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Bachelor Thesis

Assessing the risk perception of microplastics

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Abstract

Since the last century, the use of plastic has increased dramatically. Plastic invading the environment is breaking into smaller pieces called mesoplastic, larger microplastic, and small microplastic particles. These pieces have been found in flora and fauna which is likely ending up in our food. In order to prevent more damage, a change in consumer behaviour is necessary. Nevertheless, plastic consumption has increased even though statistics indicate an increasing seriousness in the population, hence the it got more relevant to the individual. This might indicate an increased concern as well as risk awareness, but does this eventually lead to a change in consumer behaviour?

This study is going to measure if the intention to change behaviour is being predicted by an individual's risk perception, concern and psychological distance. A regression analysis is going to measure the hypothesis for high-risk perception, lower psychological distance, as well as higher concern. Lower psychological distance leading to higher concern, and higher behavioural intentions. As well as high concern leading to higher behavioural intention. The results indicate an overall significance, especially in relation to temporal psychological distance. Nevertheless, the results also show that the participants might not know how to change their behaviour after all.

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Introduction

Since synthetic organic polymers, also known as plastic, were invented just over a century ago (Gorman, 1993), the use of it increased dramatically. In 2016, the worldwide production increased to 335 million tons of plastic (PlasticsEurope, 2019), Asia being the largest manufacturer (50%) followed by Europe (19%), and North America (18%). Plastic is lightweight, strong, durable, and cheap (Laist, 1987). These properties make it suitable for the manufacture of a wide range of products. Unfortunately, these characteristics are the same reasons why plastic is such a serious threat to the environment (Pruter, 1987; Laist, 1987). Alone in 2010, about 4.8–12.7 Million metric tons of plastic waste was not taken care of and as a consequence, entered our oceans. There are many ways in how plastic invades the marine environment, due to plastic producing companies, fisheries (Wilber, 1987) or beachgoers (Pruter, 1987).

These large plastic items (also called macro fragments) break up into smaller pieces due to mechanical, biological, photic, and/or thermal degradation (Andrady, 2011, Cole et al., 2011, Thompson et al., 2004, Eriksson and Burton, 2003) and are the majority of plastic found in the ocean (Gregory and Andrady, 2003). The most common small fragments are called mesoplastic (5 - 10 mm), larger microplastic (2 - 5 mm) and small microplastic particles (.2 - 2 mm). These pieces of microplastic are invading the marine environment dramatically and are widely distributed since they are buoyant, accumulate on the surface and are able to float long distances. Estimations indicate that 0 -7290 items per hectare exist in the aquatic environment (Barnes, Galgani, Thompson, and Barlaz, 2009), which is around five trillion pieces and above 250,000 tons of plastic (Eriksen et al., 2014).

Research shows that these plastic particles impact the marine flora and fauna (e.g., Anastasopoulou et al., 2013, Cole et al., 2013, Farrell and Nelson, 2012; von Moos et al, 2012, Murray and Cowie, 2011, Van Franeker et al., 2011, Graham and Thompson, 2009, Fossi et al, 2012, Carpenter et al., 1972) and that smaller pieces are likely to be absorbed by marine life (Carson, 2013, von Moos et al, 2012, Andrady, 2011, Ng and Obbard, 2006).

In 2009, Andrady and Neal stated that marine pollution, especially by the use of plastic, is a behavioural problem, which means that a possible solution lies within a societal change (2009). This means that the responsibility now shifts to the consumer, ‘ethical products’ (e.g. containment of plastic) in reality and media presence are the results of that. Nevertheless, one

might gain the impression that political actions have failed or fade into the background. Actions have dealt with the symptoms but not the source of the problem (Blühdorn, 2007) Hence, sustainability has shifted to private action (Grunwald, 2010). Also, the marketplace is perceived as the 'dominant ground for change', which is understood in a more self-interested way, but it distracts the focus from collectivist approaches to enhance meaningful change.

Science proves that the negative impact of microplastic is severe and increasing, but the consumption of plastic is still an ongoing process. For this reason, the responsibility for change lies within our society, which means that our (consumer) behaviour has to change. Statistics show that at least in Europe plastic recycling has been taken more seriously and got more relevant to the individual (psychologically is more close) (Ipos, 2018), even though the plastic production increased (PlasticsEurope, 2017). This might give an indication of an increased concern due to higher risk perception within the citizens. But does this affect the individual's intention to change their behaviour? Therefore, the *general research question* is:
Can the intention to change one's consumer behaviour be predicted by an individual's risk perception, concern and psychological distance?

For that, risk perception, concern, psychological distance and the behavioural intention to change about microplastic is going to be measured in order to predict the intention to change consumer behaviour.

Conceptual framework

Risk perception In a social context, risk is defined as 'the likelihood of an adverse effect resulting from an event or an activity, rather than an opportunity for desired outcomes.' (Renn & Benighaus, 2013, p.295). This means that actions or events can have consequences for the human's value. Risk perception, therefore, is an individual's judgement about the possibility of negative incidents like injury, illness, disease, and here deteriorating effects on microplastics on the global environment. Assessing how people see and deal with specific hazards is helpful in health and risk communication, in order to find solutions for interventions (Renn & Benighaus, 2013). In light of these findings, the perception of the negative effects of microplastic is measured in the present study.

Literature conceptualises the concept of risk perception in several ways. In this study, we focus on the two dimensions that are identified by Janmaimool and Watanabe (2014), namely the cognitive dimension and the perceptive dimension. The cognitive dimension relates to an individual's present knowledge and understanding of the risk itself, including the personal need to acquire more information on the microplastic issue and magnitude of which its existence is denied based on knowledge as well. The perceptive dimension, on the other hand, focuses on how individuals feel about the risk probability, by emphasizing individuals' feelings as seen on a moral and emotional dimension and to which extent they show disinterest regarding the topic. The aspect difficult to quantify in this case is 'thinking' and 'feeling', both having an impact on risk perception (Hansen, Holm, Frewer, Robinson and Sandoe, 2003). Experts are more prone to base their perception and resulting thoughts on knowledge. Ordinary people do not possess expert knowledge and rely more on their personal feelings to come to risk perception. This is a well-known issue that leads 'communicators' to influence these feelings, e.g. by focusing on the troubling and scaring consequences of plastic pollution (Hansen et al; 2003).

The perceptive dimension includes the perceived probability of environmental contamination and receiving the impacts of this environmental contamination, as well as the perceived severity of catastrophic consequences (Janmaimool & Watanabe, 2014). The cognitive dimension consists of the perceived ability to control the risk, the person's concerns about the social surrounding, previous experiences facing, here case the microplastic problems, and the perceived benefits of industrial development (Janmaimool & Watanabe, 2014).

Concern Stern and Dietz (1994) determine concern about environmental issues like microplastic as based on an individual's more general set of values. The relative importance an individual place on themselves, others and the environment, influences these values. In this case, this concern is due to an awareness of the harmful consequences of the microplastic problem to a value (or valued object) (Schultz, 2001). The individuals' concern is reflected in the consumer decision-making process as well (Diamantopolous et al., 2003; Adele and Gikonyo; 2012).
As Guagnano et al,. (1995) suggests, the behaviour is influenced by attitude variables (personal commitment and costs/benefits calculations) as well as contextual factors. These contextual factors entail interpersonal influences, governmental or community perceptions, here of

microplastics (Stern, 2000). Considering the information above, if concern increases, behavioural intentions should increase as well.

Psychological distance Liberman, Trope, & Stephan (2007) described psychological distance as an indicator of how relevant an issue, here the microplastic issue, is to an individual. There are four defined dimensions of psychological distance that are interrelated: temporal, social, spatial, and uncertainty/hypothetical (Trope and Liberman, 2003). *Temporal* psychological distance describes the distance in time, for example, climate change outcomes are seen as something far away in the future, even though some are likely to happen in 2020. *Social* distance describes the personal relevance towards an issue, it can be seen as the perceived closeness or similarity between an individual and another, who are experiencing direct effects of an issue (f.e. Destroyed houses due to rising sea level). *Spatial* distance is explained as the geographical distance between an individual and, to stay with the previous example, the sea itself and therefore the rising sea levels. The last dimension is the *Uncertainty/hypothetical* (here, uncertainty) distance, that appears due to a degree of uncertainty about an event happening. Individuals are using "themselves as a standard to judge and evaluate other objects, events and actions" (Liberman et al, 2007, p.354) in their subjective environment. If an individual is not well informed about a specific topic, its perception can be that an event is unlikely to happen and is therefore distanced from the topic itself.

On the one hand, if psychological distance increases, thoughts are turning to be more abstract and less concrete, resulting in more abstract representations. In the case of temporal distance, there is less motivation to change behaviour in order to prevent a problem to happen in the future. On the other hand, if psychological distance is decreasing, these representations become more concrete, and individuals focus on the details of an event or action and are more concerned. It is important to note that concern does not influence psychological distance since the issue has to be relevant to a person to be concerned in the first place. In the matter of microplastics, psychological distance might be an influence on the behavioural intention of people to change their behaviour as consumers, in order to decrease the microplastic impact.

Behavioural intention Behavioural intention was first mentioned in the theory of reasoned action by Fishbein and Ajzen (1977). Later being modified by Ajzen in the theory of planned

behaviour (TPB) by Ajzen (2002). In there, behavioural intention is defined as an “individual’s readiness to perform a given behaviour.” as well as being the only direct determinant of behaviour (Ajzen, 2002, p.12).

In a study that measures willingness to pay a higher prize for non-counterfeit goods, concern and knowledge serve as a direct influence (Marcketti & Shelley, 2009) Albayrak, Aksoy and Caber (2013) showed in their study that environmental sensitive consumer behaviour is determined by environmental concern. Nevertheless, it can be considerably decreased by scepticism which philosophical position holds the possibility of knowledge being limited by the mind or the accessibility of its object. This aligns with the definition of psychological distance, therefore, serves in this study as scepticism.

Considering this, concern, as well as psychological distance, have to be measured in relation to behavioural intention to change one’s consumer behaviour in order to decrease the microplastic issue.

The preceding arguments result in the following 5 hypotheses.

Hypothesis:

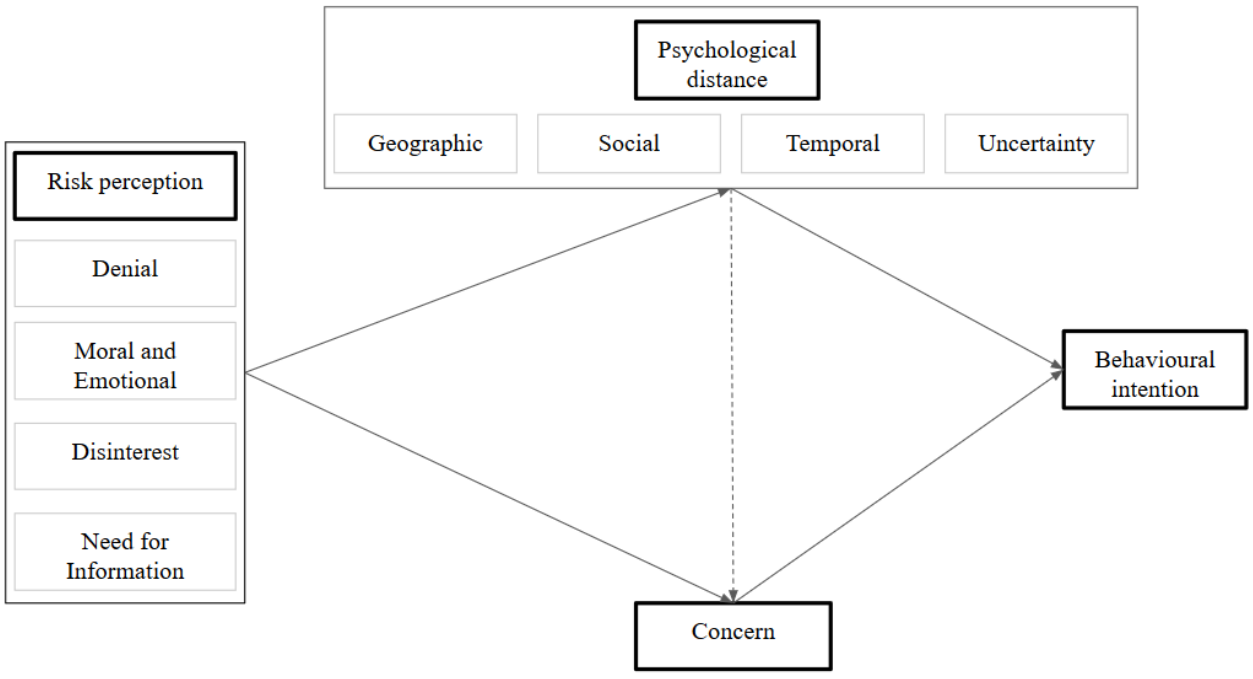

Figure 1. Conceptual Model

I. High risk perception leads to lower psychological distance
II. High risk perception leads to higher concern
III. Lower psychological distance leads to higher concern
IV. Lower psychological distance leads to higher behavioural intentions
V. Higher concern leads to higher behavioural intentions

Expectancies If the risk perception towards microplastic is higher -the knowledge increases - the issue should get more concrete, hence the psychological distance decreases (HI) and the concern increases due to both variables (HII, HIII). In turn, the behavioural intention to change consumer behaviour should become higher (HIV, V).

In HI and HII, the independent variable is risk perception influencing the dependent variables psychological distance and concern. Hypothesis III and IV are describing psychological distance as an independent variable causing the dependent variables concern and behavioural intention to be high. The last hypothesis shows concern being the independent variable influencing behavioural intentions.

Methods

Design

This online survey study is used to measure risk perception, psychological distance, behavioural intentions and concern towards the microplastic issue. Then a regression analysis is going to be made to estimate the relationship between the given concepts. In order to ensure that the participants took the study voluntarily, they had to agree to the informed consent given prior to the survey itself. Participants responded to 31 questions involving four different variables: risk perception, concern, behavioural intentions, and psychological distance.

Participants

Overall, 103 participants participated in the survey. Nevertheless, 12 participants had to be excluded due to not responding to the questions after agreeing to the consent form. Hence, no data was available from these participants.

The final sample, therefore, consisted out of 91 participants, with the average age of 29 (min. 19,

max. 63). Partly, undergraduate psychology students at the University of Twente received a sona credit for participating in the study. The survey has been answered by 23 different nationalities, the majority were German with a quantity of 53, followed by 10 Dutch participants, 28 participants indicated other nationalities.

Materials

Questionnaires. The questionnaire consists of 31 questions in total. In there, 4 scales including 7 subscales are measuring the concepts. The questions were based on several other questionnaires, but have been modified to the topic of microplastic, therefore, no comparison is possible. The reliability check of this study can be found below.

The variable *risk perception* is answered with a 5-point Likert scale, with the values 1= 'strongly agree' to 7 = 'strongly disagree' and has 4 subscales (Whitmarsh, 2011). The first subscale measured 'denial' with 6 different questions and includes statements like "*The evidence for microplastic is unreliable*". The second subscale is measuring the moral and emotional dimension which incorporates 4 questions f.e. *"I feel a moral duty to do something about the microplastic problem*". Disinterest is covering disinterest with two statements like "*Microplastic is too complicated for me to understand*". The last subscale 'need for information' embodies two statements e.g. "*I need more information to form a clear opinion about microplastic*" (see Appendix I)

The variable *concern* consists out of 3 questions with a 4-point Likert scale (1= Very concerned– 4 = Not at all concerned) (Spence, Poortinga and Pidgeon, 2012). Questions are e.g. "How concerned, if at all, are you about microplastic?" and "Considering any potential effects of microplastic which there might be on you personally, how concerned, if at all, are you about microplastic?"

The next variable being assessed is *behavioural intention* (Muscavage, 2016). There, the participant has to provide answers on a scale from 1- 5 (1. Not at all - 2. A little bit - 3 Somewhat- 4. Quite a bit - 5. Very much). The question "How willing are you to perform the following behaviours that help reducing microplastic within the next year?" is followed by 8 different statements, at which the participants have to indicate their scale number. Statements are f.e. "reduce plastic usage in order to decrease plastic pollution", "use cotton bags instead of plastic bags", and "cleaning up beaches during vacation".

The last variable is called *psychological distance* (Spence, Poortinga and Pidgeon, 2012). In there, the geographical-, social - and temporal distance, as well as uncertainty/scepticism, is measured. The one geographical distance question is “The microplastic issue will mostly affect areas that are far away from here.”, answered by 5-point scale (Strongly agree–Strongly disagree). Social distance consists out of two questions including “Microplastic will mostly affect developing countries.”.

“When, if at all, do you think humanity will start feeling the effects of plastic in the ocean/microplastic?”, is a temporal distance question and is measured with a 7-point scale (We are already feeling the effects–Never). Uncertainty is using a 5-point scale (Strongly agree–Strongly disagree), with three questions like “I am uncertain that microplastic is really happening.”.

Reliability check and descriptives Question 13 (“I often talk about microplastic to family or friends.”) and 25 (“Most scientists agree that microplastic ends up in our food.”) were re-coded.

In order to measure the reliability, the Cronbach’s alpha for all scales and subscales are going to be measured. The alpha for risk perception - denial is .84 (M= 5.51, SD = 1.02) and for risk perception - moral and emotional dimension the alpha is .85 (M= 2.66, SD = 1.24). Both subscales are therefore reliable. Unfortunately, the alpha for risk perception - disinterest (M = 4,60; SD = 1.21) and -need for more information (M = 3.60; SD = 1.49) ranges between .63 and .64, hence the reliability is acceptable. The second scale ‘concern’ has an alpha of .820 with a mean of 1.91 and a standard deviation of .63. The third scale behavioural intention has a significant alpha of .868 (M = 2.99; SD = .83).

The subscales for psychological distance - geographical and - temporal consist out of one item, therefore an alpha cannot be measured. The mean for the geographical subscale is 4.77 with a standard deviation of SD = 2.04. The subscale psychological distance temporal has a mean of 1.92 and a standard deviation of 1.14. Even after recoding, psychological distance temporal has a negative alpha (-.16; M = 3.41; SD = 1.06). And psychological distance uncertainty shows an alpha of .43 (M = 4.27; SD = .87). Therefore, both scales are not reliable.

Additional analyses indicated that these alphas could not be improved by item recoding or deletion. Also, due to the low number of items, a deletion could have a crucial negative impact on the results (see discussion). Therefore, no items have been deleted.

Table 1, Descriptives

Scale	N	Minimum	Maximum	Mean	SD	Cronbach's' Alpha
Risk Perception- Denial	91	2.00	6.71	5.51	1.02	.84
Risk Perception Emotional	91	1.00	6.50	2.66	1.24	.85
Risk Perception Disinterest	91	2.00	7.00	4.60	1.21	.63
Risk Perception Need for Information	91	1.00	6.50	3.60	1.49	.64
Concern	89	1.00	3.67	1.91	.63	.82
Behavioural Intention	88	.00	4.38	2.99	.83	.87
Psychological Distance Geographical	87	1.00	7.00	4.77	2.04	-
Psy. Distance Social	87	1.00	6.00	3.41	1.06	-
Psy. Distance Temporal	87	1.00	5.00	1.92	1.14	-.16
Psy. Distance Uncertainty	87	1.33	6.33	4.27	.87	.43

Results

Pearson correlation In order to assess the extent to which the subscales exert an impact on each other, the Pearson correlation was calculated.

To begin with, behavioural intentions correlated significantly with concern, $r = -.60$ ($p < .00$). Further, a medium correlation was found between the subscale risk perception denial and concern $r = -,64$ ($p < .00$) as well as behavioural intentions $r = .51$ ($p < .00$)

Concern (r =.72) also indicated to be significantly correlated to the subscale risk perception emotional (p < .00).

Moreover, risk perception disinterest appeared to exhibit an influence on concern r = -.59 (p < .001) Risk perception need for information could be correlated to concern r = -.35 (p = .00). However, psychological distance geographical does not show any correlations to any other scale. The subscales risk perception emotional r = .260 (p = .02) and psychological distance geographical r = .44 (p < .00) are lowly correlated to psychological distance social.

The subscale psychological distance temporal has the strongest correlations. Psychological distance temporal is correlated to concern r= .35 (p = .00), behavioural intentions r= -.40 (p <.00), to risk perception denial r = -.46 (p <.00), risk perception emotional r = .44 (p <.00), risk perception disinterest r= -.27 (p = .01), risk perception need for information r = -.36 (p = .00), and psychological distance social r = .22 (p = .04).

Table 2. Correlations

Scale	1	2	3	4	5	6	7	8	9	10
1. Concern	1									
2. Behavioural Intention	-.60**	1								
3. Risk Perception - Denial	-.64**	.51**	1							
4. Risk Perception - Emotional	.72**	-.67**	-.63**	1						
5. Risk Perception Disinterest	-.59**	.54**	.62**	-.60**	1					
6. Risk Perception Need for Information	-.35**	.22*	.36**	-.23*	.36**	1				
7. Psy. Distance Geographical	-.12	.07	.17	-.01	.16	.07	1			
8. Psy. Distance Social	.15	-.19	-.21	.26*	-.14	.05	.44**	1		
9. Psy. Distance Temporal	.35**	-.40**	-.45*	.44**	-.27*	-.36**	-.03	.22*	1	
10. Psy. Distance - Uncertainty	-.181	.07	.08	-.08	.07	.25*	.02	.05	-.31**	1

**. Correlation is significant at the .00 level (2-tailed).

*. Correlation is significant at the .05 level (2-tailed).

Hypothesis I. High-Risk Perception, low Psychological Distance

To test the first hypothesis, multiple linear regressions for each of the four independent variables (Risk Perception) on all four dependent variables (Psychological Distance) were performed. The results of the regressions only partially support the hypothesis. More precisely, there was only a significant regression found between risk perception emotional (p =.03) and need for information (p =.01) on temporal psychological distance (p < .001), with both subscales having the strongest impact on psychological distance (B = .26/B= -.26) (see table 3).

Table 3, Regression HI

dependent variable: the subscales of psychological distance, predictors: subscales RP.

Scale	Beta	df	F	*p*-value
Psy. Distance Geographical*		(4,82)	1.38	.25
Predictors				
1. Risk Perception Denial	.24			.14
2. Risk Perception Emotional	.24			.12
3. Risk Perception Disinterest	.16			.29
4. Risk Perception Need for Information	-.16			.91

Psy. Distance Social		(4,82)	1.91	.12
Predictors				
1. Risk Perception Denial	-.11			.48
2. Risk Perception Emotional	.23			.13
3. Risk Perception Disinterest	.03			.85
4. Risk Perception Need for Information	.13			.26
Psy. Distance Temporal		(4,82)	8.16	< .00
Predictors				
1. Risk Perception Denial	-.26			.07
2. Risk Perception Emotional	.26			.03
3. Risk Perception Disinterest	.16			.21
4. Risk Perception Need for Information	-.26			.01
Psy. Distance Uncertainty		(4,82)	1.03	.25
Predictors				
1. Risk Perception Denial	-.04			.80
2. Risk Perception Emotional	-.07			.63
3. Risk Perception Disinterest	-.04			.80
4. Risk Perception Need for Information	.26			.03

II. High Risk Perception, high Concern

The multiple regression analysis for the second hypothesis (high-risk perception, high concern) yielded an overall *p*-value of <.001, therefore, supporting the hypothesis. Important to note is that the subscale emotional risk perception showed a *p*-value of < .001 and the strongest Beta (.49) (see table 4).

III. Low Psychological Distance, high Concern

To test the third hypothesis, Concern was regressed on all four subscales of Psychological Distance. With an overall *p*-value of .01, the hypothesised relationship is supported. Here, the subscale psychological distance temporal did show the strongest influence on concern (*p*-value = .017) with a beta of .27 (see table 4).

Table 4, Regression HII

dependent variable: concern, predictors: subscales of risk perception and psychological distane

Scale	Beta	df	F	*p*-value
Concern		(4,84)	30.55	< .00
Predictors				
1. Risk Perception Denial	-.18			.10
2. Risk Perception Emotional	.49			.00
3. Risk Perception Disinterest	-.14			.17
4. Risk Perception Need for Information	-.13			.10
Concern		(4,82)	3,97	.01
Predictors				
1. Psy. Distance Geographical	-.19			.10
2. Psy. Distance Social	.18			.13
3. Psy. Distance Temporal	.30			.02
4. Psy Distance Uncertainty	-.11			.33

IV. Low Psychological Distance, high Behavioural Intention

In the fourth hypothesis, low psychological distance resulting in higher behavioural intention, the multiple regression analysis shows a significant *p*-value of .002. Moreover, with the strongest beta (-.38), psychological distance temporal has a significant influence on behavioural intentions as well (*p*-value < .001) (see Table 5).

Table 5, Regression HIV

dependent variable: behavioural intentions, predictors: the subscales of psychological distance

Scale	Beta	df	F	*p*-value
Behavioural Intention		(4,82)	4.67	.00
Predictors				
1. Psy. Distance Geographical	-.13			.27
2. Psy. Distance Social	-.16			.18
3. Psy. Distance Temporal	-.38			.00
4. Psy Distance Uncertainty	-.04			.68

V. High Concern, high Behavioural Intention

A linear regression analysis was performed to measure the possible influence of Concern on Behavioural Intention. The results show a *p*-value of .001 and the hypothesis is therefore supported (see Table 7).

Table 7, Regression HV

dependent variable: behavioural intention, predictors: concern

Scale	*Beta*	df	F	*p*-value
Behavioural Intention		(1.86)	48.49	.00
Predictor				
1. Concern	-.60			.00

Additional Analysis

The regression analysis of risk perception to behavioural intention is being described. In here, the independent variables are the subscales of risk perception and the dependent variable is

behavioural intentions. The analysis showed a significant *p*-value of <.001. In there, the subscales risk perception emotional ($p = .00$) and disinterest ($p = .05$) showed a significant influence, with disinterest having the highest beta of -.54 (see Table 8).

Table 8, Regression analysis

Dependent variable: behavioural intention, predictor: subscales of risk perception

Scale	Beta	df	F	*p*-value
Behavioural Intention		(4.83)	19,25	< .001
Predictors				
5. Risk Perception Denial	.00			1.0
6. Risk Perception Emotional	-.54			.00
7. Risk Perception Disinterest	.22			.05
8. Risk Perception Need for Information	.01			.88

Conclusion and Discussion

Conclusion The study aimed to understand people's risk perception towards microplastic, by conducting a survey. A total of 103 participants filled out an online survey to assess various subscales about risk perception, concern, behavioural intentions and psychological distance. This data has been analysed and showed various significant results.

The results of the present study reveal that the majority of the participants are aware of the microplastic problem and indicating emotional understanding. They demonstrate a certain interest in the topic, but on the other hand, are unsure whether their knowledge is based on sufficient information. Nevertheless, the participants show concern since they know that the effects of microplastics on society are clearly present. They are conscious about the fact that

microplastic is affecting them personally but nevertheless lack the intention to engage in the necessary change behaviours. Most of the participants share the notion of microplastic being a problem that exerts an increasing impact on them, however, opinions still diverge. Therefore, it can be said that the majority of people is certain about microplastic being a problem in reality, and have an awareness of the manifestation of its effects on society.

Hypothesis one assumes that high-risk perception is inducing a lower psychological distance. This study only confirms that partially for temporal psychological distance.
It is important to note, that the need for information subscale for risk perception is showing a significant impact on psychological distance uncertainty as well, while the risk perception denial subscale has the strongest impact.

With regard to the second hypothesis, it was revealed that high-risk perception leads to a higher concern about the implications of microplastic. Where risk perception emotional shows the strongest impact on concern.

The third hypothesis suggested lower psychological distance to influence higher concern. This hypothesis has been accepted. Important to note is that temporal psychological distance exerts a significant influence on concern, as well as the strongest impact.

The fourth hypothesis presumes lower psychological distance to increase behavioural intentions. The results showed a significant regression and can be therefore be accepted. Especially psychological distance temporal has a significant impact as well as the strongest one. In line with what was expected by the fifth hypothesis, the results showed a higher concern to increase the intention of individuals to change their behaviour, and therefore the hypothesis is accepted.

Discussion The results yield a confirmation that *the intention to change one's consumer behaviour is predicted by an individual's risk perception, concern and psychological distance.* The first hypothesis is accepted partially for temporal psychological distance. This means that participants are aware that the microplastic problem is affecting humanity already. This aligns with Trope and Liberman (2003), who suggested that individuals perceive a near future event as more important than a distant future event. In this case, as the effects are already apparent, and the participants are aware of it (see descriptives), the individuals place higher importance on the microplastic problem. Read, Loewenstein, and Kalyanaraman (1999), also found if the temporal

distance increases, the decline of the value of the outcome is steep at first but becomes more moderate after time. The results also show that risk perception denial has the strongest influence on psychological distance overall. This aligns with the correlation, that shows that risk perception denial has an impact on psychological distance temporal as well as concern. This means, the more denialistic a person is, the more abstract the problem gets (Trope and Libermann, 2003) and the less concerned the person is (McCright and Dunlap, 2011).

The second hypothesis shows that risk perception is influencing concern. As Schultz stated, concern is influenced due to an awareness of the harmful consequences (2001). Furthermore, risk perception's cognitive dimension consists, among other things, of concern about a person's social surrounding (Janmaimool & Watanabe, 2014). Both theories, therefore, imply, to be concerned about a topic, in this case, the microplastic problem, individuals have to acquire a certain awareness or risk perception about it. The subscale risk perception disinterest is also correlated to concern, which means that the more interested the person is in a topic, the more knowledge is acquired (hence, less concrete) and the more concern the individual shows in turn (Trope and Liberamann, 2003).

The third hypothesis shows psychological distance influencing concern, where temporal psychological distance is having the strongest impact on concern. Trope and Liebermann stated, that a low psychological distance makes representations more concrete and individuals are able to focus on the problem's details (2003). Time plays an important role, as the participants are aware of the effects showing now, psychological distance is already low, hence the overall concern about microplastic increases.

Hypothesis four predicts that psychological distance has an impact on behavioural intentions. This aligns with Trope and Lieberman (2003), who proposed that the less distant a problem, in this case, the microplastic problem, is, the more concrete it gets. Therefore it is more urgent to change the behaviour, hence the intention is higher. This fits also to the findings of Albayrak et al. (2013) who found that behavioural intention can be significantly influenced by scepticism, which is being served here as psychological distance (2013). Especially temporal psychological distance showed significance which can be related to the fact that microplastic effects are getting closer in time (Gibbens, 2019).

The last hypothesis where higher concern leads to higher behavioural intention is proven in this study. It aligns with the above-mentioned theory by Diamantopolous et al (2003) as well

as Marcketti and Shelly (2009), both stating that individual's environmental concern is influencing the behaviour, in specific, the consumption behaviour.

In general, psychological distance geographic shows no correlations which means that the participants are aware that the effects of microplastic are not just centred on a particular place, but everywhere. Since it has been found in the fish that have been sold for food or even tap water (Gibbens, 2019) Psychological distance temporal shows correlations to concern and all subscales of risk perception. Since the participants already indicated that the effects are already showing, the problem is getting more concrete and they focus more on the details of the problem (Trope and Liberman, 2003). Furthermore, temporal psychological distance is affecting the intention, however, intention overall is shown to be little.

The additional analysis showed that risk perception has an impact on behavioural intentions as well. This aligns with Ajzen's theory of planned behaviour where risk perception serves as attitude, which is influencing intention directly (2002).

Taking into account, the hypothesis being accepted, the conceptual model can be accepted as well. Important to stress is that risk perception has the strongest impact on temporal psychological distance. In turn, temporal psychological distance has the strongest impact on concern. All in all, the results show that individuals are aware of the microplastic problem, especially about the fact that the effects already show. Nevertheless, they lack the intention to change. Considering that they are unsure of having sufficient information, might be an indication that they are not sure of how to change their consumer behaviour.

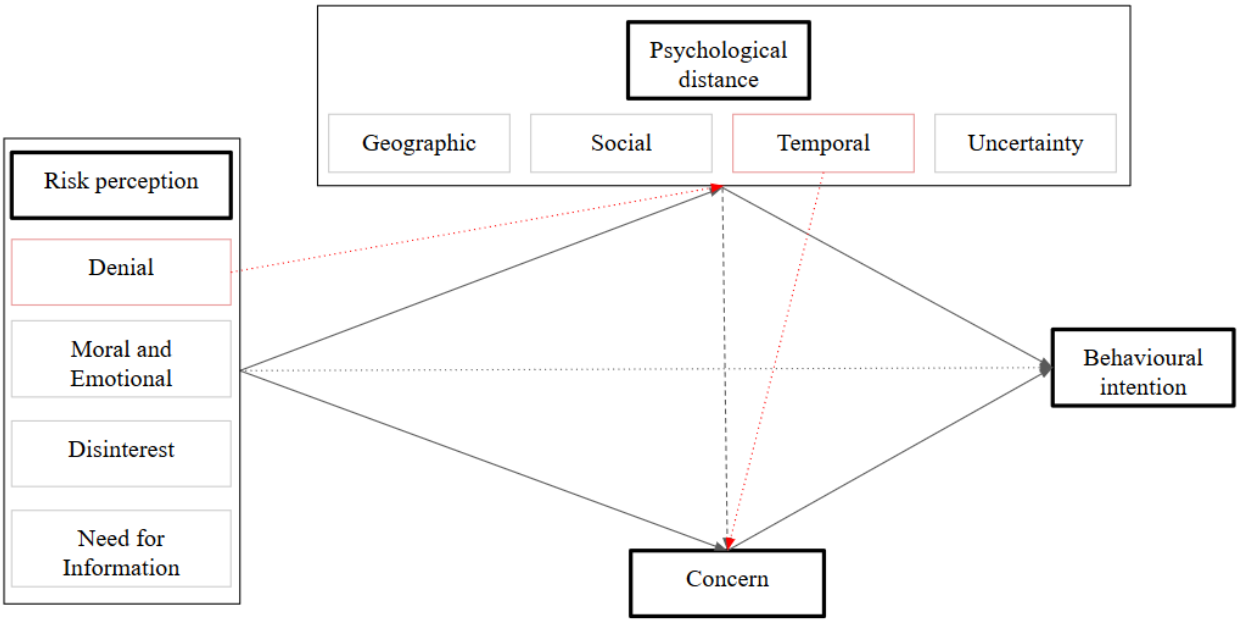

Figure 2, Concept model conclusion

Limitations The sample size is with max. 91 very low, which indicates that the answers must not be presumed to reflect the population.

Cronbach's alpha has been used to analyse the reliability of the survey's items. The majority turned out to be reliable. Unfortunately, the subscale risk perception disinterest has a questionable alpha. This might be due to the small number of items measuring the subscale (Cortina, 1996). This fits also to the fact that there is no alpha for the subscale psychological distance geographical and temporal since it consists of one item. The subscale psychological distance social has a negative alpha which means the items are not able to grasp the essence of the construct being evaluated. The psychological distance uncertainty scale is having a low alpha. This puts into question if the scales are measuring what they are supposed to measure.

Implications Considering the results above, it is possible to change the citizen's consumer behaviour by increasing their risk perception through means of education. Time indications play an important role as well as the resulting concern. The results can be used for governments who want to reduce the plastic usage, or for non-governmental organizations to start an intervention.

Recommendations and Future Research For further research, there are several implications to make. Considering the low reliability in the questionnaire, more participants and more items per scale are needed. Also, a replication of the study would be advisable, where the psychological concepts are being improved. Since the temporal aspect of psychological distance showed the strongest correlations and regressions, focussing on time in the equation is important. Taking the low behavioural intention into account, it is recommended to educate people about how to decrease their plastic consumption easily.

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Appendix I - Questionnaire

Welcome to this research study!
We are assessing the risk perception of microplastics. You will be presented with information relevant to microplastic and asked to answer some questions about it. Please be assured that your responses will be kept completely confidential.
The study should take you around 10 minutes to complete. Your participation in this research is voluntary. You have the right to withdraw at any point during the study, for any reason, and without any prejudice. If you would like to contact the Principal Investigator in the study to discuss this research, please e-mail Inga Maren Floer (i.m.floer@student.utwente.nl).

By clicking the button below, you acknowledge that your participation in the study is voluntary, you are 18 years of age, and that you are aware that you may choose to terminate your participation in the study at any time and for any reason.

Please note that this survey will be best displayed on a laptop or desktop computer. Some features may be less compatible for use on a mobile device.

- I accept
- I do not acceptImport Questions From...

Risk PerceptionBlock Options

Q1

I do not believe microplastic is a real problem

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q2

I am uncertain about whether the problem of microplastic is even real

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q3

It is too early to say whether microplastic is really a problem

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q4

The evidence for microplastic is unreliable

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q5

Too much fuss is made about microplastic

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q6

The media is often too alarmist about issues like microplastic

Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree

Q7

Talking about microplastic is boring

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q8

Microplastic is something that frightens me

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q9

I feel a moral duty to do something about the microplastic problem

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q10

The effects of microplastic are likely to be very severe for humanity

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q11

I consider microplastic to be an unacceptable risk

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q12

Microplastic is too complicated for me to understand

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q13

I often talk about microplastic to family or friends

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q14

It is difficult to know which products are better for the environment

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q15

I need more information to form a clear opinion about microplastic

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Concern Block Options

Q16

How concerned, if at all, are you about microplastic?

Very concerned Concerned Neutral Not at all concerned

Q17

Considering any potential effects of microplastic which there might be on you PERSONALLY, how concerned, if at all, are you about microplastic?

Very concerned Concerned Neutral Not at all concerned

Q18

Considering any potential effects of microplastic there might be on humanity in GENERAL, how concerned are you about microplastic?

Very concerned Concerned Neutral Not at all concerned

Behavioural IntentionBlock Options

Q19

Please answer the following questions based on the scale provided.

1. Not at all

2. A little bit

3. Somewhat

4. Quite a bit

5. Very much

How willing are you to perform the following behaviors that help reducing microplastic?

- Donate money to a respected organization cleaning up the beaches and ocean.
- Research about companies that do not use plastic in their cosmetic products.
- Reduce plastic usage in order to decrease plastic pollution.
- Write a letter to companies that use microplastic in their products to urge them toward more sustainable practices
- Use cotton bags instead of plastic bags.
- Inform friends and family members about threats of microplastic.
- Share your knowledge about how microplastic is affecting the nature through social media (e.g., Facebook, Twitter, Instagram).
- Cleaning up beaches during vacation

Psychological DistanceBlock Options

Q20

The microplastic issue will mostly affect areas that are far away from here.

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q21

Microplastic will mostly affect developing countries.

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q22

Microplastic is likely to have a big impact on people like me.

Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree

Q23

When, if at all, do you think humanity will start feeling the effects of plastic in the ocean/microplastic?

We are already feeling the effects	We are going to feel the effects in the near future	We will feel the effects in the distant future	We will feel the effects in the future, I am not sure when	Never

Q24

I am uncertain that microplastic exists.

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q25

Most scientists agree that microplastic ends up in our food.

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

Q26

It is uncertain what the effects of microplastic will be.

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

DemographicsBlock Options

Q28

Please indicate your gender

- Male
- Female
- Genderqueer

Q31

Please indicate your age

Q32

Nationality