-dimensional construct in which resistance should be

measured through cognitive, emotional, and behavioural dimensions (Oreg, 2006; Piderit, 2000).

In contrast to the innovation literature, the psychological literature has done a lot of research into the dimensions of resistance. Great similarities can be seen with the theory of Knowles and Riner (2007), researchers within psychology. They identified that resistance is constructed out of three dimensions: emotional resistance, cognitive resistance, and behavioural resistance. First, emotional resistance is the negative emotional reaction that displays itself when consumers feel that their choices have been taken away or that the range of alternatives is limited (Knowles & Riner, 2007). Second, cognitive resistance is the skeptical reaction that consumers have to a proposed innovation. Lastly, behavioural resistance can be defined as consumers' desire to not change (Knowles & Riner, 2007).

Within the innovation literature, some authors already build upon the fact that resistance should be measured through cognitive, emotional, and behavioural dimensions (Heidenreich & Handrich, 2014; Koch et al., 2020; Oreg, 2006). Very interesting results were found within these studies, in which personality characteristics play a role in the resistance shown by consumers. Here, the psychological literature, through the literature on personality traits, is combined with the innovation literature resulting in very interesting results where significant relations were found between personality traits and resistance to innovation (Heidenreich & Handrich, 2014; Koch et al., 2020; Oreg, 2006).

However, these studies only measure the relation between personality traits and resistance prior to the introduction of an innovation. Therefore, to understand the relation between personality traits and resistance better it would be very interesting to analyse these relations in a sustainable context, since resistance against sustainable innovations is not good for the success of these innovations.

In short, much can still be contributed to the resistance to innovation literature, especially when combined with the psychology literature, in the context of sustainability. This research, therefore, aims to display the relationship between the big five personality traits Openness to Experience and Neuroticism in relation to resistance to innovations in the context of radical sustainable innovations. The main question of the research will therefore be:

What is the relationship between Big Five personality traits (Openness to Experience, Neuroticism) and emotional, cognitive, and behavioural resistance to radical sustainable innovations?

One sustainable innovation was chosen to examine the relationship. The sustainable innovation is a burger made from insects, also called an insect burger.

The scientific relevance of this research will be the combination of the innovation literature with the psychology literature. Namely, that resistance is displayed as a three-dimensional construct, which is based on the psychological literature, and its relation to personality. The described circumstances in the context of sustainable radical innovations are also new to the literature and therefore very relevant. The literature will therefore be strengthened and extended.

Next to its scientific relevance, this research also has practical relevance. The research will generate insights into the effect of the personality traits openness to experience and neuroticism on resistance to innovations, in the context of radical sustainable innovations. These insights will help to better understand resistance against radical sustainable innovations and will therefore contribute to the awareness of resistance. As a result, more attention will be given to resistance to radical sustainable innovations, and companies will be able to adapt their business operations to the insights of this study. In the end, this needs to result in less resistance to sustainable innovations and will therefore also contribute to the reduction of the high failure rates among sustainable innovations. All in all, to give radical sustainable innovations better chances of succeeding, which will help to contribute to the environmental problems.

Theoretical Framework

This chapter presents scientific literature related to the most important concepts for this research through which the hypotheses are derived.

Resistance to innovations

Research related to innovation can be divided into two streams. The first stream focuses on the adoption of innovations, and the second stream focuses on resistance to innovations, which happens prior to the adoption phase (Laukkanen, 2016). Until recently, the focus was mainly on the successful adoption of innovations due to pro-innovation bias. Pro-innovation bias is based on the premise that all innovations are superior to their existing alternatives, and consumers would thus be disadvantaged by not adopting the innovation (Ram, 1987). However, this approach only focuses on the positive aspects of innovations and ignores how new products often come with changes, uncertainties, and risks for the consumer (Ram & Sheth, 1989). Therefore, the second stream related to resistance prior to adoption has rapidly gained prominence in recent years (Huang et al., 2021).

Ram and Sheth (1989) were among the first influential authors in the resistance to innovation literature. Their definition of resistance to innovations is still used often: ‘Innovation resistance is the resistance offered by consumers to an innovation, either because it poses potential changes from a satisfactory status quo or because it conflicts with their belief structure’ (Ram & Sheth, 1989). In other words, resistance displays itself when innovations demand an adjustment in consumers’ rooted behavioural patterns, norms, habits, and traditions and when any psychological problem or conflict occurs (Kleijnen et al., 2009). Therefore, according to Ram and Sheth (1989), resistance is one of the major causes for the high failure rates of innovations.

Even though sustainability is one of the most important topics of the 21st century, consumers also show resistance towards sustainable innovations (Kushwah et al., 2019; Sadiq et al., 2021; Wiedmann et al., 2011). Furthermore, sustainable innovations demand adjustments in consumer behaviour. The United Nations (n.d.) defines sustainability as ‘Meeting the needs of the present without compromising the ability of future generations to meet their own needs’. Sadiq et al. (2021) provide evidence that consumers experienced functional and psychological barriers against eco-friendly innovations. While the environmental concerns of consumers also played a moderating role

to some extent, the resistance nevertheless remained (Sadiq et al., 2021). This is unfortunate because eco-friendly products are more beneficial to the environment than conventional products (Paul et al., 2015). The insect burger, which is the innovation researched within this research, has significant environmental advantages. The known advantages of insect farming as compared with livestock production are the use of less water and land and lower greenhouse gas emissions (van Huis & Oonincx, 2017). Despite the focus on sustainability and insects as food in the recent years, European consumers have remained hesitant about the consumption of insects (Hartmann et al., 2015; Verbeke, 2015)

The insect burger can be classified as a radical innovation, which the literature distinguishes from incremental innovations (Heidenreich & Kraemer, 2015; Veryzer Jr, 1998). Radical innovations are breakthrough innovations that ask for dramatic leaps in terms of familiarity and use for the customer (Veryzer Jr, 1998). These innovations are often responsible for new technological systems, industries, or domains (Kasmire et al., 2012). Consumers also classify radical innovations as incongruent within their established usage patterns, whereas incremental innovations are congruent with them (Heidenreich et al., 2016). Therefore, incremental innovations are more perceived as mere improvements or refinements to already existing innovations (Kasmire et al., 2012). Radical innovations are more likely to elicit innovation resistance because radical innovations are perceived by consumers as more different than incremental innovations (Heidenreich & Kraemer, 2015; Veryzer Jr, 1998).

At this point within the innovation literature, no unambiguous way is used to measure the construct resistance against innovations (Huang et al., 2021). Various scientific studies have used different operationalisations of resistance to innovations. Often, resistance is measured as a single-dimension construct. Nonetheless, recently, multiple authors have measured resistance to innovation as a multi-dimensional construct (Kuisma et al., 2007). This is often due to the suggestion of Ram and Sheth (1989), who claim that resistance to innovation is constructed out of functional resistance and psychological resistance. Functional resistance refers to innovations which do not fit the specific needs and/or usage patterns of the consumer (Talke & Heidenreich, 2013). Psychological resistance occurs when the innovation conflicts with social norms, values, or individual usage patterns from the consumer and if the innovation is too risky (Kleijnen et al., 2009; Talke & Heidenreich, 2013). Recently, more attention has been given to emotional resistance as well. According to Valor (2020) and Castaño et al. (2008), innovations can cause feelings of stress, anxiety, and fear among consumers. In line with this, Castro et al.

(2019) have found that resistance can be seen as a construct with a cognitive and emotional dimension. Combining the insights from the above-described literature, the current study notes that great similarities can be seen with the psychological theory of Knowles and Riner (2007). Knowles and Riner (2007) identify three dimensions of resistance: emotional resistance, cognitive resistance, and behavioural resistance. This aligns with Piderit (2000) and Oreg (2006), who also believe that a comprehensive conceptualisation of resistance requires cognitive, affective, and behavioural dimensions.

The current study builds further on the views of Knowles and Riner (2007) regarding the three dimensions of resistance. First, emotional resistance is the negative emotional reaction that displays itself when consumers feel that their choices have been taken away or that the range of alternatives is limited (Knowles & Riner, 2007). As a result, resistance occurs to restore the threatened freedom, and a typical reaction for this type of resistance is ‘I don’t like it!’ (Knowles & Riner, 2007, p.86) Second, cognitive resistance is the skeptical reaction that consumers have to the proposed content. This type of resistance focuses completely on the content, and a typical reaction of this type of resistance is ‘I don’t believe it!’ (Knowles & Riner, 2007, p. 86). Lastly, behavioural resistance can be defined as consumers’ desire to not change (Knowles & Riner, 2007, p. 86). Knowles and Riner (2007) also note that because people want to avoid disruption and spending energy on new ideas and actions, a typical reaction here is ‘I won’t do it!’ (p.86).

While resistance can clearly be seen as a multidimensional concept, the different dimensions of consumer resistance depend on many factors and can vary greatly among individual consumers. Among other factors, previous research has found evidence that personality plays a role in the reactions of consumers to resist innovations (Heidenreich & Handrich, 2014; Koch et al., 2020; Mani & Chouk, 2018). Personality can be seen as a combination of characteristics and tendencies that unconsciously affects an individual’s cognition and behaviour (Koch et al., 2020). Several studies have examined the effect of consumers' big five personality traits in relation to their intention to adopt innovations (Lissitsa & Kol, 2019; Malik & Singh, 2022; Xu et al., 2016). However, there are limited studies that focus on the big five personality traits and resistance in the context of sustainable innovations.

Personality trait: openness to experience

Openness to experience is one of the five broad factors of personality, or big five personality traits, according to the five-factor model (McCrae & John, 1992). The big five model assumes that an individual’s personality can be described based on five personality traits (Goldberg,

1990). Openness to experience is characterised by individuals' propensity to try new things and value unusual ideas and experiences (Korukonda, 2007; Lissitsa & Kol, 2019). Therefore, people who score high on openness to experience tend to be curious, adventurous, imaginative, and emotional (Costa & McCrae, 1992). Moreover, they are often interested in areas such as art and music (Costa & McCrae, 1992). People who score high on openness to experience are also often inventive and can easily change their ideas and beliefs due to new experiences and information (Korukonda, 2007). Lastly, several researchers have found that openness to experience is a strong predictor of individuals' innovativeness (Ali, 2019; Steel et al., 2011).

A few researchers have examined the relationship between openness to experience and resistance to innovation, namely Koch et al. (2020), Heidenreich and Handrich (2014), and Oreg (2003). However, an important difference between these articles and the current study is the former measure the relationship between openness to experience and resistance before the introduction of any innovation. This is based on the theory that consumers already resist innovations before evaluating it (Heidenreich & Spieth, 2013). This study instead focuses on the relationship between openness to experience and resistance within the context of radical sustainable innovations. To the knowledge of the researcher, no previous research has been done in this area. Nevertheless, the results of these previous articles still present valuable insights for the hypotheses of this research. Heidenreich and Handrich (2014) and Koch et al. (2020) have found that as a consumer's openness to experience increases, their resistance to innovations decreases. Furthermore, Oreg (2003) has found significant, though weaker, relationships between openness to experience and resistance to innovations. Lastly, Koch et al. (2020) explain that lower resistance is expected because people who score high on openness to experience often try new things, which requires behavioural change and thereby reduces a person's resistance to change.

In summary, the previous literature has shown that a higher openness to experience produces a lower experienced resistance. A similar reaction is expected regarding emotional resistance, which is the negative emotional reaction that displays itself when consumers feel that their choices are taken away or that the range of alternatives is limited (Knowles & Riner, 2007). Since people who score high rather low on openness to experience are more likely to see new ideas as useful rather than as threatening (Nekljudova, 2019), they are also better at putting problems into perspective by trying to think positively about them (Nekljudova, 2019). As a result, they often see opportunities instead of threats (Nekljudova, 2019). In other words, people

who score high on openness to experience would not consider innovations as limiting their choices but instead as expanding them, thus lowering resistance. In line with the results of the previous literature (Koch et al., 2020; Oreg, 2003; Heidenreich and Handrich, 2014) and the characteristics of openness to experience, this study proposes the following hypothesis:

H1a: As consumers' openness to experience increases, their experienced emotional resistance to radical sustainable innovations decreases.

To continue, the personality trait openness to experience is also expected to influence consumers' experienced amounts of cognitive resistance, where people react skeptically to innovations (Knowles & Riner, 2007). To begin, one characteristic of openness to experience is that it positively correlates with divergent thinking and creativity (McCare, 1987). In addition, people who score high on openness to experience tend to score high on flexibility and fantasy, resulting in a developed picture of thinking (Nekljudova, 2019). Besides, researchers found that consumers who score high on openness to experience have higher cognitive abilities, meaning that they could better understand information and react to unforeseen changes (Smillie, 2017; Lepine et al., 2000). These characteristics then imply that openness to experience makes people react less skeptically to innovations because they are more open to seeing the possibilities of innovations. Given the results of the previous literature (Heidenreich & Handrich, 2014; Koch et al., 2020; Oreg, 2003) and the characteristics of openness to experience, this study proposes the following hypothesis:

H1b: As consumers' openness to experience increases, their experienced cognitive resistance to radical sustainable innovations decreases.

Furthermore, behavioural resistance, which comes from the desire to not change (Knowles & Riner, 2007), is also expected to be related to openness to experience. Openness to experience is characterised by the 'willingness to engage with complex and novel environmental stimuli including ideas, individuals, cultures, sensations, as well as other experiences' (Boyd, 2020, p. 3333). It is also related to individual innovation behaviour, such as work behaviour where one generates and applies new ideas and approaches in the workplace (Wu et al., 2011; Yesil & Sozbilir, 2013). Besides, Oreg (2003) and Saksvik and Hetland (2009) found that openness to experience was negatively correlated to routine seeking. Thus, one assumes that openness to experience reduces the desire to not change since people who score high on openness to

experience are willing to try new things and are not routine seekers. Given previous research (Heidenreich & Handrich, 2014; Koch et al., 2020; Oreg, 2003) and the characteristics of openness to experience, this study proposes the following hypothesis:

H1c: As a consumers' openness to experience increases, their experienced behavioural resistance to radical sustainable innovations decreases.

Personality trait: neuroticism

Neuroticism is another one of the big five personality traits (McCrae & John, 1992). Neuroticism can be characterised by the tendency to experience negative feelings and distress, including anxiety, insecurity, sadness, anger, fear, irritability, loneliness, worry, dissatisfaction, and low self-esteem (Ali, 2019; Costa & McCrae, 1992; Jeronimus et al., 2014). People who score high rather than on neuroticism are more vulnerable to psychological stress and tend to emotionally overreact more often (Ali, 2019; Devaraj et al., 2008). Overall, neurotic people are not likely to be open to new experiences (Lissitsa & Kol, 2019). Furthermore, several studies have found that neurotic individuals face difficulties with innovative behaviour and participating in innovative ideas (Ali, 2019; Rossberger, 2014).

Koch et al. (2020), Heidenreich and Handrich (2014) and Oreg (2003) have also researched the relationship between neuroticism and an individual's initial reaction of resisting innovations. All articles have found a positive correlation between neuroticism and resistance to innovations. This means that as individuals' neuroticism increases, their experienced resistance to innovations decreases. Koch et al. (2020) expect that insecurity and emotional instability, which are characteristic of neuroticism, result in risk aversion and thereby resistance to innovations, as innovations often come with changes, uncertainties, and risks for the consumer (Ram & Sheth, 1989). Oreg (2003) has found that the highest positive correlation between neuroticism and resistance to innovations relates to emotional levels, such as stress and tension.

The previous literature has shown that increased neuroticism leads to increased levels of experienced resistance. This relationship is also expected with emotional resistance. First, individuals who score high on neuroticism experience more negative feelings, are more emotionally reactive, and more prone to overreact in situations than those with low scores (Rossberger, 2014). Therefore, neurotic individuals also react more severely to potential losses and risks (Lissitsa & Kol, 2019). Further, highly neurotic people often interpret normal situations as threatening and difficult (Rossberger, 2014). Given that neurotic people experience

comparatively more negative emotions, their emotional resistance is also expected to be higher. Given the results of the previous literature (Heidenreich & Handrich, 2014; Koch et al., 2020; Oreg, 2003) and the characteristics of neuroticism, this study proposes the following hypothesis:

H2a: As consumers' neuroticism increases, their experienced emotional resistance to radical sustainable innovations increases.

Furthermore, cognitive resistance is expected to be related to neuroticism. To begin with, radical innovations often ask for dramatic leaps in terms of familiarity and use for the customer (Veryzer Jr, 1998). However, according to research neurotic people are not creative thinkers (Piderit, 2000; Xu et al., 2016). In combination with the fact that neurotic individuals experience negative feelings often and tend to overreact in normal situations (Lissitsa & Kol, 2019; Rossberger, 2014), it is expected that neurotic individuals will not be open to and lack the creativity to fully understand radical innovations, which will result in cognitive resistance. Thus, given the results of previous literature (Heidenreich & Handrich, 2014; Koch et al., 2020; Oreg, 2003) and the characteristics of neuroticism, this study proposes the following hypothesis:

H2b: As consumers' neuroticism increases, their experienced cognitive resistance to radical sustainable innovations increases.

Lastly, behavioural resistance is also expected to be related to neuroticism. The research from Oreg (2003) and Saksvik and Hetland (2009) states that the personality trait Neuroticism correlates positively with routine seeking, meaning that neurotic individuals seek routines in their daily life, don't like change and don't like to try out new things. This is in line with the research of Lissitsa & Kol (2019) who found that neurotic people are not open to new experiences. Thus, it is expected that neurotic individuals would also not be open to changing their behaviour for sustainable radical innovation. Given previous research (Heidenreich & Handrich, 2014; Koch et al., 2020; Oreg, 2003) and the characteristics of neuroticism, this study proposes the following hypothesis:

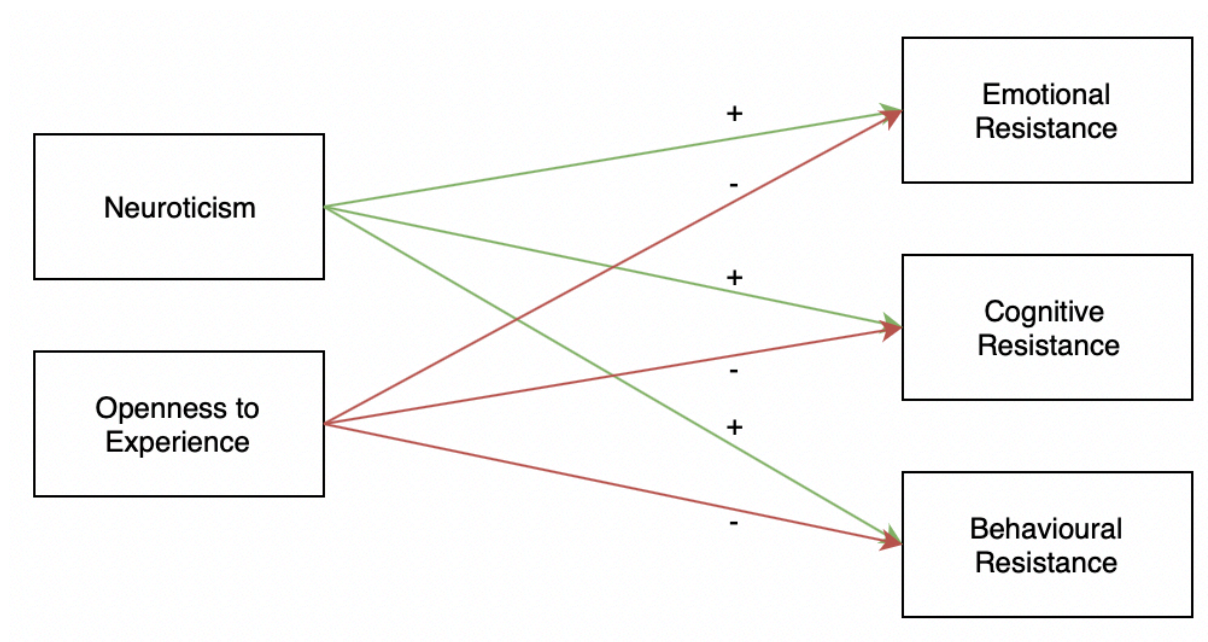
H2c: As consumers' neuroticism increases, their experienced behavioural resistance to radical sustainable innovations increases.

Conceptual model

The following conceptual model has been designed to combine all the hypotheses. It is expected that openness to experience always correlates negatively with the different types of resistance, while neuroticism is always expected to positively correlate with all the dimensions of resistance.

Figure 1

Conceptual model



Methodology

This chapter describes the research strategy, which is followed by information about the sample of the research and an outline of the survey procedure. It then presents the measurement instruments, which are tested on their validity and reliability. The chapter ends with a discussion of research ethics.

3.1 Research Strategy

This study focuses on openness to experience and neuroticism in relation to emotional, cognitive, and behavioural resistance against radical sustainable innovations. The research is deductive because it aims to combine different theories from the literature (Saunders et al., 2019). The research question is answered via quantitative research, more specifically survey-based research. The study is a mono-method quantitative study because the data has been collected via a single data collection technique (Saunders et al., 2019). Although the use of multiple methods is often preferable, this was not possible due to the limited time available. Moreover, the use of survey-based research has several advantages: it is an efficient way to collect standardised data from many respondents, and the results are easy to explain and understand (Saunders et al., 2019).

3.2 Sample

Sampling technique

Data was collected via a sample of the population. The population of this research were adults who speak Dutch, and the sample of this research mainly consisted of people who were living in the Netherlands. By surveying only Dutch-speaking people, possible cultural differences were limited. The survey was only available in the Dutch language, which excluded people from the population but also limited translation errors. Furthermore, only people above the age of 18 were included in the sample to prevent ethical problems where parental consent is needed. The sample was not limited to further restrictions.

Data was collected via non-probability sampling. The reason for this is that it was not possible to create the sampling frame needed for probability sampling, due to missing information and the limited time and resources available (Saunders et al., 2019, p. 315). The first probability sampling technique used for this research was convenience sampling. Convenience sampling is a type of sampling technique in which people are sampled because they are ‘convenient’ sources

of data (Lavrakas, 2008). This technique was chosen because there was only limited time and resources available for the collection of the data. To partly resolve the disadvantage that this technique is prone to bias, the survey was sent out via different platforms which all have different types of users: Instagram, LinkedIn, Facebook, WhatsApp, and e-mail (Auxier & Anderson, 2022). As the researcher's social environment mainly consists of highly educated people within the age group of 20-30, the researcher also decided to collect respondents in front of a supermarket to attract a more diverse group.

The second type of sampling technique used was snowball sampling. Snowball sampling is a method of generating a pool of participants for a research study through referrals made by individuals (Crouse & Lowe, 2018). In the messages that were sent with the request to fill in the survey, people were also asked to share the survey. An advantage of the snowball sampling method is that many people from the population can be reached in a short period of time. One disadvantage, however, is that respondents probably attract people similar to themselves, resulting in a hazard for a homogeneous sample (Saunders et al., 2019). This is another reason as to why the survey was distributed in front of a supermarket.

Together with Hilde Bos, Ricky Gommans, Paola Spaan, and Julia Moolenaar, the researcher collected data for the questionnaire. The advantage of this is that more respondents filled in the questionnaire than if everyone had collected respondents individually. Resulting in more power in the analysis. A disadvantage was that the questionnaire consisted of more questions than were necessary for this study, and a higher dropout rate occurred than was expected. In this paper, only the questions needed for this research are discussed.

Sample characteristics

In total, 903 respondents filled in the survey, of which 697 respondents filled in the survey completely. People who were below the age of eighteen, did not give their consent to participate in the survey, and/or did not fill in the resistance questions completely were removed from the sample. The resistance items are a highly important part of the research, and therefore the respondents with incomplete answers on the resistance scale were removed. Eventually, the analyses were completed with the data from 743 respondents. Among these respondents, all the variables had a missing below 10%. According to Hair et al. (2019), missing data under 10% can generally be ignored. Missing data within this research can be classified as missing at random (MAR), because the missing data slowly rises with each question due to respondents

ending the survey before the end. Within this final sample, 241 respondents were male (32.4%), and 445 respondents were female (59.9%). Moreover, 57 respondents did not fill in the question or gave a different answer. The average age of the participants in the survey was 33.49 ($SD = 15.62$; range: 18-81), which is lower than the average age of the Dutch population at 42.3 (Statista, 2022a). The educational level of the respondents ranged from elementary school to PhD. HBO bachelor occurred most frequently (24%), and overall the sample was more highly educated (HBO, WO & PhD: 63.3%) as compared with the Dutch population (HBO, WO & PhD: 35.5%) (Statista, 2022b). More information can be found in appendix 1.

3.3 Procedure

As previously mentioned, the survey consisted of several questions that were not relevant for this research due to a collaboration with other researchers for extra power. An overview of the survey flow with the relevant and irrelevant questions highlighted can be seen in table ... The irrelevant questions for this research are to be discussed. The programme used for the survey is Qualtrics, where people could participate in the survey via a link. When opening the link, people first saw an introduction, followed by two questions. These two questions filtered out the people who did not give consent to participate or who were below the age of 18. These people were directed to the end of the survey. The remaining group of respondents started with questions related to openness to experience and neuroticism to avoid the results of the personality questions being influenced by the resistance questions. Next, the introduction and questions of innovation 1, the insect burger (only relevant for this research), or innovation 2 followed. The order respondents saw the innovations differed between the respondents to prevent the ‘order-effect’. This means that some respondents first saw the introduction and questions of innovation one, and some respondents first saw the introduction and questions of innovation two. The introduction text of the insect burger can be seen in appendix 3. Lastly, the survey ended with demographic questions. All the answer options for the personality and resistance questions were in the form of a five-point Likert scale ranging from ‘strongly disagree’ to ‘strongly agree’. To prevent ‘straight lining’, which refers to respondents giving the same answer in a series of questions arranged on a grid (Schonlau & Toepel, 2015), some questions were formulated in reverse. Moreover, the questions were spread out over several pages for the same reason. Overall, the questionnaire took respondents about twelve minutes to complete. To limit the non-responses, the respondents got a notification that they were almost at the end of the survey when they had answered more than half of the questions to motivate them to continue. Another

method used to limit non-responses is that three gift vouchers were raffled among the people who left their contact details behind. This contact data was stored separately from the answers and could also not be linked to the answers filled to ensure that results remained completely anonymous.

Table 1

Survey flow

				Randomized			
1	2	3	4	5	6	7	8
Introduction & permission	Age	Openness & Neuroticism	Trait	Innovation 1	Innovation 2	Manipulation check	Demographics
				- Introduction	- Introduction	- Innovation 1	- Gender
				- Resistance	- Resistance	- Innovation 2	- Education
				- Antecedents	- Antecedents		
				- Consequences	- Consequences		

Note. The red highlighted blocks were parts of the survey that were not used within this research.

3.4 Measurement instruments

This section describes the measurement instruments used within this study. A detailed overview of the measurement instruments can be found in appendix 2: measurement instruments.

Manipulation check

To confirm that the insect burger can be classified as a radical innovation instead of an incremental innovation, the researcher added a manipulation check to the survey. Within the survey, three items measured how radical the innovation was, and two items measured how incremental the innovation was. An example of an incremental item is ‘The insect burger is very similar to what I already know’. An example of a radical item is ‘The insect burger is a completely different product as compared with (meat) burgers’. The radical and incremental items were based on Kasmire et al.’s (2012) definitions of radical innovations and incremental innovations. Furthermore, the radical items were also based on the survey from Carlo et al. (2014). The definitions and survey questions from Carlo et al. (2014) can be found in appendix 2. However, although the items are based on theory, the composite scale has not been validated before. Therefore, attention has been given to the validation of the scale via a factor analysis, which is discussed later in this chapter. An overview of all the items can be found in appendix 2: measurement instruments.

Openness to experience & neuroticism

To measure the independent variables openness and neuroticism, the researcher used validated items from a Dutch translated scale. The original scale from John and Scrivastava (1999) is a well-known and freely available scale designed to measure the big five factors of personality. The scale has good internal consistency and convergent validity with other well-known big five scales (Denissen et al., 2008). Denissen et al. (2008) translated the scale into a valid and reliable Dutch scale. Ten openness and eight neuroticism items from this translated scale were used in the survey. The item ‘Is original, comes up with new ideas’ is an example item that measures openness (Denissen et al., 2008), while ‘Gets nervous easily’ is an example of an item that measures neuroticism (Denissen et al., 2008). An overview of all the items can be found in appendix 2: measurement instruments.

Resistance

As previously mentioned, the independent variable of resistance was viewed as a three-dimension variable encompassing emotional, cognitive, and behavioural resistance. In the survey, each dimension was measured via three items. The items which measured emotional and cognitive resistance were based on items from from Ngafeeson and Manga (2021), building on the idea that the conceptualisation of resistance must cover emotional, cognitive, and behavioural realms. An example of an item from emotional resistance is ‘I feel irritation when I think about the insect burger,’ and an example from cognitive resistance is ‘I don’t see any potential in the insect burger’. The three items from behavioural resistance all came from different articles, such as Lee and Ashton (2004), Ngafeeson and Manga (2021), and Heidenreich and Spieth (2013). However, all items were carefully selected to match the definitions of the different types of resistance explained in chapter 2. Thereby, all scales are checked for convergent and discriminant validity and reliability. An example of a behavioural resistance item is ‘There is a good chance that I will buy the insect burger’.

3.5 Data analysis

The independent and dependent variables in this research were measured via a five-point Likert scale. While Likert scales can be treated as interval scales, they are technically ordinal scales (Kang, 2013; Watkins, 2018). Within this research, it was treated as an interval scale. Although all the questions used in the questionnaire are based on reliable and validated scales, the data was first analysed via exploratory factor analysis and Cronbach’s alpha to test the validity and

reliability of the scales used (Watkins, 2018; Kang, 2013). Furthermore, factor analysis helped with data summarisation and data reduction (Hair et al., 2018). The data of the manipulation check were then analysed via a t-test to see if the insect burger scored significantly higher on the radical items instead of the incremental items, which would confirm that the insect burger is a radical innovation. To answer the main question of this research, three multiple linear regression analyses were performed, as described in the next chapter. Multiple linear regression was chosen to analyse the linear relationships between the independent and dependent variables.

3.6 Reliability and validity of the measurement instruments

To achieve valid and reliable scales, the validity was achieved by assessing the convergent, discriminant, and nomological validity, and the reliability was assessed through Cronbach's alpha (Hair et al. 2018). Furthermore, the author measured whether the insect burger is significantly seen as a radical innovation through a manipulation check.

Manipulation check

A factor analysis was performed to see if the data showed two types of dimensions, namely radical and incremental. Several criteria were checked to see if the explorative factor analysis was an appropriate technique to use. First, there was sufficient correlation among the items of the manipulation check. The Kaiser-Meyer-Olkin measure of sampling adequacy was .66. Furthermore, Bartlett's test of sphericity showed significant results ($\chi^2(10) = 575.1, p < .001$) (Field, 2018). These results confirmed that factor analysis was appropriate to use. Explorative factor analysis was done via principal axis factoring because the main goal was to identify dimensions and not reduce data (Hair et al. 2018). Initial eigenvalues show that there were two factors with an eigenvalue above one, according to Kaiser's criterion (Field, 2018). Furthermore, all communalities were above .2. Promax rotation was used because there was correlation between the items (Field, 2018). All factor loadings exceeded the minimum factor loading of .4, except INS_MC_RAD_1 loaded on the incremental items instead of the radical items. After deleting INS_MC_RAD_1, all loadings were still high enough and other assumptions were still met. Thus, incremental items two and four loaded on factor one and radical items three and five loaded on factor two. Ultimately, the scale's reliability of the incremental items was .63 and the reliability of the radical items was .63. Through these analyses, validity and reliability for the manipulation check were achieved.

After the validity and reliability of the manipulation check were achieved, the aggregated mean of the radical items was compared to the aggregated mean of the incremental items by conducting a Paired Sample T-Test. As expected, the respondents perceived the insect burger to be more radical ($M = 3.575$ $SD = .851$) than incremental ($M = 2.561$, $SD = .892$). The result found was significant; $t(696) = 19.46$, $p = <.001$. Appendix 4: Construct reliability and validity gives an overview of the important tables for the analyses done.

Openness to experience

Firstly, to see if all criteria are met, the author observed that 9 of the 10 items correlated at least .3 with at least one other item of openness, suggesting reasonable factorability. The Kaiser-Meyer-Olkin measure of sampling adequacy was .77, which is above the advised value of .6 (Field, 2018). Lastly, Bartlett's test of sphericity was significant ($\chi^2 (45) = 1731.1$, $p < .000$)(Field, 2018). These results confirmed that factor analysis is appropriate to use. The explorative factor analysis was done via principal axis factoring. Initial eigenvalues indicated two factors with an eigenvalue above 1, according to Kaiser's criterion (Field, 2018). Furthermore, all communalities, except for one item (Rev_OPENNESS_7), were above .2. Factor loadings were each examined using Varimax and Promax rotation. However, due to the correlation between the items, Promax was used as the rotation method (Field, 2018). Rev_OPENNESS_7 was deleted because its factor loading and communality were classified as low, which is a sign that the item does not explain the construct of openness well (Hair et al., 2019). One possible reason for the different result than expected on this item is that the respondents might have misunderstood this item. This is because it was also the first item that was formulated in reverse. After the deletion of this item, all factor loadings exceeded the minimum factor loading of .4, and there were no cross loaders (Field, 2018; Hair et al., 2018). Ultimately, openness items 1, 2, 3, 4, 5, and 8 loaded on factor one, and openness items 6, 9, and 10 loaded on factor two. Factor two consisted of all the items of openness related to art. However, as art is part of the personality trait of openness, all the items from openness are seen as one factor instead of two in this research. The scale's reliability is .754, which was improved after the deletion of Rev_Openness_7. Through these analyses, validity, and reliability for the construct of openness were achieved. Appendix 4: Construct reliability and validity gives an overview of the important tables for the analyses done.

Neuroticism

Again, several criteria were checked before the explorative factor analysis. First, there was sufficient correlation among the neuroticism items. The Kaiser-Meyer-Olkin measure of sampling adequacy was .88. Furthermore, Bartlett's test of sphericity was significant ($\chi^2(28) = 1790.2, p < .000$)(Field, 2018). These results confirmed that factor analysis was appropriate to use. Once more, explorative factor analysis was done via principal axis factoring. Initial eigenvalues showed that there was one factor with an eigenvalue above 1, according to Kaiser's criterion (Field, 2013). Furthermore, all communalities, except for one item (NEUROTICISM_6), were above .2. No rotation was used because there was only one factor indicated. No items were deleted because all factor loadings were above the minimum of .4 and had no cross loadings (Field, 2018; Hair et al., 2018). Although the communality of one item was not above .2, it was chosen to remain on the original validated scale. Ultimately, all neuroticism items loaded on one factor, which aligned with the expectations. The reliability of the scale was .833. In summary, no items were deleted, and validity and reliability were achieved for the construct neuroticism. Appendix 4: Construct reliability and validity gives an overview of the important tables for the analyses done.

Resistance

Factor analysis was again the appropriate technique to use given that all criteria were met. All 9 items correlated at least .3 with at least one other item of resistance (Field, 2018). Kaiser-Meyer-Olkin's measure of sampling adequacy was .90. Furthermore, Bartlett's test of sphericity was significant ($\chi^2(36) = 3840.7, p < .000$)(Field, 2018). The explorative factor analysis was again done via principal axis factoring because the main goal was to identify dimensions and not reduce data (Hair et al., 2018) Initial eigenvalues indicated that there were only two factors with an eigenvalue above 1, despite the expectation that three factors would have this result (emotional, cognitive, and behavioural resistance). The items from cognitive resistance loaded under two factors instead of one. As these items were retrieved from a validated scale, the researcher decided to rerun the principal axis factoring with a fixed amount of three factors. In addition, the Promax rotation was used because of the correlation between the items (Field, 2018). All communalities were above .2, and all factor loadings loaded under the correct factor. The only exception was the INS_COG_RESISTANCE_4 item, which cross loads with all factors, and the author decided to delete this item. After the deletion of this item, there were no more cross-loadings, and all factors loaded under the correct factor. The reliability of emotional resistance scale was .864, for the cognitive resistance scale it was .738 and for the

behavioural resistance scale it was .874 Through these analyses, validity and reliability for the construct of resistance were achieved. Appendix 4: Construct reliability and validity gives an overview of the important tables for the analyses done.

Discriminant validity

Discriminant validity focuses on the degree to which two concepts are distinct (Hair et al., 2018). To ensure that all the scales are distinct from one another, the author performed exploratory factor analysis with all the independent and dependent variables. Principal axis factoring was run with an oblique rotation (Promax) because there was some correlation between the factors, which is expected within social sciences (Costello & Osborne, 2005). The factor loadings displayed two openness factors, two neuroticism factors, and one resistance factor. There were no cross loaders or items that loaded on a different factor than expected. However, there was only one factor for resistance (instead of three) and two factors for both openness and neuroticism. This is understandable because the different resistance dimensions correlated. As the other rotation methods produced the same result, a second principal axis factoring with Promax rotation and a fixed number of three factors was run. This resulted in one factor each for openness, neuroticism, and resistance and no cross loaders. Furthermore, the component correlation matrix with the correlation between the factors was checked. All the factors correlated less than .7 with one another, which also indicates discriminant validity. Overall, the discriminant validity has been achieved. Even though the dependent variable of resistance did not form three separate dimensions, discriminant validity is less important among these dimensions because they are not used in the same regression analysis. Important tables for the discriminant validity can be found in appendix 4: construct reliability and validity.

3.7 Ethics

Within this research, attention has been given to ethics. First, the research was performed according to the research restrictions of Radboud University. For the survey, the respondents were informed about the purpose of the research and were asked for permission to use their data in the research. As previously mentioned, only people above the age of 18 could participate in the research to avoid ethical problems with parental consent. Moreover, the respondents could end and withdraw from the survey at any time. Furthermore, the survey was completely anonymous, and the respondents were informed of this. The personal data requested for the gift vouchers were also stored separately and could not be linked to the data of the survey.

Furthermore, all the data collected was stored in a secure online environment of Radboud University. Lastly, as a researcher, I also promise to abide by the rules of scientific research.

Results

To examine the relationships between the independent variables and dependent variables, the researcher performed three multiple linear regression analyses. For these multiple linear regression analyses, the items from openness to experience, neuroticism, emotional resistance, cognitive resistance, and behavioural resistance were aggregated into the following single average variables: MEAN_OPENNESS, MEAN_NEUROTICISM, MEAN_RES_EM, MEAN_RES_COG, and MEAN_RES_BE.

4.1 Assumptions multiple linear regression analyses

According to Field (2018) several assumptions need to be checked before doing a multiple linear regression analysis, namely correct measurement levels, linearity, homoscedasticity, multicollinearity, and normality. All these assumptions were tested for the three multiple linear regression analyses performed. First, the independent and dependent variables are both of scale level and therefore suitable for regression analysis. Second, the scatterplots showed that all relations between the independent and dependent variables are linear and homoscedastic. Further, there was no multicollinearity in the data because all correlations between the independent variables were below .80. Lastly, the skewness and kurtosis of all individual items are between -3 and +3, therefore normality can be assumed.

4.2 Multiple linear regression analysis - Emotional Resistance

Multiple linear regression was used to test if openness to experience and neuroticism significantly predicted emotional resistance. The overall regression was statistically significant (adj. $R^2 = .03$ $F(2, 740) = 11.34$, $p = <.001$), and the relationship between openness to experience and emotional resistance was marginally significant ($\beta = -.07$, $p = .058$). However, significance levels were not high enough. Therefore, hypothesis 1a was not supported, which means that the personality trait openness to experience does not significantly affect experienced emotional resistance to radical sustainable innovations. Furthermore, the results show that neuroticism significantly predicted emotional resistance ($\beta = .16$, $p = <.001$). Hence, hypothesis 2a was supported, which means that increased consumer neuroticism led to increased emotional resistance to radical sustainable innovations.

4.3 Multiple linear regression analysis - Cognitive Resistance

Another multiple linear regression was calculated to test if openness to experience and neuroticism significantly predicted cognitive resistance. The overall regression was statistically not significant ($\text{adj. } R^2 = .001$, $F(2, 740) = 1.54$, $p = .214$), and the relationship between openness to experience and cognitive Resistance was also not significant ($\beta = -.01$, $p = .867$). Consequently, hypothesis 1b was not supported, which means that the consumer's openness to experience did not significantly influence cognitive resistance. The relationship between neuroticism and cognitive resistance was marginally significant ($\beta = .06$, $p = .081$). However, this still resulted in the rejection of hypothesis 2b because the significance levels were not high enough. This means that neuroticism did not significantly affect the experienced cognitive resistance to radical sustainable innovations.

4.4 Multiple linear regression analysis - Behavioural Resistance

Lastly, a multiple linear regression was used to test if openness to experience and neuroticism significantly predicted behavioural resistance. The overall regression was statistically significant ($\text{adj. } R^2 = .02$, $F(2, 740) = 7.50$, $p < .001$), and openness to experience significantly predicted behavioural resistance ($\beta = -.11$, $p = .003$). Hence, hypothesis 1c was supported, which means that increased consumer openness to experience led to decreased behavioural resistance to radical sustainable innovations. Furthermore, neuroticism also significantly predicted behavioural resistance ($\beta = .09$, $p < .014$). Consequently, hypothesis 2c was also accepted, which means that increased consumer neuroticism led to increased behavioural resistance to radical sustainable innovations.

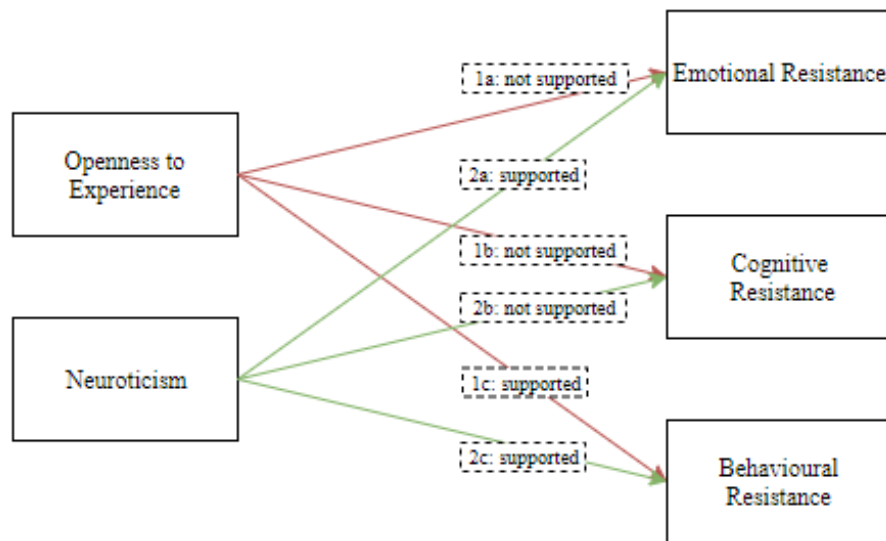
Table 2:

Results of the significance levels of the hypotheses

Hypothesis	Path	Coefficient (t-value)	p-value
H1a (rejected)	Openness to Experience > Emotional Resistance	-.07 (-1.90)	.058
H2a (accepted)	Neuroticism > Emotional Resistance	.16 (4.36)	<.001
H1b (rejected)	Openness to Experience > Cognitive Resistance	-.01 (-.167)	.867
H2b (rejected)	Neuroticism > Cognitive Resistance	.06 (1.75)	.081
H1c (accepted)	Openness to Experience > Behavioural Resistance	-.11 (-2.98)	.003
H2c (accepted)	Neuroticism > Behavioural Resistance	.09 (2.46)	.014

Figure 2:

Conceptual model with results of the hypotheses



Conclusion and discussion

5.1 Main findings and theoretical implications

In recent years, resistance to innovation has become a topic that gained more attention within scientific research. For many years the adoption literature had the focus point, as a result, innovation literature has had considerably less attention (Heidenreich & Handrich, 2014). Therefore, the literature on resistance to innovation is still evolving. Even though personality traits have been extensively researched in the psychological literature, there is still much to learn in the innovation literature. Koch et al. (2020), Oreg (2003), Heidenreich and Handrich (2014) and others have already contributed to this and uncovered interesting insights about the relation between personality traits and resistance to innovation. To also contribute, the objective of this study was to examine the relation between personality traits and Resistance within the context of radical sustainable innovation. Therefore, at the beginning of this research the following main question was formulated:

What is the relationship between Big Five personality traits (Openness to Experience, Neuroticism) and emotional, cognitive, and behavioural resistance to radical sustainable innovations?

It was expected that the higher a consumer's Openness to Experience, the lower the experienced Emotional, Cognitive and Behavioural Resistance to radical sustainable innovations. For Neuroticism a reversed relation was expected, namely, the higher a consumer's Neuroticism, the higher the experienced Emotional, Cognitive and Behavioural Resistance to radical sustainable innovations. With the use of data, collected via a survey and analysed via multiple regression, three out of six hypotheses were confirmed, and two of three rejected hypotheses were found marginally significant.

The first hypothesis, 1a, was rejected, meaning that the hypothesized negative relation between Openness to Experience and Emotional Resistance was not found significant. However, it should be noted that the relation was marginally significant. Nevertheless, this result is not in line with the research from Koch et al. (2020) and Heidenreich and Handrich (2014). The variable Resistance within the research from Koch et al. (2020) and Heidenreich and Handrich (2014), which was partly constructed out of Emotional resistance, was in both studies negatively correlated with the personality trait Openness to Experience. However, the results are in line with the research from Oreg (2003) and Saksvik and Hetland (2009) who found that

emotional reaction, which is one of their dimensions of resistance, does not significantly correlate with the personality trait Openness to Experience.

These apparently contradictory results show that it is very important to see resistance as a multidimensional concept. Results between the different dimensions differ and the way resistance is measured can be the reason for the different outcomes among the studies.

Subsequently, hypothesis 2a of this research was accepted. This means that the higher a consumer's Neuroticism, the higher the experienced Emotional Resistance against radical sustainable innovations was found to be significant. This relation had the highest significance levels of all accepted hypotheses. Both the research from Oreg (2003) and Saksvik and Hetland (2009) found the same results where Neuroticism correlated the strongest with Emotional Resistance, in comparison to their other Resistance dimensions. The outcome contributes to the body of literature because this research found evidence that the positive correlation between Neuroticism and Emotional Resistance holds in the context of radical sustainable innovation. Due to the emotional character of the personality trait Neuroticism, it is not unexpected that of all hypotheses proposed, this relation showed the highest significance levels. Besides, extending the body of literature, the results also strengthen the current literature on the topic.

To continue, hypothesis 1b was rejected, therefore, according to this study, there was no significant relationship found between openness to experience and cognitive resistance. This effect was unexpected since according to Smillie (2017) and Lepine et al. (2000) people who score high on openness to experience have higher cognitive abilities, which was expected to result in less cognitive resistance. Also, several characteristics of openness to experience suggested the hypothesized effect to be expected. A possible reason could be that the intrinsic desire for psychological equilibrium is stronger than the effect the personality trait openness to experience has on cognitive resistance, where psychological equilibrium means that the change presented by innovations disturbs a person's status quo, which results in resistance to the innovation (Ram, 1987). Nevertheless, the results extend the body of literature on the topic by showing that greater cognitive abilities do not necessarily result in lower cognitive resistance.

Further, hypothesis 2b assumed that the higher a consumer's neuroticism, the higher the experienced cognitive resistance. However, this effect was also found to be non-significant. Nevertheless, it should be noted that the relation was marginally significant. Yet, the result is therefore not in line with previous literature and the expected consequences it would have on

cognitive resistance. It was expected that neurotic individuals would experience significantly more cognitive resistance because they often overreact in normal situations (Lissitsa & Kol, 2019; Rossberger, 2014), and they are not creative thinkers (Pickering et al., 2016; H. Xu & Brucks, 2011). Therefore, it was expected that they would experience more cognitive resistance because radical innovations ask for dramatic leaps in terms of familiarity and use for the consumer (Veryzer, 1998). The reason for the different outcome than expected could be the same as for the previously discussed cognitive resistance hypothesis, namely that the intrinsic desire for psychological equilibrium is stronger than the effect the personality trait neuroticism has on cognitive resistance (Ram, 1987). Besides, since both hypotheses on cognitive resistance were not found to be significant, it could mean that personality traits relate less to cognitive resistance than the other 2 dimensions of resistance. Nevertheless, the results extend the body of literature on the topic by showing that greater cognitive resistance is not related to neuroticism.

Subsequently, hypothesis 1c was accepted, meaning the higher a consumer's openness to experience, the higher the experienced behavioural resistance. This relation was found significant. This is in line with the research from Oreg (2003) and Saksvik and Hetland (2009) who both found a negative correlation between routine seeking and openness to experience. Further, the results are also in line with the proposed characteristics of openness to experience, for example, the engagement in new experiences, and their expected effect on behavioural resistance (Boyd, 2020; Wu et al., 2011; Yesil & Sozbilir, 2013). These results strengthen the literature, but also extend the literature by significantly showing that this relationship is also found within a radical sustainable innovation context.

At last, hypothesis 2c was accepted, meaning the higher a consumer's Neuroticism, the higher the experienced behavioural resistance. This relation was also found significant. This is in line with the research from Oreg (2003), Saksvik and Hetland (2009) and Lissitsa and Kol (2019). Oreg (2003) and Saksvik and Hetland (2009) found that neuroticism is positively correlated with routine seeking. Lissitsa and Kol (2019) found that neurotic people are not open to new experiences. Again, these results strengthen the literature on the topic, but also extend the literature by significantly showing that this relationship is also found within a radical sustainable innovation context.

Lastly, within this research the effect sizes were checked for all hypothesized relations. This increased the reliability of the research, because effect sizes are less biased by sample (Khalilzadeh & Tasci, 2017). This is especially of importance in scientific research with large samples (Khalilzadeh & Tasci, 2017). According to Khalilzadeh and Tasci (2017) the effect sizes on all hypotheses are classified as small effects. This means, according to this research, that the independent variables Openness to Experience and Neuroticism only explain a small amount of variance in the different dimensions of Resistance. Hence, the results of this study partly deviate from previous literature where the effect of Openness and Neuroticism on Resistance was often more substantial. The correlation coefficients in the research from Oreg (2003), Koch (2020) and Heidenreich and Handrich (2014) of the significant relations often exceed the correlation coefficients of this research. A possible reason could be that the context of the research on sustainable innovations lowered the number of resistance consumers experienced. Sadiq et al. (2021) found that the environmental concerns of consumers play a moderating role to some extent in resistance to sustainable innovations.

5.2 Limitations and future research suggestions

This research has exposed some interesting results. Several hypotheses were found to be significant. However, a limitation of this research is that the results are based on a single radical sustainable innovation. Therefore, one cannot tell if the effects will also show for other radical sustainable innovations or if the effects are specific to the insect burger. Thus, since several hypotheses were confirmed, it would be interesting for future research to examine the relations also for multiple radical sustainable innovations. Besides, a good addition would also be to also analyse the relations in the context of incremental sustainable innovations.

Secondly, in this research, the effects of the personality traits Openness and Neuroticism were analysed. Nevertheless, the Big Five exists of a total of five personality traits. The remaining three personality traits could also relate to resistance to innovation. For example, the research from Saksvik and Hetland (2009) found interesting results that extraversion and agreeableness negatively correlate with a consumer's initial reaction to resist innovation. Thus, in the future, it would be interesting to do more research in which all big five personality traits are considered in relation to resistance to innovation, within the context of multiple radical and incremental sustainable innovations.

Further, a different analysis technique could be used in future research, namely Structural Equation Modeling. All the hypothesized effects were analysed via three multiple linear regression analyses, which was a good method for answering all the hypotheses. However, according to Hair et al. (2018) structural equation modelling enables analyses of all the effects of all dependent variables in one model and is therefore to most efficient estimation technique for a series of multiple regression analyses. Besides, structural equation modelling gives a more extensive view of the interaction effects between variables, which can be of great value in the above suggested future research options.

Lastly, the results of this research are solely based on respondents who speak Dutch. Therefore, it is unknown how well the results can be generalized to the non-Dutch population. In addition, the sample had a relatively low average age and was highly educated. Thus, the sample was to some extent different from the Dutch population. This was probably due to the fact the data was collected via convenience and snowball sampling. Hence, future research would benefit from different data collection methods and researching the hypothesized relations among the non-Dutch population.

5.3 Practical implications

This research and its findings have several implications for practice that contribute to new product development and marketing. First of all, companies should be aware that most consumers are initially not open to change; innovators and early adopters are only a small minority (Heidenreich & Handrich, 2014; Ram, 1989). Therefore, managers should try to understand consumers who resist innovations and use this knowledge in their business operations. Important is that managers take in mind when they are trying to understand the consumers, that there are different types of resistance. A focus should be on the emotional, cognitive, and behavioural aspects of the construct resistance because this study and several other studies found evidence for this (Heidenreich & Handrich, 2014; Knowles & Riner, 2007; Oreg, 2003; Piderit, 2000).

Secondly, managers should be aware that the experienced resistance to innovations is not the same for the entire population. Now, the literature is still in development as to where the difference in resistance comes from. This research has found that personality characteristics play a role in the experienced resistance to radical sustainable innovation. Combining these results with the literature from other studies on the topic can provide managers with valuable

insights into the relationship between personality traits on resistance to innovation in general. Subsequently, in today's digital age, a lot of companies have an extensive amount of information on their customers. For example, social media data provides a lot of data about consumers. Overall, companies do not have information on how their customers score on the different personality traits. However, there are several promising studies that found information that can help determine the type of personality consumers have based on digital data, such as textual posts and images (Azucar et al., 2018; Chittaranjan et al., 2011; Sun et al., 2020). According to the research from Azucar et al. (2018) these predictions about the personality types of consumers can be used for several reasons, for example, to improve user experience and enhance recommender systems. However, these tools might also help to predict the kind of resistance to innovation a consumer is expected to show based on the personality type, but also other predictors can be included. With this information, businesses can personalize their marketing campaigns to the predicted resistance to innovation a customer is expected to have or choose to not focus on specific customer groups that are predicted to have a lot of resistance. To conclude it is very important that businesses are aware that resistance to innovation displays itself on different dimensions and that the resistance experienced is different among consumers. Therefore, businesses should find ways to predict the expected consumer resistance to personalize the relationship with their customers.

5.4 General conclusion

To conclude, several significant relations were established. Evidence was found that the higher a consumer's Neuroticism, the higher the experienced emotional and behavioural Resistance to radical sustainable innovation. Meaning neurotic people experience more emotional and behavioural resistance. Also, interesting results were found about the personality trait Openness to Experience. The research indicated that the higher a consumer's Openness to Experience, the lower their behavioural resistance to radical sustainable innovation. Therefore, an important remark to make is that it is very important to see resistance as a multidimensional construct because the relations between Neuroticism and Openness to Experience differed among the different dimensions of Resistance. These results have strengthened the current literature on the topic, but also extended the literature because all relations were examined in the context of radical sustainable innovation. Future researchers can build on these results.

Appendix

Appendix 1: Sample characteristics

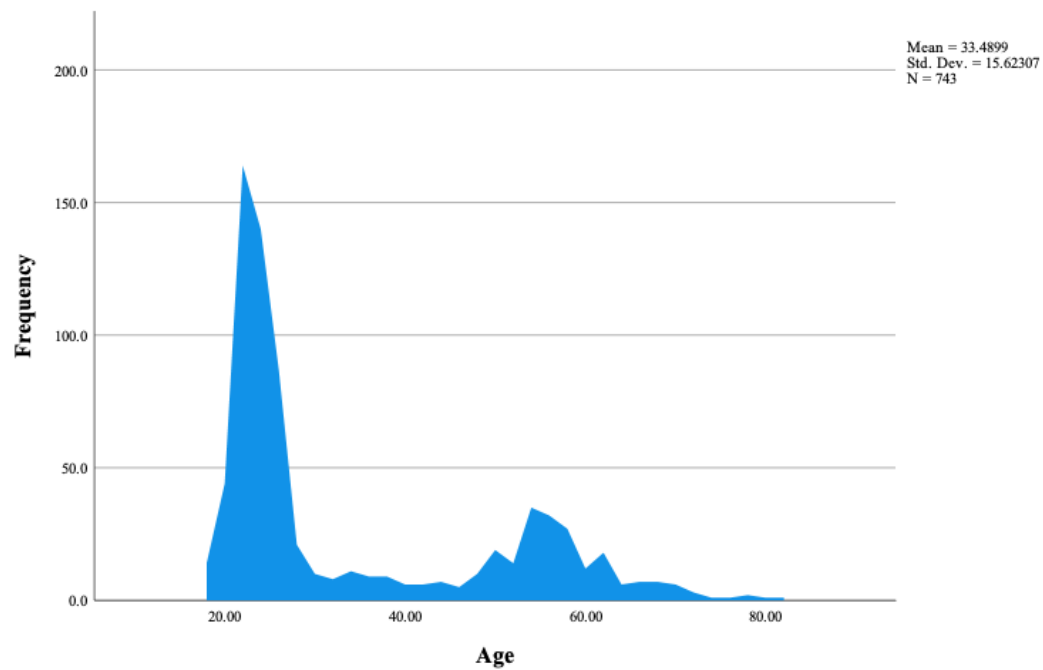
Table 3

Frequency table education level sample

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Elementary education	2	0.3	0.3	0.3
	Secondary education	89	12.0	12.8	13.1
	MBO	133	17.9	19.1	32.1
	HBO Bachelor	178	24.0	25.5	57.7
	HBO Master	36	4.8	5.2	62.8
	Universiteit Bachelor	115	15.5	16.5	79.3
	Universiteit Master	137	18.4	19.7	99.0
	PHD	7	0.9	1.0	100.0
	Total	697	93.8	100.0	
Missing	System	46	6.2		
Total		743	100.0		

Table 4

Frequency graph age sample



Appendix 2: Measurement instruments

Manipulation check

Table 5

Items manipulation check radical/incremental

Radical /Incremental	Item name	English items	Dutch items
Radical	INS_MANIPULA TIECHECK_1	The insect burger is a completely different product compared to (meat) burgers	De insectenburger is een totaal ander product in vergelijking met (vlees)burgers
Incremental	INS_MANIPULA TIECHECK_2	The insect burger is very similar to what I already know	De insectenburger lijkt veel op wat ik al ken
Radical	INS_MANIPULA TIECHECK_3	The insect burger is very innovative	De insectenburger is heel vernieuwend
Incremental	INS_MANIPULA TIECHECK_4	The insect burger is a small adjustment to previous meat burgers	De insectenburger is een kleine aanpassing op voorgaande vleesburgers
Radical	INS_MANIPULA TIECHECK_5	The insect burger differs substantially from previous meat burgers	De insectenburger wijkt substantieel af van voorgaande vleesburgers

Note. The items for the manipulation check were based on the following definitions of incremental and radical innovations:

“Incremental innovations are perceived as mere improvements to existing technologies. They can be seen as mere modifications or refinements of already existing innovations” (Kasmire et al., 2012).

“Radical innovations are often the foundation for new technological systems, industries, or domains and involve significant conceptual breakthroughs” (Kasmire et al., 2012).

Besides the radical items are also based on items which measure perceived radicalness from the research by Carlo et al. (2014):

1. “These technologies were **major** improvements over previous technologies.”
2. “These technologies were based on **revolutionary** changes in technology.”
3. “These technologies were **breakthrough** innovations”

Openness to Experience

Table 6

Items Openness to Experience

Item name	English items (John & Srivastava, 1999)	Dutch items (Denissen et al., 2008)
OPENNESS_1	Is original, comes up with new ideas	Origineel is, met nieuwe ideeën komt
OPENNESS_2	Is curious about many different things	Benieuwd is naar veel verschillende dingen
OPENNESS_3	Is ingenious, a deep thinker	Scherpzinnig, een denker is
OPENNESS_4	Has an active imagination	Een levendige fantasie heeft
OPENNESS_5	Is inventive	Vindingrijk is.
OPENNESS_6	Values artistic, aesthetic experiences	Waarde hecht aan kunstzinnige ervaringen.
Rev_OPENNESS_7*	Prefers work that is routine	Een voorkeur heeft voor werk dat routine is.
OPENNESS_8	Likes to reflect, play with ideas	Graag nadenkt, met ideeën speelt.
Rev_OPENNESS_9	Has few artistic interests	Weinig interesse voor kunst heeft.
OPENNESS_10	Is sophisticated in art, music, or literature	Het fijne weet van kunst, muziek, of literatuur.

*Item was deleted

Neuroticism

Table ...

Items Neuroticism

Item name	English items (John & Srivastava, 1999)	Dutch items (Denissen et al., 2008)
NEUROTICISM_1	Is depressed, blue	Somber is
Rev_NEUROTICISM_2	Is relaxed, handles stress well	Ontspannen is, goed met stress kan omgaan
NEUROTICISM_3	Can be tense	Gespannen kan zijn
NEUROTICISM_4	Worries a lot	Zich veel zorgen maakt

Rev_NEUROTICISM_5	Is emotionally stable, to easily upset	Emotioneel stabiel is, niet gemakkelijk overstuur raakt
NEUROTICISM_6	Can be moody	Humeurig kan zijn
Rev_NEUROTICISM_7	Remains calm in tense situations	Kalm blijft in gespannen situaties
NEUROTICISM_8	Gets nervous easily	Gemakkelijk zenuwachtig wordt

Resistance

Table 7

Items Emotional, Cognitive and Behavioural Resistance

Item name Emotional Resistance	English items	Dutch items
INS_EM_RESISTANCE_1	I felt frustrated about how the new EHR system works (Ngafeeson & Manga, 2021)	Ik voel frustratie als ik aan de insectenburger denk
INS_EM_RESISTANCE_2	I was irritated by the way the new HER system restricts my pattern of work (Ngafeeson & Manga, 2021)	Ik voel irritatie als ik aan de insectenburger denk
INS_EM_RESISTANCE_3	I was stressed by the change brought by the new EHR system (Ngafeeson & Manga, 2021)	Ik voel me gestrest als ik aan de verandering denk die de insectenburger teweegbrengt
Item name Cognitive Resistance		
INS_COG_RESISTANCE_4*	I did not think the new EHR system does the job (Ngafeeson & Manga, 2021)	Ik zie geen potentie in de insectenburger
INS_COG_RESISTANCE_5	I saw several weaknesses with the new HER system (Ngafeeson & Manga, 2021)	Ik zie verschillende tekortkomingen met betrekking tot de insectenburger

INS_COG_RESISTANCE_6	I was critical about the new EHR system (Ngafeeson & Manga, 2021)	Ik ben kritisch over de insectenburger
Item name Behavioural Resistance		
INS_BE_RESISTANCE_7	I cannot be bothered to think about switching to another service provider (Lee & Neale, 2012)	Ik zou niet overstappen op de insectenburger
INS_BE_RESISTANCE_8	I tried as much as possible to avoid some aspects of the new EHR system (Ngafeeson & Manga, 2021)	Ik ga proberen zoveel mogelijk de insectenburger te vermijden
Rev_BE_RESISTANCE_9	How likely do you feel it is that you would purchase this product (Heidenreich & Spieth, 2013)	De kans is groot dat ik de insectenburger ga kopen

*Item was deleted

Appendix 3: Survey

Stimulus material insect burger

Insectenburger

Insecten zijn een milieuvriendelijker alternatief voor vlees, zonder in te hoeven leveren op het binnenkrijgen van dierlijke eiwitten. Zo is voor één kilogram koeienvlees 10 kilogram voer nodig, terwijl voor één kilogram krekels maar 1.7 kilogram voer nodig is. Daarnaast stoten insecten veel minder broeikasgassen uit, vergt het verbouwen van insecten aanzienlijk minder water, hebben ze amper ruimte nodig, en zijn insecten geen kieskeurige eters. De insectenburger bestaat deels uit insectensoorten zoals sprinkhanen, meelwormen en/of andere soorten en deels uit groenten en kruiden. Vaak worden de insecten zo gemalen dat ze niet meer te zien zijn. Dit betekent dat de insectenburger qua uiterlijk lijkt op een standaard vleesburger. De insectenburger smaakt kruidig, maar is wel wat droger en minder sappig dan een normale burger gemaakt van vlees. De insectenburger wordt per twee stuks verpakt en is te koop voor €3,99.



Appendix 4: Construct reliability and validity

Manipulationcheck

Table 8

Correlation matrix and communalities manipulation check

	Correlation matrix					Communalities	
	1	2	3	4	5	Initial	Extraction
INS_MC_RAD_1	1.000					0.225	0.308
INS_MC_INC_2	-0.315	1.000				0.257	0.373
INS_MC_RAD_3	0.214	-0.093	1.000			0.227	0.464
INS_MC_INC_4	-0.404	0.458	-0.101	1.000		0.286	0.579
INS_MC_RAD_5	0.286	-0.281	0.464	-0.222	1.000	0.290	0.510

Note. All items have at least one correlation above .3 and score above .2 on the communalities

Table 9

Pattern matrix: factor loadings manipulation check after deletion of INS_MC_RAD_1

	Factor	
	1	2
INS_MC_INC_2	0.764	
INS_MC_RAD_3	0.111	0.701
INS_MC_INC_4	0.604	
INS_MC_RAD_5	-0.129	0.674

Extraction Method: Principal Axis Factoring.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Openness

Table 10

Correlation matrix and communalities Openness

	Correlation matrix										Communalities	
	1	2	3	4	5	6	7	8	9	10	Initial	Extraction
OPENNESS_1	1.000										.314	.460
OPENNESS_2	.330	1.000									.222	.289
OPENNESS_3	.239	.275	1.000								.167	.294
OPENNESS_4	.353	.262	.186	1.000							.270	.326
OPENNESS_5	.456	.259	.176	.387	1.000						.294	.446
OPENNESS_6	.232	.161	.026	.297	.181	1.000					.548	.735
Rev_OPENNESS_7	.175	.158	.045	.040	.134	-.029	1.000				.082	.062
OPENNESS_8	.347	.392	.364	.320	.356	.151	.095	1.000			.307	.489
Rev_OPENNESS_9	.182	.160	.011	.198	.120	.703	.062	.101	1.000		.527	.644
OPENNESS_10	.189	.127	.052	.222	.124	.517	-.083	.122	.514	1.000	.328	.395

Note: 9 out of 10 items have correlations that are above .3

Note. All items have at least one correlation above .3 and score above .2 on the communalities, except for item Rev_OPENNESS_7

Table 11

Pattern matrix: factor loadings Openness after deletion of Rev_OPENNESS_7

	Factor	
	1	2
OPENNESS_1	.598	
OPENNESS_2	.518	
OPENNESS_3	.475	-.112
OPENNESS_4	.504	.153
OPENNESS_5	.594	
OPENNESS_6		.843
OPENNESS_8	.677	
Rev_OPENNESS_9		.843
OPENNESS_10		.605

Extraction Method: Principal Axis Factoring.
Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 3 iterations.

Neuroticism

Table 12

Correlation matrix and communalities Neuroticism

	Correlation matrix								Communalities	
	1	2	3	4	5	6	7	8	Initial	Extraction
NEUROTICISM_1	1.000								0.268	0.271
Rev_NEUROTICISM_2	.327	1.000							0.412	0.461
NEUROTICISM_3	.285	.413	1.000						0.336	0.369
NEUROTICISM_4	.400	.461	.515	1.000					0.430	0.492
Rev_NEUROTICISM_5	.423	.504	.404	.487	1.000				0.445	0.536
NEUROTICISM_6	.352	.227	.335	.320	.311	1.000			0.194	0.180
Rev_NEUROTICISM_7	.240	.502	.312	.351	.478	.177	1.000		0.362	0.355
NEUROTICISM_8	.360	.471	.430	.517	.491	.275	.453	1.000	0.415	0.492

Note. All items have at least one correlation above .3 and most communalities are above .2

Table 13

Factor loadings Neuroticism

	Factor
	1
NEUROTICISM_1	0.520
Rev_NEUROTICISM_2	0.679
NEUROTICISM_3	0.608
NEUROTICISM_4	0.702
Rev_NEUROTICISM_5	0.732
NEUROTICISM_6	0.424
Rev_NEUROTICISM_7	0.596
NEUROTICISM_8	0.702

Extraction Method: Principal Axis Factoring.

a. 1 factors extracted. 5 iterations required.

Resistance

Table 14

Correlation matrix and communalities Resistance

	Correlation matrix									Communalities	
	1	2	3	4	5	6	7	8	9	Initial	Extraction
INS_EM_RESISTANCE_1	1.000									0.665	0.805
INS_EM_RESISTANCE_2	0.777	1.000								0.674	0.751
INS_EM_RESISTANCE_3	0.647	0.614	1.000							0.471	0.521
INS_COG_RESISTANCE_4	0.549	0.587	0.464	1.000						0.535	0.577
INS_COG_RESISTANCE_5	0.429	0.406	0.349	0.453	1.000					0.345	0.516
INS_COG_RESISTANCE_6	0.449	0.474	0.339	0.498	0.520	1.000				0.411	0.541
INS_BE_RESISTANCE_7	0.472	0.534	0.381	0.611	0.403	0.486	1.000			0.655	0.761
INS_BE_RESISTANCE_8	0.558	0.607	0.505	0.627	0.399	0.478	0.719	1.000		0.647	0.716
RES_BE_RESISTANCE_9	0.369	0.425	0.331	0.551	0.331	0.441	0.724	0.659	1.000	0.578	0.693

Note. All correlations are above .3 and all communalities are above .2

Table 15

Pattern matrix: factor loadings Resistance after deletion of INS_COG_RESISTANCE_4

	Factor		
	1	2	3
INS_EM_RESISTANCE_1	0.924		
INS_EM_RESISTANCE_2	0.801		
INS_EM_RESISTANCE_3	0.733		
INS_COG_RESISTANCE_5			0.686
INS_COG_RESISTANCE_6		0.103	0.696
INS_BE_RESISTANCE_7		0.848	
INS_BE_RESISTANCE_8	0.269	0.671	
RES_BE_RESISTANCE_9	-0.115	0.897	

Extraction Method: Principal Axis Factoring.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Discriminant Validity

Table 16

Factor loadings of an explorative factor analysis of all factors (Openness, Neuroticism & Resistance)

	Component						Component		
	1	2	3	4	5		1	2	3
OPENNESS_1			0.653	0.147	-0.131			-0.101	0.658
OPENNESS_2			0.627						0.571
OPENNESS_3			0.599	-0.177	0.297				0.413
OPENNESS_4		0.137	0.570	0.239	-0.168				0.641
OPENNESS_5			0.644		-0.233			-0.217	0.612
OPENNESS_6			0.124	0.823			-0.118	0.231	0.612
OPENNESS_7			0.718		0.150				0.618
OPENNESS_8				0.826	-0.140		-0.180	0.179	0.540
OPENNESS_9		-0.104		0.770	0.126			0.136	0.520
NEUROTICISM_1		0.307		0.115	0.592			0.594	
NEUROTICISM_2		0.751	-0.148					0.742	
NEUROTICISM_3		0.665	0.246		0.166			0.637	0.144
NEUROTICISM_4		0.636	0.106		0.292			0.732	0.132
NEUROTICISM_5		0.738			0.161			0.762	
NEUROTICISM_6		0.234		-0.123	0.623		0.106	0.462	
NEUROTICISM_7		0.740	-0.153		-0.146			0.668	-0.106
NEUROTICISM_8		0.714			0.172			0.739	
INS_EM_RESISTANCE_1	0.828		-0.110	0.171	0.120		0.778		
INS_EM_RESISTANCE_2	0.850			0.147			0.806		
INS_EM_RESISTANCE_3	0.708		-0.150	0.148	0.104		0.663	0.179	
INS_COG_RESISTANCE_5	0.652	-0.179			0.221		0.634		
INS_COG_RESISTANCE_6	0.680		0.131				0.703		
INS_BE_RESISTANCE_7	0.767			-0.164	-0.166		0.798		
INS_BE_RESISTANCE_8	0.813			-0.109			0.833		
Rev_BE_RESISTANCE_9	0.658	0.173	0.112	-0.258	-0.238		0.718		

Extraction Method: Principal Component Analysis.
Rotation Method: Promax with Kaiser Normalization.
a. Rotation converged in 6 iterations.

a. Rotation converged in 4 iterations.

Note. On the left, the factor loadings can be found for all factors without a fixed number of factors and on the right, the factor loadings can be found with a fixed number of factors of three.

Table 17

Factor correlation matrixes (Openness, Neuroticism & Resistance)

Component (1)	1	2	3	4	5
1: Resistance	1.000	0.142	-0.029	-0.129	-0.001
2: Neuroticism	0.142	1.000	-0.073	0.098	0.162
3: Openness	-0.029	-0.073	1.000	0.145	-0.020
4: Openness	-0.129	0.098	0.145	1.000	0.045
5: Neuroticism	-0.001	0.162	-0.020	0.045	1.000

Component (2)	1	2	3
1: Resistance	1.000	0.081	-0.100
2: Neuroticism	0.081	1.000	0.007
3: Openness	-0.100	0.007	1.000

Extraction Method: Principal Component Analysis.

Note. On the top, the factor correlation matrix can be found for all factors without a fixed number of factors and on the bottom, the factor correlation matrix can be found with a fixed number of factors of three.

Appendix 4: Planning

Weeknummer	Wanneer?	Wat?
5		
6	11 februari	Innovaties vastleggen, planning maken en vragenlijst opstellen
7		
8		
9 (vakantie)	6 maart 23:59	H1/H2/H3 inleveren voor feedback
10		
11		
12 (tentamens)	25 maart	Research Proposal
13 (tentamens)		Opzetten experiment in qualtrics + alles finaliseren dat we gelijk kunnen beginnen met dataverzameling
14 (herkansing)	8 april	Go / no-go
15		Verwerken feedback H3 + Start dataverzameling
16		Verwerken feedback H1/H2
17		Dataverzameling compleet
18 (vakantie)		
19		Results + analyse klaar
20		Conclusie/Discussie in bulletpoints klaar en opsturen voor feedback (einde week)
21		Feedback volledige scriptie door Simone en Juliëtte
22		
23		
24	13 juni	Maandag 13 juni: inleverdeadline scriptie 1e kans
25		Verdediging
26		Verdediging
27		Verdediging

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