THE INFLUENCE OF PACKAGING DESIGN FEATURES ON CONSUMERS' PURCHASING & RECYCLING BEHAVIOUR.

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PREFACE

This master thesis was written as contribution to a research by the Dutch Top Institute Food and Nutrition (TIFN), a public-private partnership on pre-competitive research in food and nutrition, and the Netherlands Institute for Sustainable Packaging (KIDV) under grant SD002 Sustainable Packages.

A briefer version of this master thesis has been published previously as a conference paper for the 21st IAPRI World Conference on Packaging which was held from 19-22 June in Zhuhai, China. Additionally, the conference paper was presented as an oral presentation during the conference

The authors are planning to publish the whole research as a journal paper in the Journal of Cleaner Production. For this reason, the master thesis has been written in a journal paper format.

ABSTRACT

Consumers open, on average, more than seven packages a day which are usually thrown away directly after use. Consequently, packaging waste has become a symbol of the throwaway society, unavoidably adding to our environmental impact. Existing studies have shown that the visual appearance of a package has great influence on consumer behaviour during (1) the processes of making conscious sustainable purchasing decisions and (2) sorting packaging waste after usage. However, it is not clarified *how* these aspects influence their behaviour and *how* packaging designers should use this knowledge.

Consequently, this paper aims to bridge the gap between packaging design and consumer behaviour during purchase and recycling of sustainable packaging by focusing more on specific elements of the design. A theoretical analysis provides an overview of current literature combining behavioural sciences with design research. Based on (the gaps in) the literature, combinations of design elements are analysed with a conjoint analysis which provides more in-depth research into combinations of specific elements of the design. The most effective elements are integrated into packaging designs which are tested by consumers in a realistic setting, providing insight in more realistic purchasing and recycling behaviour. A comparable test setup has not yet been conducted among existing studies on this subject.

The results of the study show that decisions made by consumers regarding the packaging are mostly based on the graphical elements and to a lesser extent on information and form. Furthermore, the results indicate that appeal, buying intention, recycling intention, sustainability perception and reliability of the packaging producer are higher for a package with graphical elements regarding sustainability, such as nature imagery and information regarding sustainability. However, congruence with the product inside is very important especially in the case of adapting the graphics towards a more sustainable appearance. In case of appeal, buying intention and sustainability perception a sustainable looking form is preferred more than a least sustainable looking form. According to the results on recycling behaviour, graphically manipulated packages containing added logos or text to stimulate recycling or a more ecological appearance were consistently seen as more sustainable and respondents were also more positive about those in general. When testing recycling intention in real life, it deemed difficult to tell if recycling logos and a stimulating text have an impact on recycling intention of consumers. This opens many new possibilities for further research.

Keywords: packaging design, packaging development, sustainability, purchase behaviour, recycling behaviour, marketing.

1. INTRODUCTION

Consumers open, on average, more than seven packages a day (Crowe, 2003), which are usually thrown away directly after use. Consequently, packaging waste has become a symbol of the throwaway society (*Duurzaam Verpakken voor de Circulaire Economie*, 2013), unavoidably adding to our environmental impact (Magnier & Schoormans, 2015). Therefore, packaging producers are more and more taking into account sustainability aspects of the packaging (Magnier & Schoormans, 2015). Within this trend consumers are very important actors. During the purchasing process, consumers are presented with many different products packed in different packages and they have to make a decision which product-packaging combination to buy. After usage of the packaging, a consumer has an important role in sorting the packaging waste in order to facilitate waste processing. The better packaging waste is sorted, the easier it is to recycle it (*Duurzaam Verpakken voor de Circulaire Economie*, 2013). During those processes of (1) making conscious sustainable purchasing decisions and (2) sorting packaging waste after usage the visual appearance of a package is of great influence. Regarding purchase, consumers evaluate packaging as positive when it contains elements that communicate eco-friendliness (Lindh et al., 2016; Martinho et al., 2015; Rokka & Uusitalo, 2008; Van Birgelen et al., 2009). However, only a few studies focus on the influence of specific design elements on consumer behaviour (Magnier & Crie, 2015; Steenis et al., 2017). According to these studies product choice and evaluations are clearly influenced by environmental aspects of the packaging but it is not clarified *how* these aspects influence purchase behaviour and *how* packaging designers should use this knowledge. When looking at the second point of interest, waste processing and recycling of packaging is still hardly taken into account during the development. Recycling is a promising solution to tackle the waste problem and there are possibilities to make packaging better recyclable and even more important: to process the recycled materials into new packages (*Duurzaam Verpakken voor de Circulaire Economie*, 2013). Within this process the consumer plays an important role and the design can have an important influence on how a package is sorted and eventually processed (Buelow et al., 2010). Prior research on recycling behaviour of consumers has mainly focused on their recycling habits and to a lesser extent on the link between consumer behaviour and packaging design (Bolderdijk et al., 2013; De Groot & Steg, 2007; Geiger et al., forthcoming; Klaiman et al., 2017; Pancer et al., 2015; Perrin & Barton, 2001; Steg et al., 2014). Therefore, we want to focus more on the influence of specific design features and how these aspects influence recycling behaviour.

The purchasing process and recycling process may be separate processes but they can have significant influence on each other. One may try to find out how to increase the purchase of sustainable packaging but if the packaging is not recycled as intended after usage, there is still a lack of improvement in sustainable consumer behaviour. Similarly, it would be useless to only focus on the recycling part of the packaging if the packaging is not bought on beforehand. Prior research has mainly addressed either one of the subjects as only one study was found which focuses on both (Martinho et al., 2015). Therefore, we have chosen to study the purchasing process as well as the recycling process and to provide a link between the two processes. Another limitation of existing studies on this subject is formed by the fact that they have only gotten to the desk research phase with lack of real-life tests. Many of those studies have emphasized the need for more realistic test set ups in order to enhance realism of the results. Subsequently, this study contains a real-life test set up providing insight in more realistic purchasing and recycling behaviour.

Concluding, this paper aims to bridge the gap between packaging design and consumer behaviour during purchase and recycling of sustainable packaging. We specifically aim to seek knowledge which is applicable for designers. A theoretical analysis provides an overview of current literature combining behavioural sciences with design research. The purchasing process is discussed first followed by the recycling process. Based on (the gaps in) the literature, combinations of design features are analysed with a conjoint analysis which provides more in-depth research into specific aspects of the design. The most effective features are integrated into packaging designs which are tested by consumers in a realistic setting.

2. LITERATURE REVIEW

2.1. Existing literature

Existing literature on the influence of sustainable packaging design on consumer responses and behaviours can be classified into three streams of research. This division is based on the manner existing literature has organised their literature studies which makes it logical to continue in the same line. The first stream focusses on external and psychological factors such as environmental awareness and how these affect purchase and recycling behaviour of consumers. Here packaging design is seen as one of the influences on purchasing and recycling behaviour next to the other influences (Geiger et al., forthcoming; Martinho et al., 2015; Prakash & Pathak, 2017; Van Birgelen et al., 2009). The second stream is focusing more on a holistic approach of the packaging design, where the effect of the whole packaging design on consumer behaviour is studied among other criteria. These studies have tried to reveal consumers' perceptions of sustainable packaging and the influence thereof (Lindh et al., 2016; Magnier & Crie, 2015; Nordin & Selke, 2010). The third stream of research is following an analytical approach with regard to independent characteristics of the packaging and how these affect purchase and recycling decisions and behaviours (Magnier & Crie, 2015; Steenis et al., 2017). The purchasing process is discussed first followed by the recycling process and for both processes the division as discussed above is used.

2.2. Purchasing process

2.2.1. External factors

Perceptions and behaviours of consumers are influenced by their attitudes and beliefs. If consumers are highly involved in a certain topic, they will react differently if a product contains information which is related to that topic than other consumers. This is also the case for consumers' attitude towards sustainability which is often referred to as their environmental concern (Bickart & Ruth, 2012; Kilbourne & Pickett, 2008; Mohr et al., 1998). A study highlighted the importance of consumers' attitude towards environmental friendliness of products and packaging. The attitude of those who endorse a low importance on environmental friendliness should be altered in order to let them engage more in pro-environmental behaviour. To enable this, it is necessary to improve their environmental knowledge (Martinho et al., 2015). However, changing the mindset of individuals with low values towards environmental friendliness is difficult. Even if they are reminded of the environmental consequences of their behaviour they are not inclined to act accordingly (Geiger et al., forthcoming).

A shortcoming of studies focusing on the influence of environmental concern during purchase is that choices are not merely based on these factors and therefore the focus should be on environmental friendliness among other choice criteria instead of only focussing on consumers' attitudes (Rokka & Uusitalo, 2008).

2.2.2. Holistic approach

Findings from studies on consumer perceptions of sustainable packaging reveal that consumers lack knowledge on the concept of sustainability (Lindh et al., 2016; Nordin & Selke, 2010; Steenis et al., 2017). They find it difficult to differentiate between sustainable and non-sustainable packaging, since it is almost impossible for customers in a store to determine the environmental status of a package (Magnier & Schoormans, 2015). Perceived differences between several types of packaging were tested by Steenis et al. (2017). Several structural types of soup packaging such as a glass jar and a plastic pouch were graphically manipulated to create a sustainable looking and a conventional looking version. Respondents could express perceptions of packaging cues in their own words. The study indicated the variety and salience of cue perceptions of the packaging designs and it turned out that convenience and sustainability aspects were primarily mentioned, before conventionalism and quality. Cue perceptions were combined and this indicated that a consistent distinction can be made between the two graphic designs, as the conventional design was described as modern and familiar, whereas the sustainable looking packaging was described as

more traditional. According to consumers the sustainability of packaging is increasingly seen as an important attribute of the whole product. For example, a study among German consumers showed that they were willing to trade off almost all attributes of the product for environmentally friendly packaging, except for taste and price (Van Birgelen et al., 2009). Additionally, a study by Lindh et al. (2016) was conducted to determine Swedish consumers' perceptions of food packaging and its environmental aspects. The results indicate that consumers base their choices to a large extent on perceived convenience of the packaging, meaning aspects related to handling and performance of a package. Aspects such as re-sealability, easy opening and manageable size were considered as attractive, while protection and provision of information were taken for granted. A majority of the Swedish consumers claimed that the environmental impact of packaging plays at least a medium important role in making product purchase decisions and 86% claimed a willingness to pay extra for more sustainable packaging. A study conducted by Martinho et al. (2015) among Portuguese consumers identified which factors affect sustainable consumer behaviour with respect to sustainable packaging during purchase decisions and recycling behaviour. The factors studied were satisfaction with packaging features, behaviour and attitudes, environmental awareness and demographics. Comparisons were made between two contrasting groups of customers, one group that found sustainable packaging important at the time of purchase and another group that rated it as not being important. The study indicates that price is a key determinant for both groups in making purchase decisions. Around 70% were willing to pay a premium between 1% and 5% for products contained in sustainable packaging. An attractive packaging design was a less important feature to the respondents than low prices, high product quality and high functionality.

During the studies which are focussing on a holistic view of the packaging, respondents were specifically asked about their purchasing behaviour regarding sustainable packaging and this is not realistic during actual purchase situations. In such situations there is always a trade-off between different product attributes (Rokka & Uusitalo, 2008). During the study of Rokka and Uusitalo (2008) the importance of packaging sustainability was investigated among convenience and price and one third of Swedish consumers perceived environmentally labelled packaging as the most important criterion in their decision making. The influence of sustainable packaging while making purchase decisions is increasing and consumers are willing to pay more if they can trust the packaging is more sustainable, which presents an opportunity for the packaging industry to further develop more environmentally sustainable packaging (Lindh et al., 2016).

2.2.3. Analytical approach

Packaging consists of several design features such as colours, shape, logos and claims, which influence consumers' reactions and responses (Magnier & Schoormans, 2015). Consumers use these features to make inferences about the product contained inside, such as taste, quality and nutritional contents, but also about the packaging itself (Magnier & Schoormans, 2015; Pancer et al., 2015). These features may signal to consumers that the packaging is more sustainable (Steenis et al., 2017), but only a few studies specifically focus on the influence of these environmental elements (Magnier & Crie, 2015; Steenis et al., 2017). According to these studies, product choice is influenced by environmental aspects of the packaging, as it contributes to 34 percent of overall utility of all packaging attributes combined (Magnier & Crie, 2015; Rokka & Uusitalo, 2008). Moreover, the environmental aspects of packaging play a role in purchase decisions (Magnier & Schoormans, 2015; Magnier et al., 2016; Steenis et al., 2017).

Packaging features which convey eco-friendliness in consumers' opinions can be classified under three attributes of the packaging: form and structure, graphical elements and on-package information (Magnier & Schoormans, 2015; Rettie & Brewer, 2000). Form and structure include materials, shape, weight and texture, graphical elements comprise the colours, imagery and typewriting (Magnier & Crie, 2015; Magnier & Schoormans, 2015). On-package information is formed by verbal information (Magnier & Crie, 2015; Rettie & Brewer, 2000) and labels and logos. In the following section the features are discussed per attribute.

Form and structure

Consumers' judgements regarding the sustainability of the packaging are clearly dominated by material-related considerations (Lindh et al., 2016; Magnier & Schoormans, 2015; Steenis et al., 2017; Young, 2008). For instance, they consider the use of recyclable materials as a way to judge the environmental status while ignoring all other important aspects (Young, 2008). Additionally, most consumers have negative perceptions of packaging, as they perceive it as being one of the major contributors to solid waste and therefore dislike the use of 'too much' material. They are unaware of the fundamental roles of packaging as means of containment, protection and preservation of the product and as communication tool. To alleviate this negative view, it is crucial to promote the importance of packaging in sustainable production, distribution and consumption (Nordin & Selke, 2010). Additionally, it is important to understand how consumers respond to specific packaging materials, as material choices are able to decrease the actual environmental impact of packaging (Lindh et al., 2016; Magnier & Schoormans, 2015; Nordin & Selke, 2010; Scott & Vigar-Ellis, 2014; Steenis et al., 2017). An empirical study was conducted by Steenis et al. (2017) to investigate consumer judgements on the sustainability of several packaging materials. These judgements were compared to actual LCA data of the packaging and results showed important incongruences. According to the respondents, a bioplastic pot and glass jar were seen as most sustainable while plastic pouches and metal cans were seen as least sustainable, followed by carton sachets. The outcomes of the LCA study reveals that of the packages studied, carton and mixed material pouches were most sustainable and metal and glass were least sustainable, followed by bioplastic, which indicates a gap between perceived sustainability by consumers and actual sustainability based on the materials of the packaging.

Graphics

In the case of graphics the colour green is often associated with environmental behaviour and has become synonymous with the environment (Pancer et al., 2015). In addition to the colour green, the colours brown and white and images of nature often evoke positive emotions in consumers (Hartmann & Apaolaza-Ibáñez, 2010). Graphic aspects may be used to promote packaging types that consumers would not intuitively perceive as sustainable (Steenis et al., 2017).

Information

Information related to eco-friendliness is mostly formed by labels from environmental organizations and claims using ethical vocabulary. While using environmental cues, it is important to maintain congruency. If for instance a verbal claim is placed on a package with a conventional design, this may lead to a perceived incongruence among consumers and the verbal claim can be seen as greenwashing. If a package has an ecological look, verbal sustainability claims can highlight certain visual elements in order to increase its persuasive impact and this provides customers with more information to think about. (Magnier & Schoormans, 2015). Hence, it seems a good idea to use verbal claims to highlight the ecological look of the package.

2.3. Recycling process

2.3.1. External factors

Biospheric values

An important factor which can promote recycling is formed by the biospheric values endorsed by an individual (Geiger et al., forthcoming). Biospheric values are comparable to the environmental concern of an individual. Biospheric values reflect that people strive to benefit nature and the environment and this appears to be a predictor of pro-environmental behaviour, including recycling (Steg et al., 2012). Individuals with strong biospheric values are likely to recycle more than the ones with lower biospheric values, as the former will base their choices and behaviour on the consequences for the environment (De Groot & Steg, 2007). Yet, these values do not always translate into actual recycling behaviour since this is also determined by other factors (Geiger et al., forthcoming; Pancer et al., 2015; Schuitema & Groot, 2015; Steg et al., 2014). Packaging design can be regarded as one of those other context factors which has an impact on whether

recycling occurs. It is proposed that packaging design can increase recycling behaviour among consumers (Cialdini et al., 1990; Langley et al., 2011). The third external factor is formed by the waste management, such as local recycling facilities (Geiger et al., forthcoming; Pancer et al., 2015; Schuitema & Groot, 2015; Steg et al., 2014). Since this study focuses on the influence of packaging design on recycling behaviour, the influence of waste management is not discussed here. However, there has been some background research into waste management in the Netherlands which can be found in Appendix A1.

Barriers and drivers to recycling

A study by Klaiman et al. (2017) identified which packaging attributes are perceived as barriers to recycling. Results show that having to clean a package negatively influences a consumer's decision to recycle it. Content can have a significant influence particularly for metal cans and plastic trays. If the content leaves a residue which is unpleasant or difficult to remove the packaging will often be thrown into general waste including the residue (Langley et al., 2011). Time spent recycling was also seen as a barrier towards recycling. However, the number of parts the packaging consisted of did not have a significant effect (Klaiman et al., 2017). Perrin and Barton (2001) found that households recycle primarily for environmental reasons such as concerns for future generations and the environment. Barriers found were having not enough time, storage problems in terms of requiring several waste bins for different waste streams and distance to recycling centres.

2.3.2. Holistic approach

It is proposed that packaging design can increase recycling behaviour among consumers (Cialdini et al., 1990; Langley et al., 2011). It appears to be a tool to promote recycling behaviour among individuals who do not necessarily recycle, while it does not harm to individuals with high biospheric values who are expected to generally recycle. This is also supported by Wikström et al. (2014), who highlighted the importance to investigate the influence of packaging design. Wever et al. (2010) showed that packaging design has an influence on littering and waste behaviour. According to the results conspicuous anti-littering labels may reduce littering. These studies thus emphasise that design matters in terms of influencing recycling behaviour but it is not clarified how the design plays a role. Therefore, the current study will investigate how the design plays a role during the process of recycling.

2.3.3. Analytical approach

Form and structure

The materials a package consists of significantly influence the perceived sustainability by consumers (Steenis et al., 2017) and consequently, whether or not that package is recycled (Geiger et al., forthcoming). Langley et al. (2011) conducted a test among households in Rotherham including bin raids to understand how consumers respond to design attributes of food packaging with regard to waste, including the material and structure. Sustainable waste options such as re-use were addressed and specifically how the material and form influenced these types of use. Results indicate that glass is recycled and re-used more than any other material, which could be due to the perception of high value and the form of glass packaging which often allows the potential to use it again. Metal cans are recycled in the same amounts as glass but not re-used as respondents indicated that cleaning them was uncomfortable. Plastic was most often thrown into the general waste stream, which may be due to a lower perceived worth and a low understanding of plastic's life cycle. Cardboard had a relatively high recycling rate because it is mostly easy to recycle. This is in contrast to the results of a study from Klaiman et al. (2017), who stated that there was no difference between paper or boxboard relative to plastic. Packages that can be re-filled and re-closed are more likely to be re-used. Also, re-sealable packages usually come in larger packs which are seen as more worthwhile. Certain formats of the packaging thus have a greater potential for re-use. Forms with perceived low value and no potential to use it again are more likely to end in the general waste stream. A study by Klaiman et

al. (2016) estimated consumer demand for packaging material and recyclability to evaluate the effects of information on consumer behaviour. The willingness to pay (WTP) for packaging recyclability was estimated for different packaging materials and proved to be highest for plastic, followed by aluminium, glass and carton. It is assumed that consumers may be willing to pay more for plastic as they perceive it as most harmful for the environment if it is not recycled. Interestingly, the study from Langley et al. (2011) found that plastic is often thrown into residual waste, whereas consumers from the latter study have a relative high WTP for plastic recyclability. In that case, it would be beneficial to sort the plastic waste.

Graphics

The link between sustainable looking packaging and recycling behaviour is critical since perceived sustainability is a mediator of recycling behaviour. In other words, the assumption is that a package has to be perceived as sustainable by an individual before being willing to recycle it (Geiger et al., forthcoming; Ruepert, Keizer, & Steg, 2017). By combining several cues, such as green colour, nature imagery, pro-environmental materials and verbal claims, the extent to which recycling behaviour occurs may be increased (Steenis et al., 2017). In order to find out if there is indeed a link between a sustainable appearance of the packaging and recycling intention, this will be addressed during this study.

Information

Several attributes of the design are used to promote or have an influence on recycling behaviour. Among these attributes, on package information is the most common approach to increase recycling behaviour of consumers. This information alone does however not necessarily translate into actual recycling (Geiger et al., forthcoming; Pancer et al., 2015). In general, householders do not look at information on packaging for decision making about discarding options. What can be recycled appears to be general knowledge and is linked to perceptions about the materials. Particularly for plastic packaging, clearer labelling is needed to increase consumer's understanding of what plastics can and cannot be recycled and what they are recycled into (Langley et al., 2011). Information provision in the form of labels, such as recycling symbols, are increasingly used to both emphasize pro-environmental properties as well to promote the product itself (Atkinson & Rosenthal, 2014). Along with standardized labels, many companies are introducing their own ones which leads to confusion among consumers (Buelow et al., 2010). Baxter et al. (2016) examined the extent to which consumers in Melbourne understand recycling information on packaging labels and their subsequent recycling behaviour. Results indicate that consumers have fairly good knowledge on how to sort their packaging and the meaning of most common labels is known. Most easily understood were action-oriented labels, with words telling what to do ("remove cap and recycle"). Most misunderstood labels were contradicting, for example a tidy man inside a Mobius loop or they were too vague, such as a verbal claim asking to "do the right thing". Incorrect, misleading and vague labelling proved to be one of the largest barriers to proper sorting meaning that consumers fail to discard their packaging waste properly despite good intentions. This leads to a significant amount of miscategorized waste. This could be overcome through the introduction of a standardized system with guidelines concerning more adequate labelling. In the Netherlands the guideline 'Waste Pointer' (Weggooiwijzer) is used to help packaging producers with the application of logos which instruct consumers how to throw away their packaging. The logos seem like a promising method to tell consumers how to throw away their packaging as intended, especially since an action-oriented approach is used. An example is shown in Figure 1. There are no regulations concerning the placement of the logos and the logos can be used freely by packaging producers. Furthermore, the application is not monitored by the KIDV, meaning that this is based on the insight of packaging producers and designers (Arntzen, October 6, 2017). There has not been any research into the effectiveness of these logos thus far and therefore the logos are used during this study in order to address their effect on recycling behaviour. More information about the Waste Pointer can be found in Appendix A2.

Figure 1: Left: an example of the use of a waste pointer logo on a package of yoghurt. The logo says “wrapper at paper waste”. Right: examples of two types of packaging with corresponding logos.

2.4. Conclusion literature review

Regarding the purchasing process, consumers have positive attitudes towards more sustainable packaging and they are willing to pay more if they can trust that the packaging is indeed more sustainable. However, it is difficult for them to make judgements about the environmental aspects of a package when they are standing in front of a shelf. The judgements they make are mostly based on the materials and therefore they tend to neglect other important aspects. For designers it is important to take into account that there is a gap between sustainability perceptions of consumers and the actual sustainability of the packaging materials. This presents a challenge to motivate consumers to choose packaging options that, based on their own knowledge, they would not believe to be environmentally friendly (Steenis et al., 2017). By combining graphic aspects and information with a pro-environmental form or structure packaging types which are generally not seen as sustainable can be promoted.

With regard to the recycling process, it is clear that packaging design plays an important role and can be seen as a tool to promote recycling behaviour among individuals who do not necessarily intend to do this. Materials significantly influence perceived sustainability and whether or not a package is recycled, since knowledge about what can and cannot be recycled is mostly linked to perceptions about the materials. The link between a sustainable appearance of the packaging and recycling behaviour is critical, as the assumption is that a package has to be perceived as sustainable before consumers are willing to recycle it. Thus, both for the purchasing and recycling process it is important that packaging communicates an understandable and reliable message with regard to environmental issues and clearly signals it is sustainable. Up till now studies have mostly based their results on quantitative tests in order to find out how many people have a certain opinion about the packaging. During our research we want to gain insights on the underlying motivations about design aspects of the packaging. Packaging features which convey eco-friendliness in consumers’ opinions were proposed by existing studies and have been discussed during the literature review. Based on this information an overview was assembled both for the purchasing and recycling process. The features were divided under the three attributes of the packaging as discussed during the literature review: form and structure, graphical elements and on-package information. The overview is shown in Table 1. During the following empirical study these features were used as input in order to find out which features are most promising.

Table 1: Packaging features which convey eco-friendliness according to consumers.

PACKAGING ATTRIBUTE	PACKAGING FEATURES		
Form/structure	Less material	Recycled/recyclable materials	Reusable package
Graphics	Brown, green, white	Nature imagery	
Information	Environmental claims	Environmental/ recycling logos	Labels from environmental organisations

2.5. Conceptual research model

To provide an overview of the outcomes of the literature review a framework was composed which can be used by packaging designers to get insights on how the purchasing and recycling processes work. These insights can be used as a first step in the design process in order to gain more understanding in the underlaying processes and influences among consumers when making decisions about purchasing and recycling. The framework is based on an integrated conceptual framework from Crilly et al. (2004) where consumer response to a product's visual form is studied. The framework in this paper contains the product-packaging combination as point of interest and shows the consumer perception of packaging and possible subsequent behaviour during purchasing and recycling. The perception of the packaging is formed by the holistic and analytical view and influenced by external factors. The holistic view entails that the packaging is seen as a whole among other factors which are the price of the product-packaging combination, the perceived sustainability of the packaging and the perceived convenience of the packaging. The analytical view encompasses a more detailed view where packaging features are seen separately. In real life, a customer naturally perceives most of these elements unconsciously. The external factors are formed by contextual and psychological factors which influence consumers' perception of the packaging and consequently their behaviour. As a result of both viewing methods of the packaging a certain behaviour will occur. Besides providing an overview of the literature review the framework is also meant to show how the fields of research are connected to our empirical study. This is indicated with numbers that correspond to parts of the empirical study. See Figure 2. As can be seen, our empirical study maps the whole process.

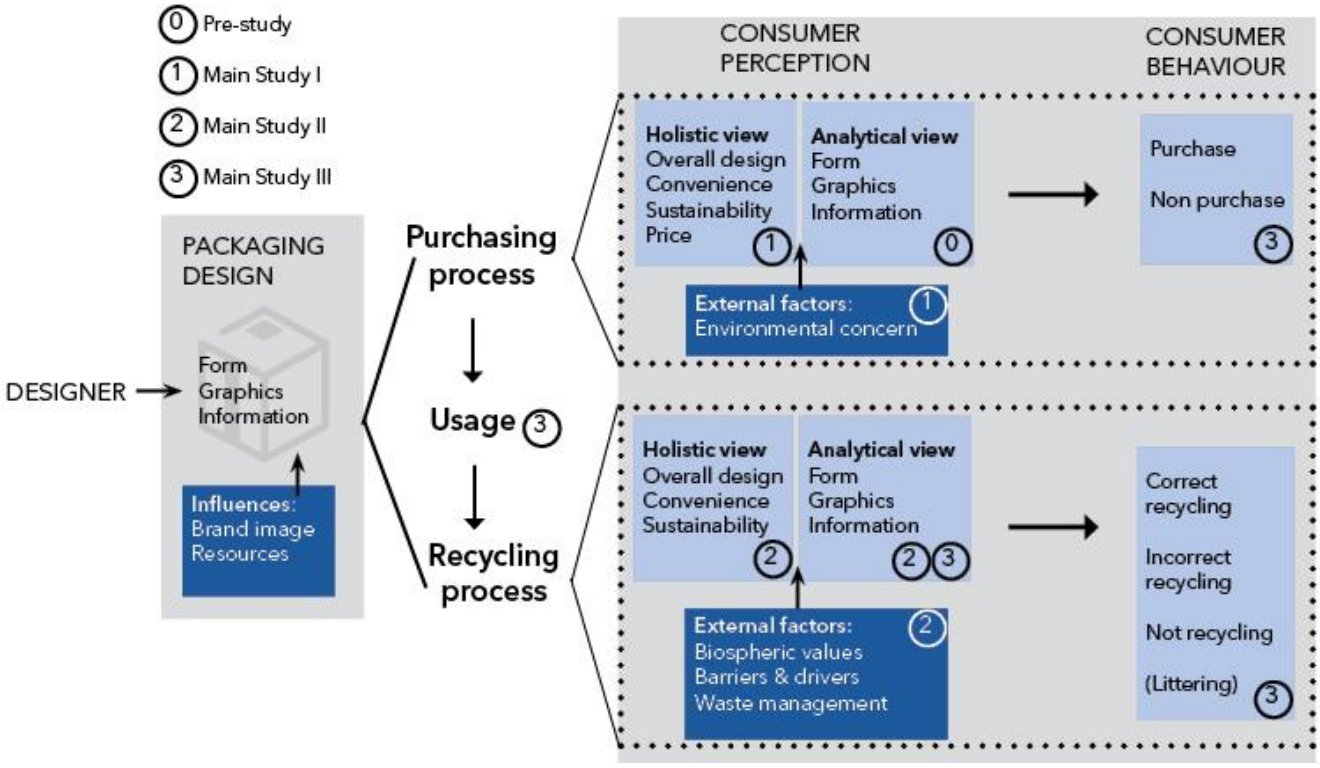

Figure 2: Consumer response to sustainable packaging during purchase & recycling.

3. METHODS

We conducted an empirical study to determine the influence of the design of sustainable packaging on purchasing and recycling behaviour. The study was split into three parts: a pre-study and three main parts. Part one focused on the influence of packaging features on several factors related to purchase and recycling intention. In order to determine the stimuli for this study, a pre-study was performed. Part two was conducted to determine the influence of recycling cues on consumers' recycling intention and their sustainability perception of packaging. Part three used the outcomes of part one and two to test purchasing and recycling intention in a realistic supermarket setting. As continuous test case throughout all parts of the study a bottle of water was used.

3.1. Pre-study

3.1.1. Method

The pre-study identified which specific packaging features are able to communicate sustainability. Consequently, we conducted a qualitative pre-study among a small group of 20 respondents (55% female, M_{age}=26.7) using an online ranking tool. The stimuli were composed by images of a bottle of water, which varied in three categories of packaging cues: the form and structure of the bottle (form), the graphical design of the label (graphics) and information or certification on sustainability (information). This was chosen to be able to analyse specific elements of the packaging design according to the division of packaging attributes as used during the literature review. A bottle of water was chosen as stimulus because it is a common product that can be bought at every supermarket. Additionally, plastic as packaging material is interesting since plastic is seen as the least sustainable packaging material by consumers (Steenis et al., 2017). Sustainability claims or information about the origin of the packaging material would therefore not look odd. An additional advantage of a bottle of water is that the content looks neutral which prevents distraction from the packaging. For each of the three categories around nine designs were made based on packaging features which convey eco-friendliness among consumers (also see Table 1). For each category, a baseline design was chosen, which is based on existing water bottles and can be seen as conventional and recognizable. The other designs were meant to be more sustainable-looking, but this was not communicated to the respondents. To keep the designs identical, only certain aspects of the packaging were manipulated for each category. In order to enhance realism of the designs, a logo of the fictional brand "AQUA" was displayed on each bottle's wrapper, along with 'mineral water'. A fictional brand instead of an existing brand would prevent any influence from brand preferences. For the scheme of form the bottle differed in overall shape and structure. Only the bottle itself was displayed without a label, since the placing and size is dependent on the form and variation can have an influence on the look and salience of the different designs. The graphics scheme of the wrapper differed in colours, imagery and slightly in logo if this was necessary to remain a stable and good-looking design. For the information scheme, the bottles and wrapper were identical for each design and extra information or certification was placed either on an additional label on the upper part of the bottle or added to the wrapper. The designs are shown in Figure 3, with the baseline designs mostly left. A more detailed version can be found in Appendix B1.

Figure 3: Stimuli for the pre-test.

3.1.2. Procedure

During the first section an external factor which influences purchasing behaviour, focussing on environmental awareness was addressed with two short questions. Firstly, participants were asked to provide their personal definition of sustainable packaging and secondly, they were asked to give themselves a grade between one and ten on how consciously sustainable they are. During the second section participants were asked to rank each of the three categories of designs – form, graphics, information - twice, first according to buying intention and secondly according to sustainability perception. For buying intention participants were asked how likely it would be that they would buy the product. After finishing this for all three categories they were asked to rank the same designs again on sustainability perception. It was explicitly mentioned to the participants that the sustainability of the packaging had to be based on perceived sustainability, since it is difficult to judge the actual sustainability based on a picture of a package. It was chosen to test the buying intention first and the sustainability perception second, otherwise the buying intention could be influenced by the judged sustainability of a package. During the ranking activity, participants were asked to explain to the moderator why they would assign a design to a certain spot in the ranking. The test was conducted using UT Ranking Tool, which allows one to make rankings of groups of images. All images can be dragged across the screen and it is possible to put multiple images on the same spot in the ranking.

3.1.3. Results and discussion pre-study

According to the personal definitions of sustainable packaging, high recyclability and low environmental impact were named most. The list with definitions given can be found in Appendix B2. Based on the question on how consciously sustainable participants found themselves the majority rated themselves between four to seven indicating that they have a moderate interest in being consciously sustainable. Respondents ranked the three categories of designs twice, first according to buying intention and secondly according to

sustainability perception. The ranking tool based the position of an image on a horizontal x-coordinate, which means that every design gets one position for purchase intention and one for sustainability, for each of the 20 rankings made. These resulting coordinates were put in box plots to gain insight in the spreading of the data. Appendix B3 shows all box plots. Each design was analysed by looking at its responding sustainability box plot and the one for purchase intention. For each category the most sustainable and least sustainable design were obtained. The least sustainable designs were ranked mostly left in the ranking on sustainability, meaning that these designs were seen as least sustainable of all designs. Since the designs of this study were designed to look sustainable, the term 'least sustainable' might be misleading and therefore it was chosen to name these designs 'neutral'. The most sustainable designs were ranked mostly right and therefore these were seen as most sustainable. For practical matters it was chosen to name these designs 'sustainable'. See Figure 4.

'neutral' designs — 'sustainable' designs

Least sustainable — **Most sustainable**

Figure 4: explanation of the ranking of neutral designs and sustainable designs.

While looking at the resulting boxplots for sustainability in order to find out which of the designs were judged as least and most sustainable, the results on purchase intention were also taken into account. This meant that the designs with the highest and lowest positions on sustainability at least had a middle position for buying intention to make sure that the designs are realistic in the sense that consumers are willing to buy it. Also, the spreading of the data was taken into account. Since the test was executed with a small number of participants, an elongated box plot indicates that the data is too widespread to be able to draw any conclusions. For this reason, it was made sure that the chosen designs had small box plots for both rankings. Two examples are shown in Figure 5. The first graph shows a graphical design where the values for purchase intention are low whereas the values for sustainability are higher but highly widespread. Therefore, this particular design is not realistic. The second graph shows an informational design where in this case the values for sustainability are low whereas the values for purchase are higher. As the values for purchase are too widespread, this design cannot be used either.

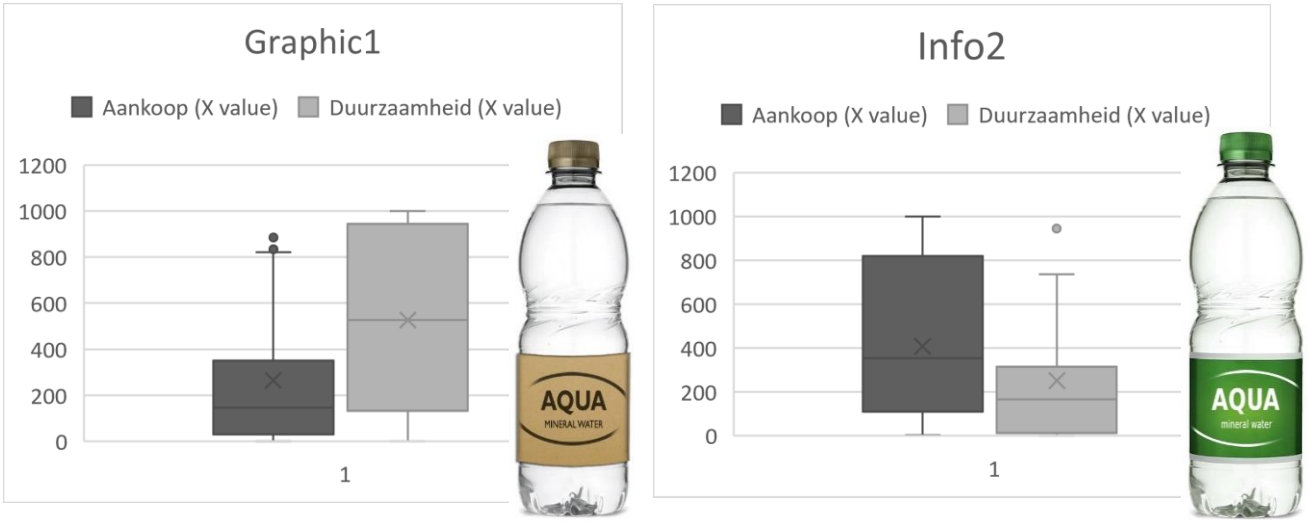

Figure 5: Examples of resulting boxplots.

During execution of the test participants provided comments about the designs and clarified how they placed the designs in the rankings. A transcript of the comments can be found in Appendix B4. In terms of the graphics, the colours green and brown and nature imagery were consistently perceived as sustainable.

This is in line with the overview of packaging features based on the literature review (Table 1). In general, some participants claimed they would not associate the particular product used for this test in combination with green colours and many would not expect it with brown as the latter caused a strange association with water (also see the left boxplot in Figure 5 which indicates a low purchase intention). They would rather expect the colour blue. This emphasizes that consumers expect a certain congruency between the packaging and its content. Simply designing a green or brown packaging to make it appear sustainable will not work for every packaging as the combination with the product inside may cause confusion and lack of appeal (Van Rompay & Pruyn, 2011). The pre-study resulted in the graphical, informational and form features for a neutral and sustainable design. These are shown in Figure 6.

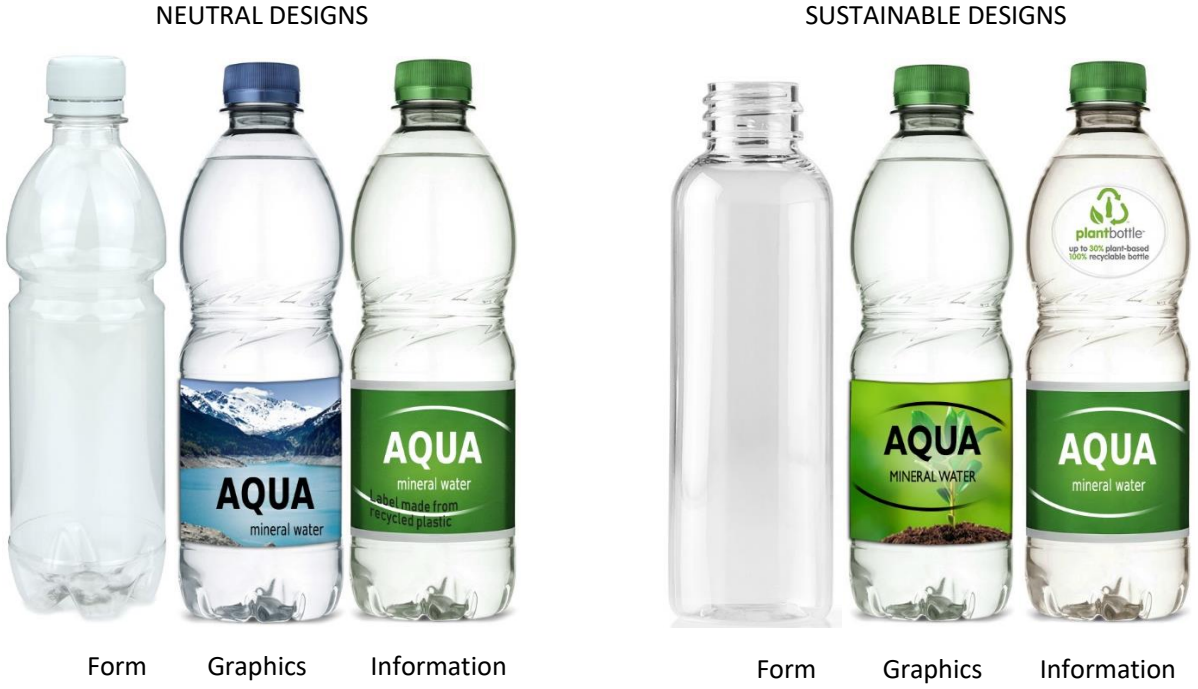

Figure 6: Resulting features of the form, graphics and information scheme.

Based on the category 'graphics' the pre-study indicated the most sustainable graphic is an image of a small green plant with a green background. Many participants found this image natural and good-looking. Based on the category 'information' the most sustainable information consisted of a separate label on the upper part of the bottle containing a logo of 'plantbottle' followed by an explanation. According most participants this information was seen as sustainable as it reveals the origin of the material and shows that the bottle is a hundred percent recyclable. Based on the category 'form' the most sustainable form of the bottle was a straight bottle and participants claimed that they would use this bottle again as it looks sturdy, minimalistic and practical. For the neutral designs, based on the category 'graphics' the resulting graphic is an image of air, mountains and water with mostly blue colours. Consumers might see these graphics as neutral as according to their comments they would expect this on a bottle of water. Based on the category 'information' the least sustainable information on the bottle was integrated into the label and consisted of a text telling that the bottle is made from 30% less plastic. According to the participants the information being integrated on the label made the overall design look clean. Based on the category 'form' the least sustainable form was seen as standard and recognizable by most participants. For all chosen features the rankings on purchase intention were average or higher meaning that consumers would be willing to buy them.

3.1.4. Conclusion pre-study

The pre-study resulted in the most sustainable and least sustainable designs for the three categories of packaging attributes: form, graphics and information. With this analytical approach the features were analysed separately in order to gain insight on each individual packaging feature in terms of sustainability and buying intention. The setup of the pre-study also provided qualitative insight into respondents' thoughts and opinions of specific design elements by letting them tell what they thought about the specific designs and why they were placing the designs on a certain spot. This was done so to study the analytical view of the packaging during the purchasing process extensively (also see the conceptual framework in Figure 2). The features of the sustainable and neutral design were further used as input of a conjoint analysis during main study I, to find out which combination of those features is most promising.

3.2. Main study I

3.2.1. Method

Main Study I was meant to address a more holistic view of the water bottle designs. In order to accomplish this a full profile conjoint analysis was used where the resulting features from the pre-study were combined into complete water bottle designs. This allowed us to find out how the combinations scored on several subjects and also which of the category of features was most important in decision making. There were two possibilities for each category – form, graphics, information. This resulted in a 2 (form: conventional or minimalistic) x 2 (graphics: blue or green) x 2 (info: on label or on bottle) between subject design which gave eight different conditions. In other words: there were eight possible combinations to be made from the different features, which formed eight water bottle designs as shown in Figure 7.

Figure 7: Designs for the conjoint analysis

3.2.2. Procedure

The survey comprised six sections. Firstly, respondents were asked to fill in two general questions about buying water bottles in order to familiarise them with the test case of the questionnaire. The second part consisted of five rankings of the eight bottles, based on five subjects: buying intention, recycling intention, appeal, reliability of the producer and sustainability. Respondents were asked to rank the bottles from one to eight, where one was the highest and eight the lowest. The questions as asked during the survey and the meaning of score one and eight per subject are shown in Table 2. In the survey each bottle corresponded with a letter from A to H and the letters could be dragged in the right order. This ranking method differed from the ranking method during the pre-study, since the possibilities of the QUALTRICS software in which the survey was made, did not have the possibility to work with draggable images.

Table 2: Questions per ranking subject.

SUBJECT	QUESTION
Buying intention	Please rank the following bottles according to buying intention. 1 = I would most likely buy this bottle; 8 = I would least likely buy this bottle.
Recycling intention	Please rank the following bottles according to recycling intention. 1 = I would most likely recycle this bottle; 8 = I would least likely recycle this bottle.
Appeal	Please rank the following bottles according to how much they appeal to you. 1 = this bottle appeals to me the most; 8 = this bottle appeals to me the least.
Reliability of the producer	Please rank the following bottles according to reliability of the producer. 1 = the producer of this bottle seems most reliable; 8 = the producer of this bottle seems least reliable.
Sustainability	Please rank the following bottles according to environmental friendliness. 1 = this bottle seems most environmental friendly; 8 = this bottle seems least environmental friendly.

Asking respondents to make a ranking is a good way to let them compare all the designs at once and this also reflects a real situation at the supermarket where several water bottles are presented next to each other and buyers make decisions based on several attributes from a holistic view. The five factors chosen are important to be able to say something about the purpose of this research. Buying intention and recycling intention are logic factors to incorporate into the survey, since the goal of this research is to find out how packaging features influence purchase and recycling behaviour. Especially for the latter the link between a sustainable appearance and recycling intention could be identified. Appeal is strongly related to buying intention, since something that appeals to a buyer is more likely to be bought than something that does not appeal. However, buying intention is also formed by need and other factors and therefore appeal does not always translate into purchase. The reliability of the producer of the packaging is taken into account, due to the information that is displayed on each design. If consumers have doubts about the information being trustworthy, this will affect the buying intention also, as well as their overall opinion and view of the packaging. Therefore, this question can be regarded as a check of the purchase intention. Lastly the perceived sustainability is asked for again during this survey, as the combination of cues may have another outcome than the cues viewed separately as was the case in the previous study.

As already had been shown during the literature review, price is a very important factor during the purchasing process. Within this study the influence of the price was investigated with respect to packaging features regarding sustainability. Subsequently, the third section of the survey contained a question where the eight bottles were shown again, but this time along with prices. The prices were chosen based on prices of existing comparable water bottles in order to enhance realism. See Figure 7. Respondents were requested to choose the bottle they would most likely buy after which they were asked to provide an explanation. Section four was meant address the external factors. Hereby we tried to find out how conscious each respondent is about sustainability as this may affect the other answers of the questionnaire. The first question of this section requested respondents to indicate to what extent they consider the consequences of their behaviour towards the environment. This was scored on a 7-point Likert scale ranging from 1 = strongly disagree to 7 = strongly agree. Respondents answering 1 or 2 were considered as belonging to the group of people with low biospheric values, 3 to 5 would point to medium biospheric values and 6 or 7 to high biospheric values. The next question asked respondents to give themselves a grade from 1 to 10 according to how conscious they are about sustainability. Respondents giving themselves the grade 1 to 3 were considered as belonging to the group of people with low biospheric values, grade 4 to 7 would indicate medium biospheric values and grade 8 to 10 would indicate the respondent having high biospheric values. By having two comparable questions on this subject, the reliability of the answers could be improved. Section five contained one question where respondents had to allocate a total of 100 points to characteristics of a bottle of water, according to importance. These were the following characteristics: colour/design of the label, form/design of the bottle, sustainability of the bottle, price of the bottle, reliability of the bottle producer, recyclability of the bottle and 'other' which could be filled in by the

respondent. It would be interesting to see what consumers find important themselves when judging a bottle of water in comparison with the importance scores based on the conjoint analysis. The sixth and final part of the survey consisted of some questions regarding demographic information.

3.3. Results main study I

Invitations to participate were send out by email and social media, containing a link to the questionnaire. The questionnaire was completed by seventy-three respondents in total (49,3% female). The results per ranking are presented in Table 3. The factor shows the packaging attributes, in this case form, graphics and info. The level shows the possible features for each factor with in this case two possibilities for each factor. The utility estimate shows the utility values of the two levels of each factor where a higher utility value indicates a greater preference. For all rankings, 'graphics – blue' and 'info - on-bottle' have the highest utility. According to the rankings on recycling and reliability, the conventional form has the highest utility, whereas the minimalistic form has the highest utility for appeal, sustainability and buying intention. The importance values show how important each factor was relative to the other factors while decisions were made. According to the importance values in Table 2, graphics clearly matter the most (average of all rankings: 44,4), followed by information (average of all rankings: 29,8) and form (average of all rankings: 25,7). Based on all rankings the attribute graphics has the highest importance value for recycling and reliability and therefore the effect is greatest for these subjects.

Table 3: Utility scores of the features per ranking as well as the importance values of the factors (graphics, info and form).

		RANKING APPEAL			**RANKING RECYCLING**			**RANKING BUYING**		
Factor	**Level**	**Utility estimate**	**Std. error**	**Importance values**	**Utility estimate**	**Std. error**	**Importance values**	**Utility estimate**	**Std. error**	**Importance values**
Grapics	Green	1.007	0.242	39.453	0.541	0.229	46.804	1.014	0.302	43.649
	Blue	2.014	0.483		1.082	0.459		2.027	0.605	
Info	OnLabel	0.801	0.242	30.573	0.712	0.229	29.002	0.671	0.302	30.030
	OnBottle	1.603	0.483		1.425	0.459		1.342	0.605	
Form	Minimalistic	-0.219	0.242	29.975	0.048	0.229	24.194	-0.192	0.302	26.321
	Conventional	-0.438	0.483		0.096	0.459		-0.384	0.605	
	Constant	2.116	0.639		2.548	0.607		2.260	0.800	
Correlations		**Value**	**Sig.**		**Value**	**Sig.**		**Value**	**Sig.**	
Pearson's R		0.938	0.000		0.890	0.002		0.898	0.001	
Kendall's tau		0.786	0.003		0.714	0.007		0.889	0.001	
		RANKING SUSTAINABILITY			**RANKING RELIABILITY**					
Factor	**Level**	**Utility estimate**	**Std. error**	**Importance values**	**Utility estimate**	**Std. error**	**Importance values**			
Grapics	Green	0.479	0.120	44.969	0.616	0.378	47.437			
	Blue	0.959	0.240		1.233	0.757				
Info	OnLabel	0.726	0.120	27.938	0.685	0.378	31.502			
	OnBottle	1.452	0.240		1.370	0.757				
Form	Minimalistic	-0.144	0.120	27.093	0.144	0.378	21.062			
	Conventional	-0.288	0.240		0.288	0.757				
	Constant	2.908	0.317		2.332	1.001				
Correlations		**Value**	**Sig.**		**Value**	**Sig.**				
Pearson's R		0.965	0.000		0.777	0.012				
Kendall's tau		0.929	0.001		0.571	0.024				

Regarding the ranking on appeal and sustainability there is no significant difference between the importance values of information and form. For the other rankings the information seems to be more important than the form which may suggest that for buying intention, recycling intention and reliability of the producer consumers pay more attention to the information than to the form to make a decision.

Based on the rankings on appeal, buying intention and sustainability 'form – minimalistic' has the highest utility. These rankings have negative utility scores with regard to the factor form which means there is an inverse relationship between form and utility, with a conventional form corresponding to a lower utility (larger negative values mean lower utility). Concluding we could say that the combination of 'graphics – blue', 'information - on-bottle' and 'form – minimalistic' can be identified as the profile with the highest utility. Similarly, the combination of graphics – green, information - on-label and form - conventional can be identified as the profile with the lowest utility. The correlations for all rankings are acceptable, as they show that predictions based on the conjoint analysis largely correlate with actual choices people make. The designs are shown in Figure 8.

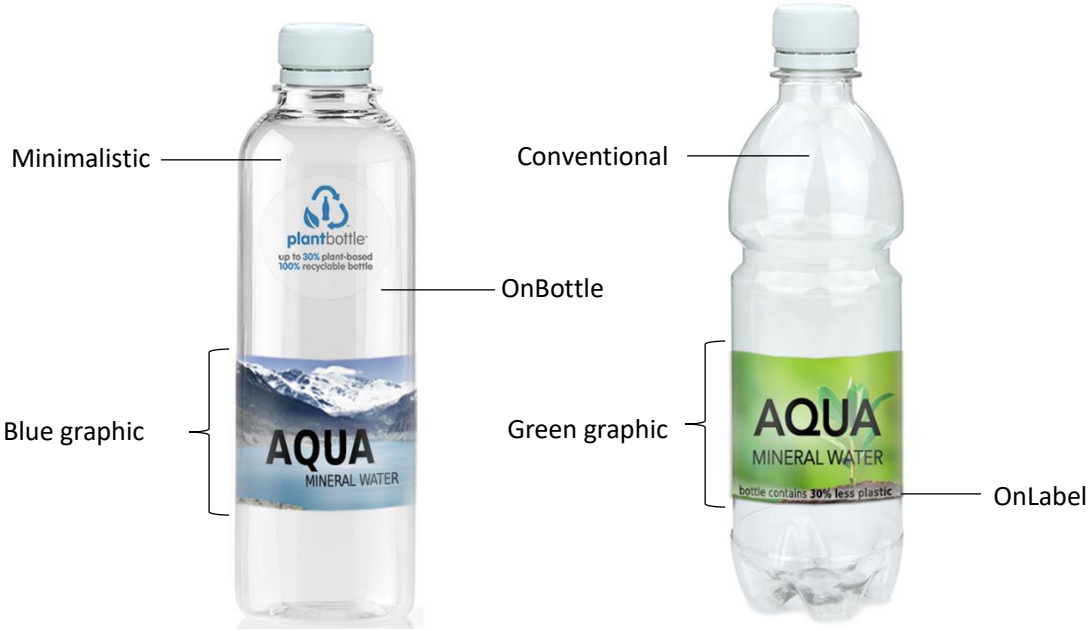

Figure 8: The designs with the highest utility (1) and the lowest utility (2).

The results based on the question where a price was included with the eight bottles can be seen in Figure 10. The combination of a blue graphic, on-label information and minimalistic form was chosen most (21 times), followed by a blue graphic, on-label information and conventional form (15 times). The blue graphic and minimalistic form are also most prefererred according to the utility values of the rankings, whereas on-bottle information has a higher utility than on-label information. According to explanations about the choices, price related comments were mostly given, followed by comments about the performance of the bottle such as re-usability. Also the preffered congruency of a blue graphic in combination with water was named here again several times.

During the last question respondents had to allocate a total of 100 points to several attributes of a bottle of water according to importance. Price was seen as the most important attribute (mean of 27 points), followed by form/design of the bottle (mean of 21 points) and sustainability and recyclability (both a mean of 14 points). The results on environmental awareness showed that most respondents have medium biospheric values. There were only a few respondents within the groups of low and high biospheric values. See Figure 9. An overview of all results can be found in Appendix C3.

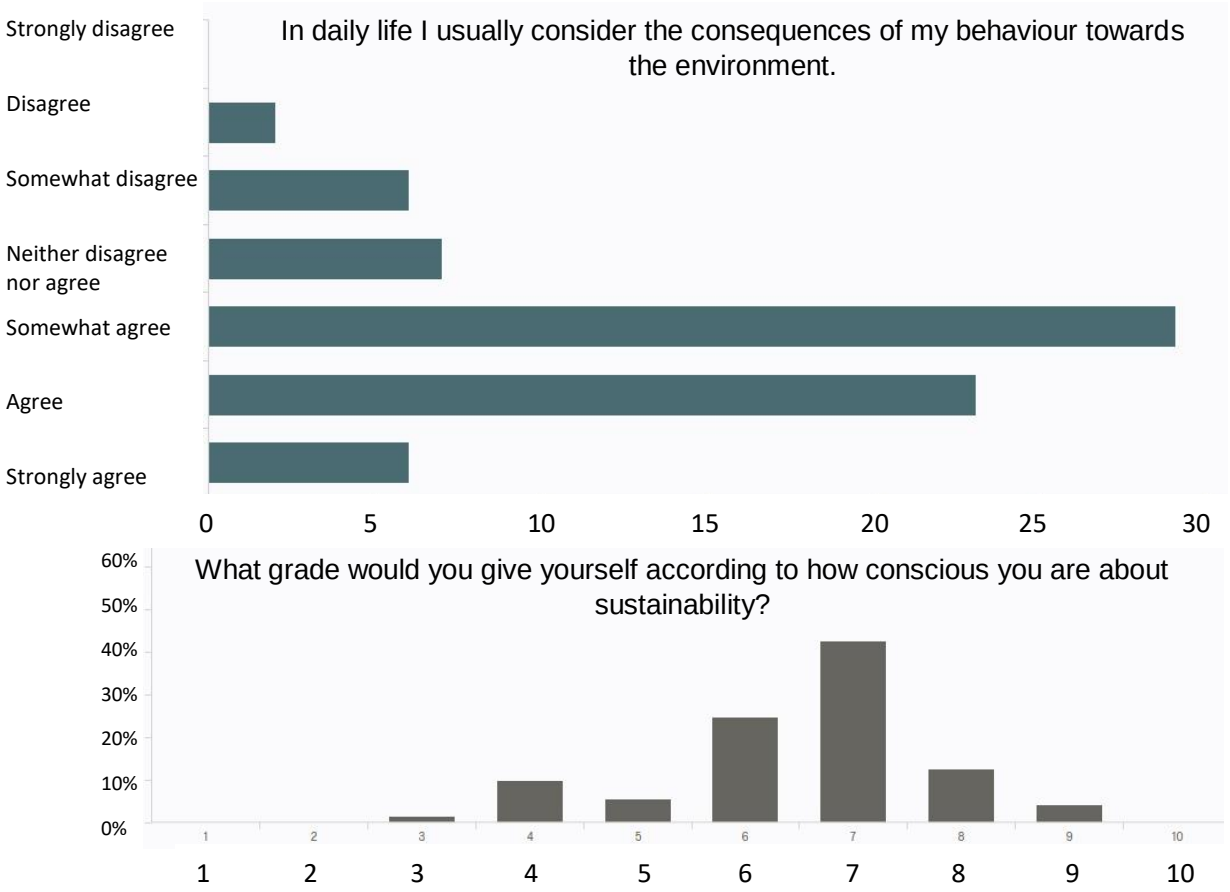

Figure 9: Results on environmental awareness.

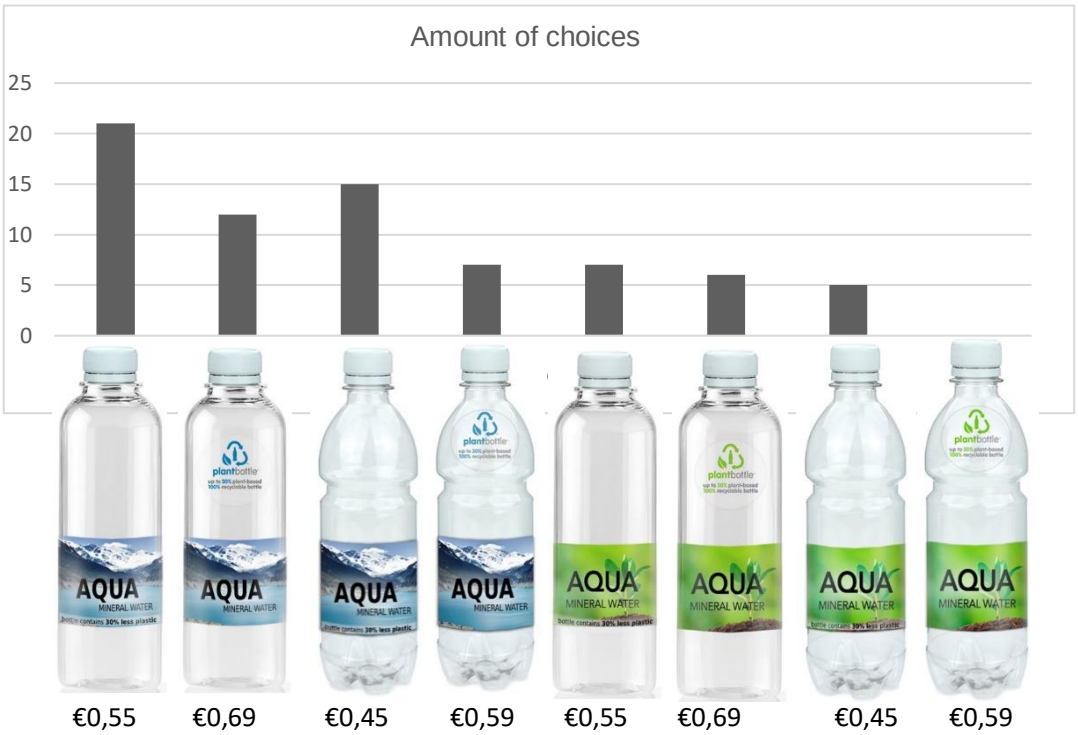

Figure 10: Results of bottle choosing with prices included.

3.3.1. Discussion main study I

General discussion

Many surveys were not finished by respondents, which might have been caused by the repetitive character of the rankings. However, the number of finished surveys is suitable to analyse the results. Furthermore, the most important outcomes of the survey, namely the bottles with the highest and lowest utility, are tested again during part two of the study which confirms the results. At the end of the survey there was room for respondents to write some comments about the survey and some indicated that they found the designs of the bottles too comparable and therefore had difficulties with ranking them. Due to the nature of the rankings, there was no possibility to place two or more bottle on the same spot, whereas some respondents would have done this if the possibility was there. For this reason, some bottles may seem to have a higher spot than the respondents actually meant.

Discussion about the results

During the rankings the neutral looking blue graphic was pointed out as most sustainable of the two which was not as expected, since the green graphic was the more sustainable variant according to the pre-test. It seems that the blue colour of the images, which is strongly connected to the product category of water may be decisive. Congruency is thus very important when judging the sustainable appearance. Besides that, the label contains nature imagery and this seems even more congruent with the product and also more reliable indicating that the water is coming from a certain natural source in the mountain. When looking at the link between a sustainable appearance and recycling intention, the blue graphic (neutral variant), on-bottle info (sustainable variant) and conventional form (neutral variant) had the highest preference. Therefore, information regarding sustainability seems to be important when making recycling decisions. The conventional form may have been in favour in this case as this bottle was less likely to be used again than the minimalistic form according to respondents. This may have caused them to indicate that they would rather recycle this bottle. According to the results on the importance of several packaging and product attributes, the form and design of the bottle is an important feature as evaluated by consumers, but when judging bottles during the rankings the form was of lower importance than graphics and information. This may be due to the assumption that actual choices are mostly made subcounsciously and therefore consumers may think that certain aspects of the packging are more important than they actually are when making real choices. Buying intention seems to be greatest for the blue label, on-label information and minimalistic form, which is not fully in line with the utility scores from the rankings. The blue label and minimalistic form also have the highest utility according to the rankings, whereas on-bottle information has a higher utility than on-label information. This may be due to the fact that the bottles with on-bottle information were 14 cents more expensive than the ones with on-label information. The results of this study show that decisions made by consumers regarding the packaging are mostly based on graphics and to a lesser extent on information and form. Eventhough they think form is very important, the results of their actual judgements show otherwise. When product prices are included price seems only to have an influence on the informational feature whereas the graphics and form are chosen similar to the highest preference.

3.4. Main study II

3.4.1. Method

The purpose of main study II was to look into the influence of recycling cues on consumers' recycling intention, which is the analytical section of the conceptual framework regarding the recycling process (see Figure 2). Additionally, the sustainability perception of packaging and the influence thereof on recycling intention was addressed, as the literature review showed that there is a critical link between sustainable packaging and recycling behaviour. Furthermore, the link between purchase and recycling behaviour is very important, because after a sustainable package has been bought it also has to be recycled in the right order to improve sustainable consumer behaviour. Two online surveys were made to have one control and one test survey. These were randomly spread among one group of respondents in order to create one control group and one test group. The main purpose of the study was to compare the results of both questionnaires in order to see if manipulated packaging was perceived differently by respondents.

3.4.2. Procedure

The survey consisted of seven sections, however, only the sections which resulted in relevant data for this research are discussed here. An extensive version of the procedure can be found in Appendix C1. The first section comprised a series of images of different types of packaging followed by different scales: sustainable – environmental unfriendly, attractive – awful, closed – inviting. These scales were chosen to test sustainability perception and appeal of the packages. Each package was judged on these criteria by filling in a 5-point Likert scale. In case of the test survey, the packaging shown was graphically manipulated. These manipulations were targeted at the graphics such as an addition of a more ecological appearance with nature imagery or targeted at information with logos or text to stimulate recycling. These graphics were in some cases integrated with the other graphics on the packaging and in other cases 'stamped' on the package in order to see if this had any influence. The form in terms of structure was not taken into account when manipulating the images, since the packages used mostly have standard forms which are derived from the material they are made from. For this reason, it would be difficult to change the form. However, the material appearance of some packages was adapted in order to create a more ecological look. Figure 11 shows two examples of packages which were manipulated. The adapted juice container contains nature imagery and a text saying "recycle me!". The text is integrated with the juice logo. The soup container contains extra information including a recycling logo from the Waste Pointer. The logo is not integrated with other graphics. The other images can be found in Appendix C1.

Figure 11: Images of an orange juice can and soup can which were manipulated. Left the control group version and right the test group version.

The second section identified if recycling logos from the Waste Pointer, which state how the packaging should be thrown away, influence decisions on where respondents would throw away different sorts of packaging. The control group was presented with images of packaging without logos and in case of the test group recycling logos were added, see Figure 12. The following section was meant to compare the mindsets of the control group and test group, since the test group had been confronted with adapted packages throughout the whole survey. Respondents were asked if they paid attention to whether a package is sustainable and whether it is recyclable. The last part of the survey focused on existing (recycling) logos which can be found on packaging. The logos were divided into three categories: pictorial, informative and action-oriented. The categories along with examples are shown in Figure 13. Respondents were asked to indicate the usefulness of each logo on a 5-point Likert scale ranging from not useful at all to very useful.

Figure 12: peanut butter jar. Left without recycling logo, right with recycling logo.

a. Pictorial

b. Informative

c. Action oriented

Figure 13: Logos which can be found on packaging in the Netherlands.

3.5. Results main study II

A detailed description of the results can be found in Appendix C2 and a graphical overview of relevant results can be found in Appendix C3. Invitations to participate were send out by email and social media, containing a link to the questionnaire. The questionnaire was completed by 86 respondents in total, from which 47 were presented with the test survey (T) (69,2% female) and 39 with the control survey (T) (72% female). The manipulated packages were consistently seen as more sustainable and respondents were also more positive about those in general. It seemed that expressions and logos which were integrated into the graphics of the packaging worked better than when these features were less integrated, as the latter was seen as less attractive. The second part focussing on where different types of packaging should be thrown away indicated that the test group knows slightly better where to throw away the packages. However, the difference was not significant in all cases and despite the recycling logos, packages would still be thrown into the wrong bin. The following section compared the mindsets of the control and test group. The test group clearly had more attention for sustainability and recyclability of the packaging after having seen the manipulated packaging. The last part focusing on (recycling) logos showed that respondents from both surveys find pictorial logos vague or unclear and they claimed there are too many packaging logos and labels in general. This is in line with previous research indicating that consumers are confused by the great amount of logos and labels displayed on packaging (Baxter et al., 2016; Buelow et al., 2010). The action-oriented logos such as the one with the text 'please recycle me!' were sometimes seen as humane or stimulating whereas others saw the texts as too didactic. Figure 14 shows some examples of quotes from respondents.

"If a product talks to you and asks you to recycle it, it gets human traits."

"I think this is too didactic."

"There are too many logos and labels."

"I do not know what this means or what I should do with it."

Figure 14: Examples of logos and comments.

4.2.1. Discussion main study II

General discussion

The groups of respondents were not exactly the same size (control group: 39; test group: 47). However, looking at demographic information, the composition of both groups is comparable (see Appendix C3). According to the question where respondents needed to indicate where different types of packaging should be thrown away, the test group did not always act according to the recycling logos despite the fact that they tell exactly where it should be thrown away. As this may seem odd, it might be assumed that some respondents simply did not notice the logos or did not look at the packaging sufficiently.

4.2.2. Conclusion Main Study II

Packages which were graphically manipulated in order to create a more ecological appearance were seen as more sustainable than the unchanged versions. Furthermore, packages containing information regarding sustainability were also seen as more sustainable. Additionally, respondents were more positive about the manipulated packages. Recycling logos do not seem to have a great influence on whether packaging is thrown away correctly, as mistakes were still made despite a recycling logo being present. After having been confronted with packaging with a more sustainable appearance or recycling logos, respondents seemed to have more attention towards the sustainability and recyclability of packaging. Recycling logos which were action-oriented (Figure 12c) seemed to be more useful according to respondents than pictorial and informative logos (Figure 12ab). Regarding the placement of (recycling) logos and texts on sustainability, it seemed important to place the features in a way that they are integrated with the other graphics on the packaging.

3.4. Main study III

3.4.1. Method

Part two of the empirical study used the outcomes of main study I and II to test buying intention (1) and recycling behaviour (2) among supermarket customers. Recycling behaviour in a supermarket may be different than at home, but within the scope of this study this seemed the most feasible option. Furthermore, for testing the buying intention this seemed a logical location since the purchase of products normally occurs at a supermarket. In order to test the buying intention, the bottles with the highest and lowest utility according to the conjoint analysis (Figure 8) were produced as physical bottle and we asked customers about their purchase intention based on those. We expected that the bottle with the highest utility would trigger the highest purchase intention. In order to test recycling intention, it would have been ideal to use the same bottles and look whether they would be recycled as intended. However, in the scope of this research it was impossible to produce a large amount of those bottles and therefore we used another approach. Supermarkets in the Netherlands regularly have tastings from brands they sell, for instance to introduce new products. Our test setup was based on this phenomenon: we put up a stand at a supermarket where customers could taste two variants of water with fresh ingredients: mint & lime and mango & orange. The water was handed out in plastic cups with a paper wrapper. The mint & lime wrapper contained logos from the 'Waste Pointer' along with an extra trigger in the form of an extension with the text "recycle me" in Dutch. The text stimulates to recycle and the logos show where the several parts of the packaging should be thrown away. According to Main Study II such action-oriented elements (Figure 13c) seemed most useful according to the majority of respondents. The mint & lime wrapper consisted of green colours which not only reflected the fruit but were also seen as a sustainable colour (Table 1). For this reason, the influence of a sustainable appearance on recycling behaviour could be addressed. The orange & mango wrapper contained a comparable design but the recycling logos were replaced with rectangles with text about the ingredients and the text on the extension was replaced with "orange mango". The green colour was replaced with orange to reflect the fruit. This allowed us to compare two types of cues: one with recycling info and one without. Since the test set up was dependent on using plastic cups, the form of the packaging was not taken into account. However, the influence of several materials, in this case plastic and paper could be investigated. Additionally, the influence of separability of the packaging parts could be addressed as well. With regard to the conceptual framework (Figure 2), the design of the green wrapper covered the influence of the analytical view of the packaging on recycling behaviour. Additionally, the resulting behaviour regarding the recycling process was tested as well as actual buying intention of a physical product-packaging combination. The cups and wrappers are shown in Figure 15.

After consumption of the flavoured water the wrapper had to be thrown into paper waste, any residue of the ingredients into organic waste and the cup into plastic waste. To facilitate this a recycling bin with separate compartments for plastic, organic and residual waste and an extra conventional bin with one compartment for residual waste were located close to the stand. The bins formed external factors regarding waste management which have an influence on recycling behaviour according to the literature studied. For this reason, the extra conventional bin was added, because only presenting a recycling bin may influence recycling intention too much whereas the goal of the test was to investigate the influence of packaging cues. By having two bins, the possibility was created to recycle but customers also had the possibility to throw everything into the conventional bin. Furthermore, some recycling barriers were taken into account with the first one the distance to the bins and secondly understanding the way the recycling bin works. After execution of the test the bins were checked to indicate if the cups and wrappers were separated and discarded correctly and if there was any difference between the two designs. We expected that the recycling rates of the mint & lime cups would be higher than those of the mango & orange cups.

Figure 15: Above the cups and below the wrappers.

3.4.2. Procedure

The test was executed at an Albert Heijn supermarket in the Netherlands on a Wednesday between 11 am and 16 pm. To attract interest of customers and to distract them from the actual purpose of the research, the test was introduced as a tasting of flavored water from a new to market water brand named 'AQUA'. Customers could choose one of the two flavors and subsequently received a cup with the flavored water of their choice. Next to tasting the water, customers were told that the new brand was looking at what would be the best water bottle design for the flavored water. Therefore, customers were presented with the two bottle designs from the previous study and they were requested to indicate which design they liked the most and which design they would most likely buy at the supermarket. Additionally, they were asked about their taste experience; however, these results were not taken into account as this was merely meant to let them believe the test was about tasting the water and choosing a bottle. After tasting the water, they were told where the bins were located but they did not receive an instruction to recycle the cups. It was observed what customers would do with their empty cup. After the test, the bins were checked and the cups were counted. The test set up is shown in Figure 16.

Figure 16: Test set up.

4.3. Results main study III

In total, 200 cups were served to customers and 96 of them provided their preference with regard to buying intention of the bottles from main study I. The bottle with the lowest utility (2) was picked 18 times and the bottle with the highest utility (1) was picked 78 times (Figure 8). Thus, design 1 was also in favour as physical bottle in a realistic setting, according to our expectation.

After emptying the bins there were five different items which were found in the bins: cups with an orange wrapper attached, cups with a green wrapper attached, individual orange wrappers, individual green wrappers and individual cups. Photos of the bin counting can be found in Appendix E1. All cups and wrappers were counted and in total 136 cups were found back in the recycling bin and 15 in the conventional bin. The other cups could not be located and had presumably been thrown in another bin in the supermarket or had been taken outside the supermarket. The resulting numbers of the bin counting are set out in Table 4. The waste streams are divided into paper, PMD (Plastic, Metal, Drink cartons) and residual which are all three belonging to the recycling bin and fourth the separate conventional bin. The results of the counting are divided under the orange and green wrapper and individual cups without a wrapper. For the wrappers the number of cups and wrappers per waste stream is shown, with the number of cups including a wrapper and the number of individual wrappers. Looking at the two variants of wrappers the orange version was found more in the total amount of waste and also has a slightly higher recycling rate as these were found more in paper waste, which is in contrast to what we expected.

Table 4: Results of the bin counting.

	ORANGE WRAPPER			GREEN WRAPPER			CUPS	
Waste stream	**Cup incl. wrapper**	**Individual wrapper**	**Total**	**Cup incl. wrapper**	**Individual wrapper**	**Total**	**Cup exc. wrapper**	**Total**
Paper	0	14	14	2	8	10	6	8
PMD*	30	17	47	30	13	43	58	118
Residual	3	1	4	3	1	4	4	10
Conventional bin	8	0	8	7	0	7	0	0
Total	41	32	73	42	22	64	68	136

**PMD = Plastic, Metal and Drink cartons.*

3.3.1. Discussion main study III

General discussion

In total, 200 cups were served to customers but only 96 of those provided their preference with regard to buying the bottles from main study I. It had not been possible to ask all 200 customers to give their opinion of the bottles, since some of them were in a hurry or only picked up a cup and moved on. Most cups were thrown in PMD with in many cases the wrappers still attached. The plastic cups themselves were thus thrown away correctly in contrast to the wrappers. Near the end of the test the PMD compartment contained many cups and some were sticking out of the bin. Seeing other cups with wrappers in this compartment may have triggered other customers to throw their cup in there as well without removing the wrapper. In general, the situation which the customers encountered at the supermarket was different from an at home situation and therefore this may have had an influence on the behaviour which occurred. During main study II, results after all indicated that people pay more attention to the separation of packaging waste at home than at other locations. Besides this, the packaging as used during this test is different from regular packaging which products are sold in at supermarkets. Due to the nature of the test, a tasting, the packaging consisted of disposable plastic cups with a paper wrapper. This may also have had an effect on the behaviour that occurred.

Discussion about the results

It seems that the barrier to separate the packaging (throw the wrapper in paper and the cup in PMD) was too high. During the observation we noticed that some customers looked at the cup and wrapper during the tasting but did not remove the wrapper afterwards. They seemed rather occupied with the tasting itself and may not have noticed the recycling cues. However, the logos were present on both sides of the wrapper and they were displayed more clearly and in greater size than on regular packaging. The text “recycle me” was clearly displayed on an extension. Due to the salience of the recycling cues we expected on beforehand that they could not be ‘missed’ by the participants. Still, there was no mentioning of any cues by participants during observation and the participants did not act according to the instructions of the logos. Therefore, the results of this test may signal that consumers simply do not look at the packaging before throwing it away.

The green wrappers were not recycled as much as we expected and their low recycling rates could be due to several factors. Firstly, an unexpected result is that more individual orange wrappers were found in paper waste than green ones. This could be explained by the observation that after tasting the water, some wrappers fell off the cups while customers were taking those to the bins. They would mostly pick the wrapper up and throw it into paper waste. It may be possible that by accident more orange wrappers had fallen off than green ones which explains why more orange wrappers were found in paper waste. It is thus unclear if all the loose wrappers found in the waste were taken off by customers or if they had fallen off or if they had come off in the garbage bag due to movement and humidity. Therefore, the numbers of

individual wrappers (Table 3) and consequently the number of wrappers consciously removed by customers as recycling act might be lower. Other factors are expected to be due to the design of the wrappers. The text on the green wrapper is in black which has a lower contrast than black text on an orange background. Furthermore, it may not have been clear enough to customers that the wrapper had to be taken off the cup, as there may not have been enough cues signalling that this had to be done, besides the logos from the Waste Pointer. This can be explained with a suggestion of a clearer instruction to remove the wrapper and throw it in into paper waste, see Figure 17.

Figure 17: This image shows the current cues on the left which signal how the cup and wrapper have to be discarded. On the right the logos are replaced with a text saying "REMOVE WRAPPER and throw it at paper waste!" along with a red arrow pointing up, resembling the movement of taking the wrapper off the cup.

Moreover, the wrapper was made from quite thin paper and in combination with the printing quality it might not have felt paper-like in contrast to thicker paper or cardboard. This can also explain why a few persons picked up wrappers which had fallen off and threw it into PMD instead of paper.

4. GENERAL DISCUSSION

4.1. Theoretical implications

This study aimed to bridge the gap between packaging design and consumer behaviour during purchase and recycling of sustainable packaging by focussing more on specific elements of the packaging. Existing literature about the influence of packaging design on consumer responses and behaviours focussed on external and psychological factors such as environmental awareness and how these affect purchase and recycling behaviour of consumers (Martinho et al., 2015; Prakash & Pathak, 2017; Van Birgelen et al., 2009). Other authors wrote about a holistic approach of the packaging design, where the effect of the whole packaging design on consumer behaviour was studied (Lindh et al., 2016; Magnier & Crie, 2015; Nordin & Selke, 2010). The third group of research followed an analytical approach with regard to independent characteristics of the packaging and how these affect purchase and recycling decisions and behaviours (Magnier & Crie, 2015; Steenis et al., 2017). It was already proposed that packaging design can increase recycling behaviour among consumers (Cialdini et al., 1990; Langley et al., 2011) and the importance was highlighted to investigate the influence of packaging design (Wikström et al., 2014). The literature review was summarized in a conceptual framework which was used to indicate how the fields of research were connected to the empirical study (also see Figure 18). The pre-study started with analysing packaging features separately after which the resulting features were combined for a holistic view during Main Study I. In Main Study II recycling cues were analysed analytically and the link between perceived sustainability and recycling intention was addressed. Main Study III tested buying intention and recycling behaviour in a more realistic setting, including usage of the packaging and separation of packaging parts. While focussing mostly on the packaging, several external factors as described during the literature review were taken into account during all studies. The contribution of this research shows that design indeed has an effect on purchase and recycling behaviour, but above all this research shows what effect this is and how designers can use this knowledge. Additionally, this research incorporated a more realistic test setup which was executed in a supermarket. Such a real-life test has not yet been conducted in previous studies within the field of research and therefore this study made a promising step towards more realistic results.

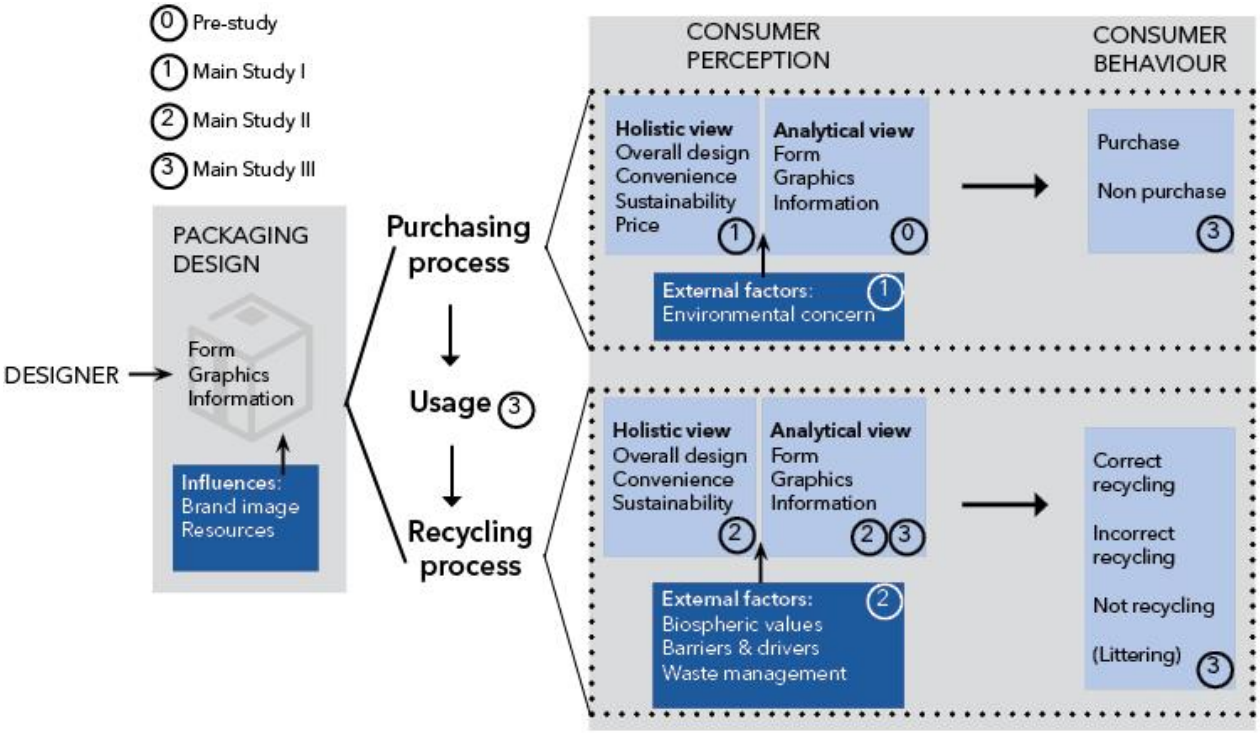

Figure 18: Conceptual framework (repetition).

4.2. Managerial implications

The results of this research provide interesting insights for marketers, packaging managers and especially packaging designers. We demonstrated how several features of the packaging have an influence on purchasing decisions and recycling intention and also how the packaging is perceived in terms of sustainability. The results indicate that appeal, buying intention, recycling intention, sustainability perception and reliability of the packaging producer are higher for a package with graphical elements regarding sustainability, such as nature imagery and information regarding sustainability. A sustainable looking form increases appeal, buying intention and sustainability perception. According to the results on recycling behaviour, graphically manipulated packages containing added logos or texts to stimulate recycling or a more ecological appearance were consistently seen as more sustainable and these packages were also more appealing. Therefore a change in the visual appearance of the packaging seems to have great potential and it could also change a company's position positively (Magnier & Schoormans, 2015). The results of this study further show that graphical elements are very important to consumers when making decisions about the packaging, so it could be beneficial to communicate packaging sustainability with the visual appearance and also make use of a form or structure which is perceived as more sustainable and/or stimulates more sustainable behaviour such as re-use. When using graphical elements, it is important to maintain congruency with the product inside and to be careful when using certain colours which are perceived as sustainable. Information can best be integrated into the graphical design in order to emphasise the sustainable appearance and to provide more information about actual packaging sustainability. However, it should not increase the price too much. Care should be taken by the fact that when consumers are making decisions about the packaging, there is always a trade-off between several aspects. Sustainability is one of them, but this study has shown that the price of the product-packaging combination is most important to consumers when making purchasing decisions. In case of recycling behaviour, a sustainable appearance increases consumers' attention towards sustainability and recyclability of the packaging but it deemed difficult to determine if there is a direct connection between the appearance and actual recycling behaviour. However, Main Study I indicated that information regarding sustainability may be important to increase recycling intention. In terms of recycling logos, the ones which are action oriented are most useful according to consumers, however when testing actual recycling behaviour with logos from the Waste Pointer and a stimulating text, these elements did not seem to have much effect. It is possible that consumers do not pay attention to recycling cues, but in case of recycling there is a great influence of external factors such as biospherical values and the context in which the it takes place. Therefore, additional tests are recommended to find out how effective recycling cues are.

4.3. Limitations and future research

Several limitations of the current set up of the study and possibilities for further research can be distinguished. First, the demographical composition of the several parts of the study differed and this may have had an effect on the results. The participants of the pre-study were mostly students, whereas the other parts of study used more heterogenous samples. Second there are some limitations regarding the design of the study. The stimuli used during the pre-study and the first and third main part consisted of water bottles and based on the results of the tests, some conclusions were drawn regarding the influence of several packaging features on purchasing behaviour and recycling behaviour. These results might also say something about other types of packaging, but this has not been covered within the scope of this research. Therefore, caution is advised in terms of generalizing the results towards other types of packaging. Third, this study took a promising step in terms of more realistic research having the last part of the study being executed in a retail environment with physical stimuli. However, a real buying situation at the supermarket and a real recycling situation at home are still different from the set up used. In real-life purchase and recycling situations, people may be less likely to look at the packaging as closely as they were asked to do or did during the tests and surveys which we executed. Even more realistic settings would improve the validity of the results; however, it may be difficult to organize such a test.

5. CONCLUSIONS

This paper aims to bridge the gap between packaging design and consumer behaviour during purchase and recycling of sustainable packaging. We conducted an empirical study to determine the influence of specific design elements of sustainable packaging on consumer behaviour. The results of the study show that decisions made by consumers regarding the packaging are mostly based on the graphical elements and to a lesser extent on information regarding sustainability and the form of the package. Furthermore, the results indicate that appeal, buying intention, recycling intention, sustainability perception and reliability of the packaging producer are higher for a package with graphical elements regarding sustainability, such as nature imagery and information regarding sustainability. In case of appeal, buying intention and sustainability perception a sustainable looking form is preferred more. According to the results on recycling behaviour, graphically manipulated packages containing added logos or text to stimulate recycling or a more ecological appearance were consistently seen as more sustainable and respondents were also more positive about those packages in general. When testing recycling intention in real life, it deemed difficult to tell if recycling logos and a stimulating text have an impact on recycling intention of consumers. During the test it seemed that the barrier to separate the packaging parts was too high and the outcomes may suggest that consumers do not look at the packaging before throwing it away. However, the behaviour that occurred may also be due to factors related to the test setup and design of the stimuli. Therefore, there are no strong conclusions which can be drawn from this part of the empirical study. This opens many new possibilities for further research.

6. ACKNOWLEDGEMENTS

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7. APPENDICES

Appendix A1

Waste management in the Netherlands.

Recycling behaviour is also influenced by context factors such as local recycling facilities (Geiger et al., forthcoming; Pancer et al., 2015; Schuitema & Groot, 2015; Steg et al., 2014). The packaging collection system in the Netherlands differs between municipalities, but overall there are two different processes: source separation, which means that residents have to separate waste by themselves or post-separation meaning that waste is separated by waste processors after collection (Plastic, blik en pak: Nascheiden ten opzichte van bronscheiden, 2017). For residents the latter is beneficial, since they do not have to separate their waste and can throw everything into one bin. This also prevents pollution within the different waste streams as is the case with source separation (Hoe ziet het nascheidingsproces bij Omrin eruit?, 2017). Still, most municipalities make use of source separation, since most collection processors work with this standardized system and post-separation is still an upcoming process which demands a special factory which is able to separate one pile of waste into the different streams of organic, plastics, paper and residual waste (Twente-Milieu, November 2, 2017). In case of source separation, residents of Dutch municipalities have to pay a waste tax which is based on a fixed amount (vastar) or differentiated amount (diftar). The vastar system means that a fixed amount of tax is paid and waste is collected independent of the amount. Diftar means there are differentiated rates per bag or container of residual waste, the weight or in some cases per time the container is emptied. The goal of this system is to motivate residents to better separate their waste to decrease the amount of tax they have to pay and thus the amount of residual waste which is generated (*Samenstelling ingezameld kunststof/PMD verpakkingen – het effect van inzamelsystemen*, 2017).

The pollution in organic, paper and glass waste is minimal, whereas plastic waste is more polluted. A common pollution within plastic are plastic items such as toys. Plastic waste that is collected at home in transparent bags generally contains less pollution than waste which is collected in mini containers or which has to be brought away to an external container. This is thought to be due to the fact that waste collected in transparent bags on the street is not anonymous whereas bags in underground containers cannot be seen or traced back to the owner (Twente-Milieu, November 2, 2017).

Appendix A2

Waste Pointer.

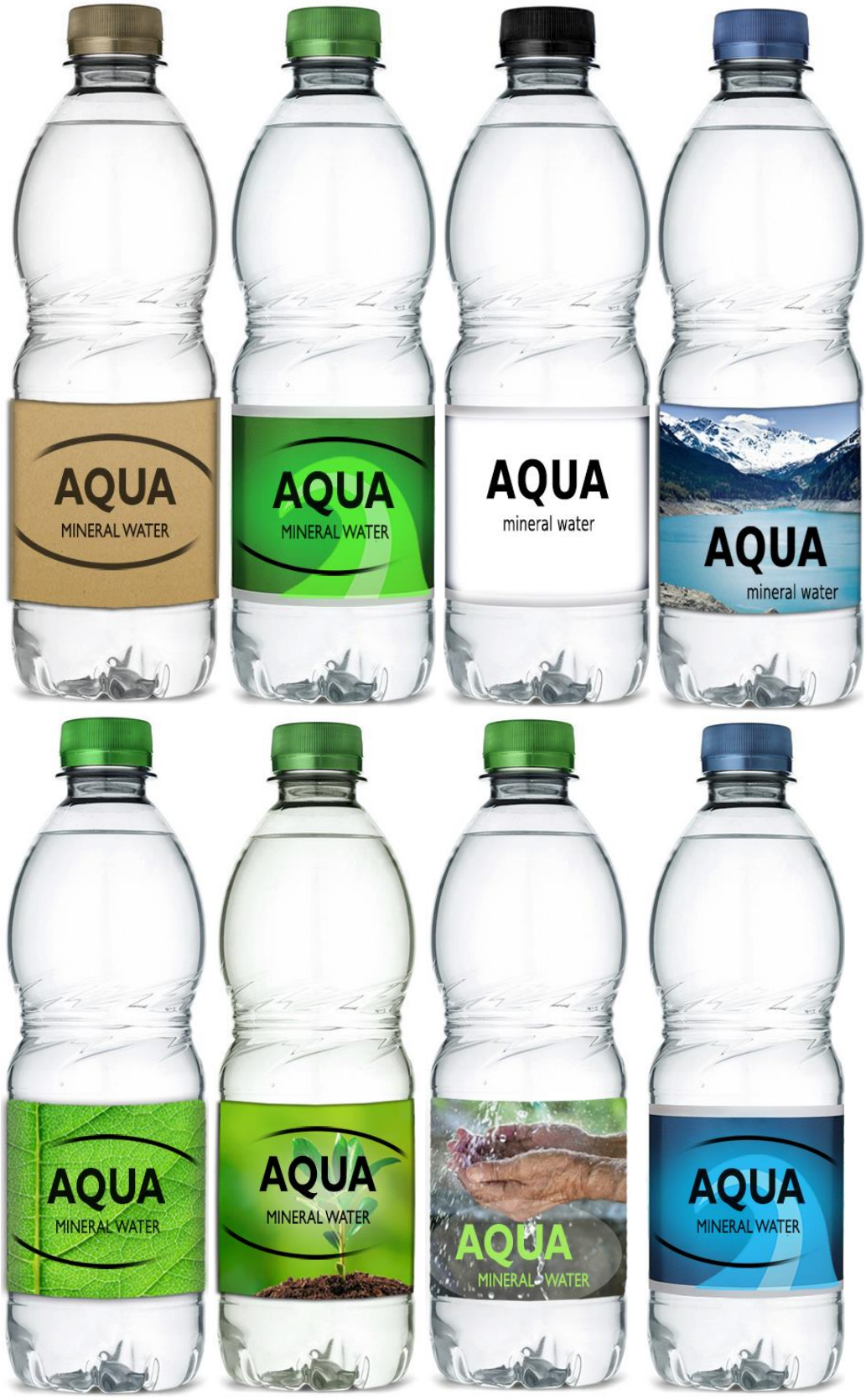
Recently the Dutch government, packaging companies and waste collection companies have signed an agreement to make the packaging industry more sustainable, which is called 'Raamovereenkomst verpakkingen'. One of the derivatives of this agreement is better communication to consumers about discarding their packages. As a consequence, the guideline 'Waste Pointer' (Weggooiwijzer) has been set up by the Dutch Institute for Sustainable Packaging (KIDV) to help packaging producers with the application of logos which instruct consumers how to throw away their packaging. These logos show the part of the packaging, for instance 'wrapper', together with a recognizable icon which is linked to the collection method and lastly the instruction, in this case 'with paper'. The guideline contains logos for every type of packaging, together with the right instruction. If packaging consists of more than one type of material, the logos are placed in the order of unpacking. The logos seem like a promising method to tell consumers how to throw away their packaging as intended; an example is shown in Figure 1. Sometimes supermarkets themselves will refer their suppliers to the logos, since using the same logos on every package will provide consistency and recognition among consumers. The initiative really comes from the industry and companies. There are no regulations concerning the placing or colours, the logos can be used freely by packaging producers. Furthermore, the application is not monitored by the KIDV, meaning that this is based on the insight of packaging producers and designers (Arntzen, October 6, 2017).

Figure 1: Left: an example of the use of a waste pointer logo on a package of yoghurt. The logo says "wrapper at paper". Right: examples of two types of packaging and the logos which can be used.

The placing of the logos of the Weggooiwijzer differs between all types and forms of packaging and a logo is often just 'stamped' somewhere on the package. Mostly on a location where it influences the design as little as possible and in a colour which is consistent with the rest of the packaging causing the logo(s) to have a low salience. For packaging designers there is always a trade-off between the wishes of marketing and the prescriptions from legislation. From a marketing point of view, the packaging has to sell the product and logos are less important, which causes them to be placed on a less important spot. Due to this KIDV cannot prescribe to companies where to put the logos, however advising them could be an option (Arntzen, October 6, 2017).

Appendix B1

Pre-study: designs of the stimuli.




Please REUSE me! (:
AQUA
mineral water
AQUA
mineral water
AQUA
mineral water
FLES
BIJ PLASTIC AFVAL
Please recycle me!
Many bottles end up in landfill every year.
Save this bottle: extend its life & save natural resources.
AQUA
mineral water
plantbottle
up to 30% plant-based
100% recyclable bottle
AQUA
mineral water
AQUA
mineral water
Bottle made out of 30% less plastic
DURABOTTLE
AQUA
mineral water
Bottle made from 30% recycled plastic.
AQUA
mineral water
ENVIRONMENT FRIENDLY
100% ORGANIC
ALL NATURAL PRODUCT
AQUA
mineral water

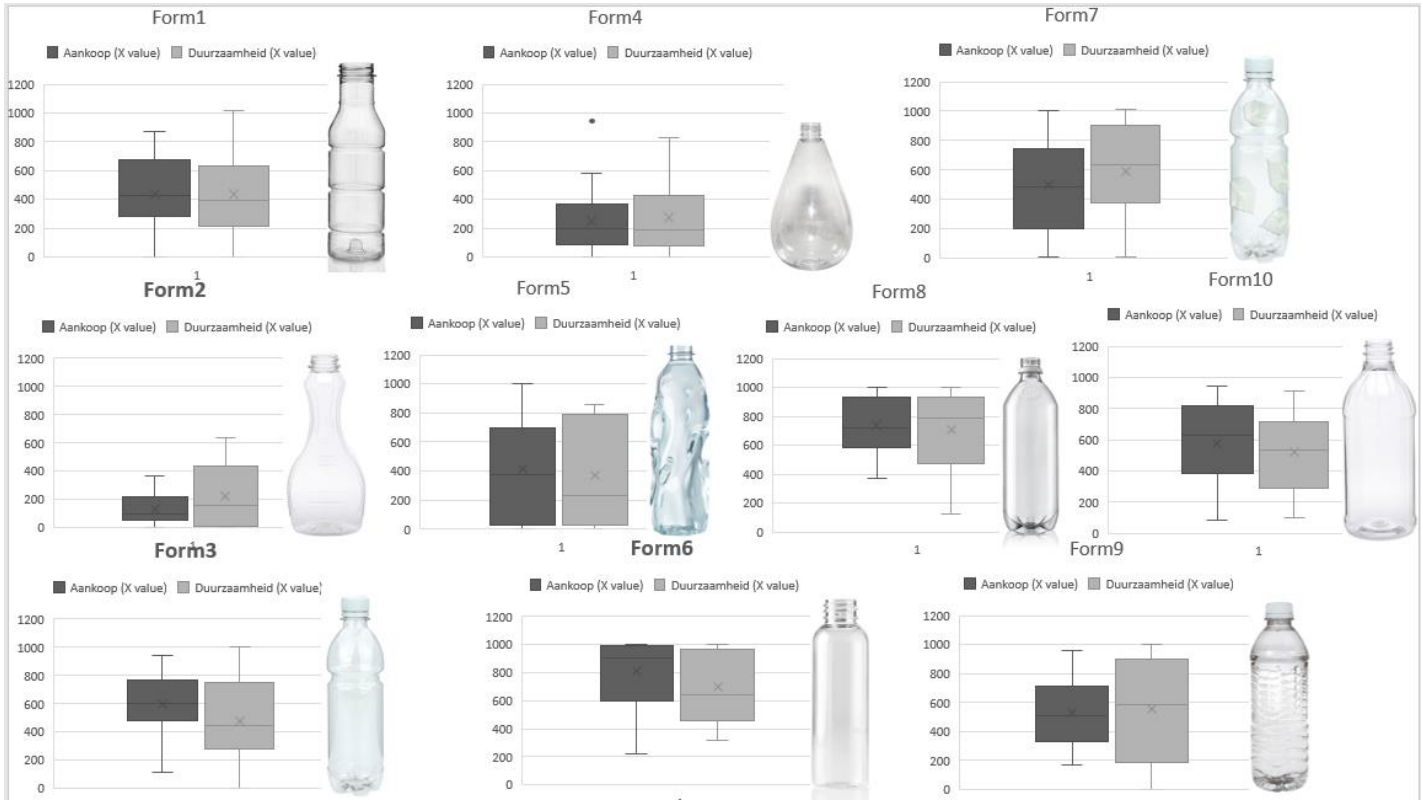
Appendix B2

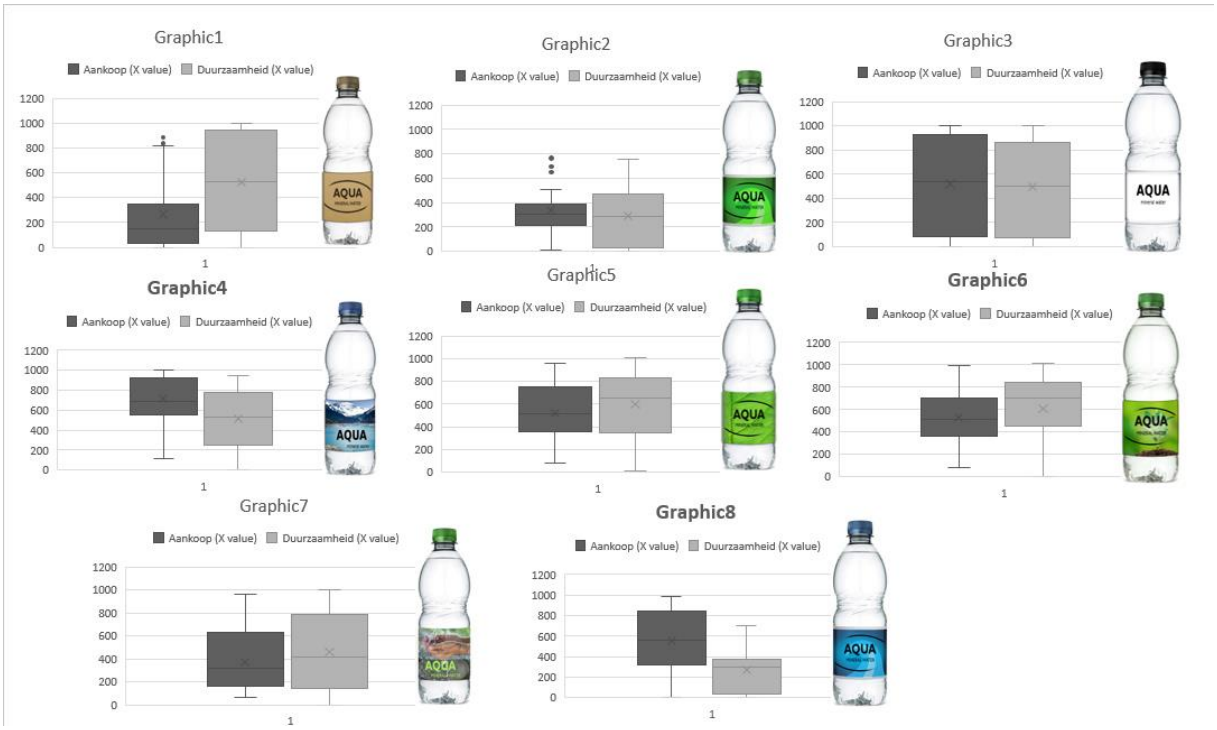
Pre-study: personal definitions of sustainable packaging (in Dutch).

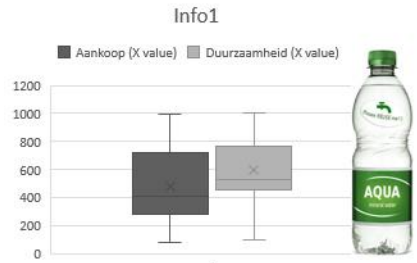
- Goed recyclebaar, biologisch afbreekbaar, weinig productie-energie.
- Weinig aan verspild, niet onnodig veel materiaal, duurzaam materiaal.
- Weinig impact. duurzame uitstraling voor consument.
- Materiaal is goed uit elkaar te halen en afzonderlijk te recyclen. Recyclebaar in gelijkwaardig product.
- Verpakking gemaakt met zo min mogelijk verspilling bij productieproces. Eindproduct herbruikbaar. Gesloten kring.
- Duurzame verpakking, is een pakking die recyclebaar is zonder afval stoffen over te houden.
- Recyclebaar, zo min mogelijk nieuwe grondstoffen gebruiken.
- Een verpakking die niet/zo minmogelijk negatief het milieuaspect beïnvloed.
- Niet zwaar en goed recyclebaar.
- Een verpakking met zo min mogelijk milieu-impact, beste is geen verpakking.
- Goed recyclebaar.
- Herbruikbaar.
- Een verpakking die op een manier geproduceerd is die niet belastend is voor het milieu en die volledig gerecycled kan worden.
- Minst belastend voor het milieu.
- Verpakking die onze leefomgeving weinig schade toebrengt.

Appendix B3

Pre-study: the box plots for the rankings on form, graphics and information.



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Duurzaamheid (X value)
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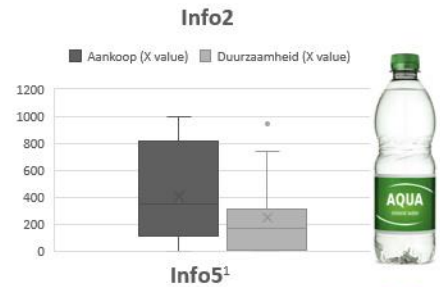
1000
800
600
400
200
0
AQUA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Duurzaamheid (X value)
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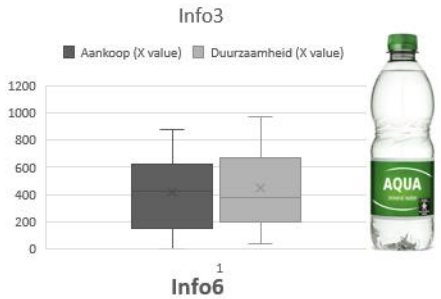
1000
800
600
400
200
0
AQUA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Aankoop (X value)
Duurzaamheid (X value)
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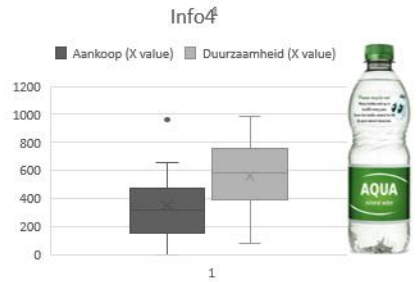
1000
800
600
400
200
0
AQUA
1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Duurzaamheid (X value)
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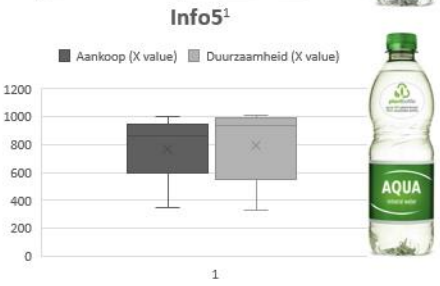
1000
800
600
400
200
0
AQUA
1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Aankoop (X value)
Duurzaamheid (X value)
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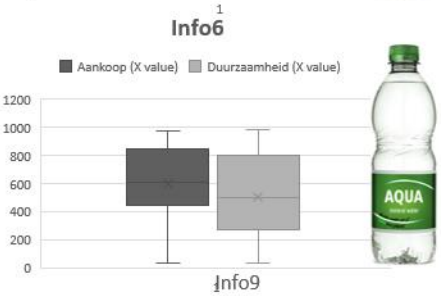
1000
800
600
400
200
0
AQUA
1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Aankoop (X value)
Duurzaamheid (X value)
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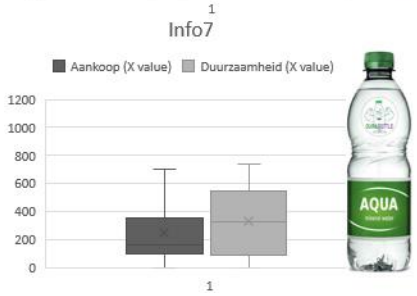
1000
800
600
400
200
0
AQUA
1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Aankoop (X value)
Duurzaamheid (X value)
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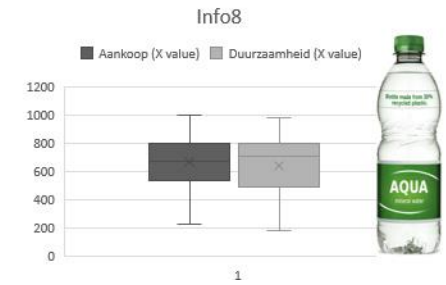
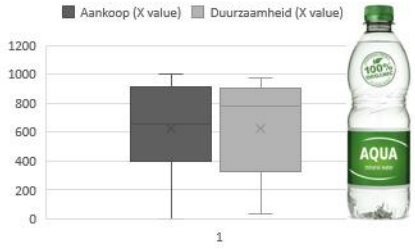
1000
800
600
400
200
0
AQUA
1


Info8
Aankoop (X value)
Duurzaamheid (X value)
1200
1000
800
600
400
200
0
AQUA
1


Info9
Aankoop (X value)
Duurzaamheid (X value)
1200
1000
800
600
400
200
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AQUA
1

Appendix B4

Pre-study: transcript of participants' comments. Comments were given in Dutch.

Graphics aankoop

30-01-2018 13.00 Respondent 1: 1 heeft een rare kleur, het lijkt oranje. 2 is alleen groen gemaakt om het duurzamer te laten lijken. Ik vind 7 wel grappig. 4 lijkt mij het meest geschikt en zou ik het snelst kopen. 3 is simpel maar dat heeft toch wel wat. Ik zou 5, 6, 3 en 8 net wel kopen, maar niet direct. 31-01-2018 9.30 Respondent 2: 3 is wit en dat ziet er schoon uit. Een blauwe kleur vind ik mooier voor water, groen past daar minder goed bij. Bruin geeft een rare associatie in combinatie met water. 31-01-2018 10.30 Respondent 3: Kleuren beïnvloeden mij niet zoveel, dus ik zie weinig verschil in de flesjes. Ik zou sowieso geen mineraalwater kopen. Als ik moet kiezen, ga ik eerder voor groen dan voor blauw. 5 en 6 zien er groen en fancy uit, dus die zou ik het snelst kopen. 31-01-2018 11.00 Respondent 4: 7 lijkt niet op water, doet me denken aan vies water. 4 ook wel doordat het water in aanraking is geweest met rotsen. Maar het plaatjes heeft ook wel weer iets cleans, dus deze komt hoger te staan. 3 ziet er enerzijds luxe uit door het zwart, maar anderzijds goedkoop door het wit. Groen zou ik minder met water associëren. 6 vind ik het meest fris lijken door de plant. 2 ziet er raar uit. 2, 5 en 6 staan in het midden. 1 ziet er duurzaam uit door het bruine, maar dit past niet bij water. 31-01-2018 11.30 Respondent 5: 7 vind ik te druk en hij doet ook goedkoop aan. 4 zou ik wel kopen, daarna 8. Deze passen het meest bij water. 1 ziet eruit als karton en dat kan goedkoop aandoen. 5 en 6 zien er natuurlijk en gezond uit. 2 doet me denken aan een sportdrankje en 3 vind ik ook minder. 31-01-2018 20.00 Respondent 6: 3 en 4 vind ik het meest aantrekkelijk. Door kleur word ik niet zo beïnvloed. 1, 8 en 2 hebben geen associatie met water. 5 en 6 bevatten planten en dat heeft niks met water te maken. 7 is verspilling van water. 3 bevat de minste rotzooi, het product verkoopt zichzelf wel. 4 ziet er mooi uit, als je dat op tafel ziet staan, bijv. in de trein, ziet dat er goed uit en het zegt iets over het type mens. 31-01-2018 21:00 Respondent 7: 3 bevat alleen tekst wat weinig aangeeft. Dit geldt ook wel voor 8 en 2 is eigenlijk

hetzelfde maar dan groen. 4 vind ik het mooist. 6 lijkt wel duurzaam door de plant. 31-01-2018 22:00 Respondent 8: 1 vind ik het minst mooi en 3 is niet zo interessant. 2 vind ik minder, net als 6 en 5 aangezien ik blauw beter bij water vind passen dan groen. 01-02-2018 09:30 Respondent 9: 1 vind ik niks, 4 ziet er wel hip uit. Blauw past meer bij water. 3 ziet er neutraal uit. De groene ziet er chemisch uit. 01-02-2018 12:00 Respondent 10: Ik ben gewend aan blauwe etiketten. 1 ziet er wel duurzaam uit, maar bruin is wel vreemd. 7 is wel goed, 3 ziet er wel standaard uit. Bij groen lijkt het alsof het een smaak heeft. 01-02-2018 12:30 Respondent 11: 3 ziet er goedkoop uit. 5 vind ik het mooist en 1 heeft ook wel wat. Ik zou geen handen erop zetten. 02-02-2018 12:00 Respondent 12: De flessen zelf lijken op elkaar. Ik zou de achterkant willen lezen om te weten wat erin zit. 4 lijkt alsof het water van een gletsjer komt, wat ver weg is, dus niet duurzaam. Karton lijkt duurzamer en wit lijkt het goedkoopst, dus die zou ik het snelst kopen. 03-02-2018 12:10 Respondent 13: Groen en bruin past niet bij water. 03-03-2018 12:30 Respondent 15: Op 4 staat een plaatje dat frisheid, natuur en schoon water uitstraalt. 3 is saai en vermeld niet wat erin zit, dit zou ik niet graag willen drinken. 1 lijkt op karton, dat vind ik wel belangrijk. 04-03-2018 16:00 Respondent 16: 4 lijkt op bestaande flessen en dit spreekt me wel aan. 5 vind ik leuk vanwege het blad. 8 en 2 vind ik het minst, ze zijn saai. 7 lijkt alsof het bedoeld is om je handen mee te wassen. 04-03-2018 16:20 Respondent 17: 3 is saai. Bruin zegt me niet zoveel. 7 zet me niet aan tot drinken. 4 doet me denken aan zeewater. 04-03-2018 16:40 Respondent 18: 1 is lelijk, bruin zou ik niet met water associëren. 2 heeft een gifgroene kleur. 3 wit/zwart vind k wel mooi. 8 is saai maar oké. 7 lijkt duurzaam maar is niet zo mooi. 5 is wel gaaf, 6 een beetje schijnheilig, net als 7. 04-03-2018 17:00 Respondent 19: 1 vind ik niet aantrekkelijk, bruin zou ik niet associëren me water. 2 ziet er radioactief uit, 8 lijkt meer op water. 04-03-2018 19:00 Respondent 20: Kan kleuren lastig onderscheiden.

Info aankoop

Respondent 1: Op een afstandje zien ze er allemaal hetzelfde uit. Het poppetje op 4 kijkt heel zielig. Er staat 'please recycle me', dat is voor mij niet nodig want dat doe ik uit mezelf al. Maar ik kan me voorstellen dat dat voor sommige mensen wel nuttig is. 8 is duidelijk en laat zien waar het materiaal vandaan komt, 6 vind ik daar minder sterk in. Sommige claims zijn nietszeggend en ik vraag me daarbij af of het echt beter is. Respondent 2: 4 bevat een heel schattig plaatje, daar val ik wel voor. Op 9 staat dat he organisch is, dat vind ik een beetje onnodig om op een flesje met water te zetten. 'Please reuse me' heb ik eerder op een flesje zien staan, dat vond ik wel leuk. Respondent 3: Iets wat me de les leest door te zeggen: 'hou me, gooi me niet weg', zou ik niet nemen want daar hou ik niet van.7 ziet er kinderachtig uit. Respondent 4: 5 zou ik snel kopen omdat erop staat dat het een plantbottle is. Bij 8 is het duidelijk dat er maar 30% gerecycled plastic in verwerkt is, dus dat vind ik minder. Op het label bij 6 zie je dit minder goed. 4 en 1 zien er leuk uit, maar die zou ik niet per se sneller kopen. Het logo op 3 zou mij niet opvallen. Durabottle van 7 zegt me niet zoveel, net als 100% bij 9. Respondent 5: 9 zou ik het snelst kopen, dit klinkt gezond. Het plastic heroe logo van 3 is herkenbaar. 4 bevat te veel tekst. Bij 8 ziet het bovenlabel er wel elegant en herkenbaar uit. 7 doet me denken aan een B-merk. Respondent 6: Bij 6 valt het niet op dat er iets op staat. 3 is het meest clean maar maakt je wel bewust waar het afval hoort. 4 heeft een goede boodschap maar de tekst verstoort het ontwerp. 7 is een goedkope verkooptruc waar ik niet in trap. Geen duidelijke boodschap. 1 zou ik niet kopen, want ik gebruik de flesjes nooit opnieuw. Bij 8 vraag ik me af waarom het geen 100% is. 5 zou ik wel kopen en 9 heeft een mooi ontwerp. Respondent 7: 3 en 6 vallen het minst op. 7 geeft niet aan waarvan het gemaakt is, net als 1 en 4. 5, 8 en 9 zou ik het snelst kopen. Respondent 8: 9 valt het meest op, 5 en 4 zien er bijzonder uit. 2 zet ik helemaal links. Ik zou eerder gaan voor dingen die meer opvallen, de tekst zou ik niet gauw lezen. Respondent 9: Op 2 staat niks, die komt links. 4 zegt dat je het moet recyclen, maar bevat geen certificering. Respondent 10: 1 ben ik het mee eens. 5 is goed en de 30% van 8 is een goed begin. 6 valt niet op en 4 kun je niet lezen. 7 is een marketing-truc en 3 zegt niets over het materiaal. Respondent 11: 5 lijkt me het meest betrouwbaar. Organisch water? Een flesje gebruik ik wel meerdere keren, dus dat hoeft er niet op te staan. 8 en 6 hebben dezelfde boodschap, maar 6 is minder duidelijk. 7 klinkt wel leuk, maar wat houdt het in? Respondent 12: 100% organisch slaat nergens op. Durabottle lijkt sterk, maar dat associeer ik niet met duurzaam. 6 is gemaakt van gerecycled plastic, wat goed is. 'Reuse me' is wel leuk. Respondent 13: Hoe minder erop staat, hoe beter. Respondent 15: Het plastic hero logo boeit me niks. Als je nu nog niet weet waar je iets weg moet gooien. Respondent 16: 6 is subtiel. 5 heeft een mooie sticker, is wel rustgevend. 100% organic sticker is wel mooi. 8 is basic en 7 is het minst mooi. Respondent 17: 3 vind ik het minst. 7 bevat een raar poppetje. 2 spreekt me het meest aan, aangezien daar niks op staat. Respondent 18: 4 bevat een lange tekst met een zielig plaatje, ik zie liever een positieve kreet. 6 is concreet en het zit beter in het logo verwerkt, daarom vind ik 8 minder mooi. 1 is wel grappig met het kraantje. 3 is goed dat het erop staat, 5 is wel cool. 7 durabottle wat bedoel je daarmee? Met uitleg op de achterkant zou ik het misschien wel kopen. 100% organisch begrijp ik niet. Respondent 19: 6 valt minder op. Is durabottle een bestaand keurmerk? Een dwingende en

zielige boodschap werkt me tegen. Goed voor het milieu/planten/recyclen vind ik beter. Respondent 20: 1 is wel leuk, 4 is te druk. 100% organic is niet geloofwaardig.

Form aankoop

Respondent 1: 5 lijkt me niet fijn om vast te houden. 4 is niet praktisch, maar ziet er wel aantrekkelijk uit. 2 is te breed onderin, dat lijkt me niet handig om mee te nemen. 10 ziet er groot uit en hij is erg kaal. 3 is een standaard fles, maar hij heeft wel een rare inkeping. 1 is wel grappig. 6 lijkt me handig om opnieuw te vullen met water. 8 is ook vrij standaard. 7 is wel grappig, maar het hangt ervan af hoeveel duurder hij is. Respondent 2: Ik vind de fancy ontwerpen, zoals 5 en 7 wel gaaf, maar ze lijken me minder praktisch en onhandig om vast te houden. 1 is simpel en strak en de ribbels zorgen voor minder materiaalgebruik. Ik zou toch afgaan op de prijs uiteindelijk. Respondent 3: Flessen die praktisch zijn, zoals 1, 8 en 10, vind ik het mooist en het handigst. De rest zou ik niet zo snel kopen. Respondent 4: Blaadjes vind ik leuk, dus 7 zou ik kopen. 2 doet me denken aan mayonaise. 5 hangt af van hoe het voelt. 6 is makkelijk voor hergebruik. 9 ziet er slap uit. 8 en 6 zijn beide degelijk en functioneel en zou ik liever hergebruiken. 4 lijkt me onhandig qua vorm, maar ziet er wel leuk uit. 1 komt links van het midden. Respondent 5: Door de bolle vorm doet 4 me denken aan een flesje sinas. 2 doet me denken aan olie. De rechte vormen lijken me stevig. 3 is meer een standaard flesje dat je kunt indrukken, waardoor er water uit kan lekken. 10 lijkt me een wat bredere en zwaardere fles. 1 doet me ook denken aan olie. Als bij 7 de blaadjes net zo doorzichtig zijn als het flesje zelf, dan lijkt me dat wel mooi. Respondent 6: 7 zou ik niet kopen want die is te druk en leidt af van de inhoud. 2 lijkt me niet praktisch en het productieproces is zwaar. Dit geldt ook voor 4 en 5. Ze zijn onpraktisch en verspillend qua productie. 10 en 1 zijn gemaakt van hard plastic en stevig, dit zou je eerder hergebruiken. 10 is wel net te groot. 1 ziet er leuk uit. 9 kun je goed samenpersen waardoor je ruimte bespaart in de vuilnisbak. 3 en 8 zijn praktisch en drinken fijn. 6 bevat hard plastic en hier zou mijn oog op vallen om het te kopen. Hard, strak en esthetisch de minste randen en deuken. Ook ligt dit goed in de hand. Respondent 7: 5 en 7 hebben een rare vorm, die zou ik minder snel kopen. 4 en 2 lijken me onhandig om mee te nemen. 6, 3, 8 en 10 kun je goed vasthouden en hebben meer grip. 9 heeft een vorm die je vaak ziet. Respondent 8:1 lijkt me handig om vast te houden en 4 niet. Ik zou eerder voor een smalle fles zoals 6 gaan. 8 doet wat voller aan. Een klein flesje vind ik mooier. 3 ziet eruit als een standaard fles. Respondent 9: 5 ziet er raar uit, lijkt me slecht in de hand liggend. Rare vormen zijn niet praktisch. Respondent 10: 7 kost meer productie. 6 ziet er fancy uit en 4 lijkt me onhandig in de tas. 5 is wel gaaf, maar kost veel materiaal. 8 is een nogal grote fles. Respondent 11: 5 is mooi en 6 ziet er strak en mooi uit. 1 en 8 zijn stevig, die kun je hergebruiken. 4 en 2 zijn niet handig qua vorm. 7 is wel leuk. Respondent 12: Ik zou een flesje kiezen welke je vaker kan gebruiken, een stevige dus. 8 en 6 dus wel. 2 lijkt op ketchup en 4 heeft heeft een onhandige vorm. Respondent 15: 1 is lelijk. Ik gebruik een fles vaak opnieuw, 6 is wel mooi. Respondent 16: 2 lijkt op parfum. 8 is eenvoudig en stevig. 3 is vrij standaard en goedkoop. 6 is basic en 10 is simpel. 5 is leuk en 1 heeft een gekke vorm. Respondent 17: 4 lijkt me onhandig en 2 ook. 5 en 7 zien er leuk uit. Respondent 18: Ik ga voor een praktisch flesje. 2 zou ik niet kopen. 8 is mooi, 10 minder. Ik hou van simpel. 5 vind ik raar maar wel vet. 4 lijkt me niet handig. Respondent 19: 2 lijkt op wasmiddel. 6 spreekt het meest aan. 7 doet niet veel. Respondent 20: 4 is lelijk.

Graphics duurzaamheid

Respondent 1: 4 ziet er het meest duurzaam uit door het blauwe en de bergen. 7 ziet er wel natuurlijk uit, net zoals 5 door het blad. 5 ziet er clean en duurzaam uit door het wit. Respondent 2: 1 doet me denken aan gerecycled papier. 3 ziet er schoon uit en er staan weinig poespas op. 4 ziet er natuurlijk uit door de bergen. 7 vind ik te druk en te onoverzichtelijk. Respondent 3: 7 ziet er duurzaam uit, alsof deze mensen weten wat ze doen. 6 en 4 bevatten plaatjes van de natuur, dus dat komt duurzaam over. 1 is bruin en dat vind ik niet duurzaam. Respondent 4: 3 vind ik het minst duurzaam. 1 heeft een super unieke en duurzame uitstraling. 4 vind ik minder. 8 zit in het midden. 7 ziet er ook hip en duurzaam uit, 6 een beetje. 2 is niet zo duurzaam en 5 zit tussen 6 en 8 in. Respondent 5: 5, 6 en 1 lijken me het meest duurzaam. 7 vind ik er nog steeds goedkoop en dus niet duurzaam uitzien. 4 ziet er wel vertrouwd uit. 2 en 8 komen links van het midden en wit in het midden. Respondent 6: 8 en 2 bevatten nietszeggende plaatjes, dit vind ik niks. Waar het minst op staat vind ik het meest duurzaam, aangezien plaatjes inkt kosten. Natuurbeelden zijn schijn, maar je bewustzijn zegt wel: oorsprong van water. 5 begrijp ik niet, waarom staat er alleen een blad op? Om een boom te laten groeien, heb je juist water nodig. 7 vind ik verpesting van het water. Respondent 7: 3 geeft weinig aan. Effen en groen lijken me meer duurzaam. 7 lijkt op verspilling van water. Plant lijkt me het meest duurzaam. Respondent 8: 3 vind ik niet zo duurzaam. 7 lijkt op verspilling van water maar geeft wel een natuurlijk gevoel. 4 geeft aan dat het water uit de natuur komt. Respondent 9: Groen spreekt aan, behalve de gif-groene. Respondent 10: 5, 6 en 1 zien er wel duurzaam uit. 7 kom over alsof het goed is voor de gezondheid. 2 is gewoon groen gemaakt. 4 is alleen een fancy plaatje. 8 heeft niet eens een plaatje en 3 is nog redelijk. Respondent 11: 1 bevat papier en dat is minder duurzaam. 3 heeft minder kleuren om te printen, hoe minder bewerkstappen en hoe minder verschil in kleur, hoe duurzamer het is. Respondent 12: Karton

oogt duurzaam. Kiemplant staat op heel veel dingen die met duurzaamheid te maken hebben, dus dat maakt me wantrouwig. Blad vind ik dan mooier. 3 is goedkoop maar kost wel minder inkt. 8 en 7 willen vooral heel erg duurzaamheid uitstralen. Blauw is standaard. Respondent 15: Plastic is plastic, karton kun je nog recyclen. Respondent 16: 7 lijkt alsof de opbrengst naar een goed doel gaat, bijv. voor schoon water. 6 en 4 lijken goed voor de aarde. 1 is saai, dus ook duurzaam. Respondent 17: Ik vind het duurzaam overkomen als je iets over de achtergrond zit, van welke bron het water komt, als er iets natuurlijks op staat. Respondent 18: 8 is schijnheilig. 2 en 8 zien er goedkoop uit. 1 is wel duurzaam want hij is lelijk. 3 niet zo, geen positief begrip. Respondent 19: 1 is duurzaam maar niet mooi. Kleurige plaatjes zijn niet duurzaam gemaakt. Respondent 20: Bij duurzaam denk ik aan spartaans en niet te veel poespas.

Info duurzaamheid

Respondent 1: 7, 8 en 9 staan redelijk hoog. Het plastic heroes logo op 3 zegt meer iets over hoe je het moet recyclen. 6 vind ik onduidelijk en 4 is nogal opdringerig. 2 vind ik het minst duurzaam, wat die zegt niks over hoe duurzaam de producent is. Respondent 2: Op 9 staat dat het organisch is, maar dat beïnvloed mij niet. Het plastic heroes logo op 3 doet af aan het ontwerp. De durabottle van 7 lijkt me fijn en sterker. Als er op de verpakking staat dat het van minder of gerecycled plastic is gemaakt, lijkt me dat goed voor de awareness. 1 lijkt me nuttig, omdat erop staat dat je hem moet hervullen met kraanwater. Bronwater kost meer energie. Respondent 3: In dit geval vind ik belerende kreten op de verpakking wel duurzaam. Maar een verpakking hoort je niet iets te laten doen. 5, 6 en 8 hebben materiaal bespaard, dus dat is duidelijk. Ik begrijp niet hoe je iemand kunt overhalen met een cartoonfiguur. Respondent 4: 5 is het meest duurzaam. Op 4 staat een duidelijk verhaal wat duurzaam overkomt. 30% lijkt weinig. Dat dit op het main label staat, lijkt me nog wel iets meer duurzaam. 7 vind ik vaag en onduidelijk. Het logo van 3 maakt de fles niet per se duurzamer. Respondent 5: Het tekentje op de plantbottle herken ik van het flessen inwisselen. Het is wel minder duurzaam om er een extra sticker op te plakken, het lijkt me beter om iets in de fles zelf te drukken. Bij 3 en 6 staat info op het label zelf, dat er toch al op komt. 2 is wat dat betreft het meest duurzaam, maar nodigt niet uit tot duurzamer gedrag. 9 staat meer links, want dit is niet per se duurzaam. Respondent 6: 2 lijkt me het minst vervuilend in productie, aangezien je geen extra etiketten nodig hebt. 3 bevat de minste poespas, maar zegt wel wat je moet doen om het milieu te besparen. 5, 1 en 9 vallen in dezelfde categorie: de boodschap zet je aan het denken om je duurzamer te gedragen. 6 heeft een te kleine tekst. 7 is meer schijn. 8 is leuk, maar 30% kan ook meer zijn. 4 zit ertussenin, de tekst is zo uitgebreid dat het meer voor de show lijkt. Respondent 7: De kleuren en flessen zijn allemaal hetzelfde. 9 valt meer op de 100%, dit maakt het duidelijk. 4 geeft niet aan of het organisch is of 100% recyclebaar. Respondent 8: Bij 7 is het onduidelijk wat dit zegt. 4 wil heel duidelijk dat je de fles recyclet. De 100% bij 9 zegt ook wel wat. Respondent 9: Certificering is het meest betrouwbaar. Respondent 10: 1 en 9 zijn medium duurzaam, 3 wel heel erg. Bij 7 geen idee wat het is. Ik gooi plastic sowieso bij het juiste afval. Respondent 11: Plantbottle logo lijkt me betrouwbaar, een tekst is vergelijkbaar. 'Reuse me' spoort aan tot hergebruik, dit maakt de fles zelf niet duurzamer maar het gedrag wel. Durabottle zit er tussenin. Plastic Hero vertelt dat de fles bij het plastic afval hoort. Respondent 12: Het is allemaal niet heel onderscheidend en niet opvallend genoeg. 6 is het beste qua argument. 'Recycle/reuse me' is een goede boodschap. 100% organic: gaat dat om het water of de fles? Respondent 15: Hergebruik en recyclen vind ik belangrijk. Respondent 16: 2 staat niks op, dus helemaal links. Plantbottle is goed, want hij is 100% recyclebaar en van plantaardig materiaal gemaakt. 8 en 6 zijn hetzelfde idee, maar bij 8 is het prominenter. 100% organic gaat over het product en niet over de verpakking. Respondent 17: 2 staat niks op, als er iets op staat ga je er wel eerder over nadenken. Het plaatje van 7 is wel leuk, maar de tekst onduidelijk. Iets met planten/organisch vind ik eerder duurzaam. Respondent 18: 9 is vaag, 7 onduidelijk. Respondent 19: 100% organisch, is dat wel echt zo? 7 zegt me niks. 3 is mooi, maar verder? 1 heeft niet een hele krachtige boodschap, denk niet dat veel mensen dat gaan doen. 4 vertelt wel wat meer. Respondent 20: Is om 't even.

Form duurzaamheid

Respondent 1: 5 oogt niet duurzaam. 7 lijkt me qua productie niet duurzaam maar wel qua uiterlijk. 6, 8 en 10 zijn strak, simpel en makkelijk te maken. 9 is een standaard flesje dat al zo vaak geproduceerd is dat ik ervan uitga dat alles geoptimaliseerd is. 3 vind ik niet echt duurzaam, 4 iets meer en 2 helemaal niet. Respondent 2: Flesjes waar weinig materiaal is gebruikt komen hoog te staan. Een fancy vorm zou ik eerder bewaren in plaats van het weg te gooien. Rechte en simpele vormen zou ik niet interessant vinden om te bewaren. Respondent 3: 7 bevat blaadjes, dus dat is duurzaam. 2 doet me denken aan zeepsop en chemicaliën, wat zeker niet duurzaam is. 5 lijkt me geen efficiënte vorm om te maken. Respondent 4: Nummer 2 doet me nog steeds aan mayo denken, dus die staat het laagst. Stevige flessen vind ik duurzamer. 6, 8 en 10 vind ik iets minder. 9 lijkt me niet duurzaam. 7 minder dan de rechte vormen, doordat er extra blaadjes op zitten. Deze fles doet meer alsof het duurzaam is. 5 staat op dezelfde hoogte. 4 komt in het midden. Respondent 5: Stevige en rechte vormen kun je nogmaals gebruiken. 9 het minst, deze gooi je makkelijker weg en kun je in elkaar drukken. 7 en 3 staan gelijk. 4 is redelijk duurzaam want hij ziet er stevig uit. 5 is fancy en die wil je wel graag

nog een keer gebruiken. 2 en 1 zitten in het midden. Respondent 6: 6 en 8 zou ik het snelst hergebruiken, want dit zijn stevige flessen. 9 deukt meteen in en gooi je het snelst weg. 7, 3 en 5 lijken zacht en kun je ook makkelijk indrukken. De rest ziet er steviger uit. 2 lijkt me niet praktisch om opnieuw te gebruiken en past niet overal in. 10 en 1 zou ik niet snel gebruiken qua vorm. Respondent 7: 4 vind ik het minst duurzaam qua vorm, omdat dit met transport en in schap meer ruimte inneemt. Dit geldt ook voor 10. 5 en 7 lijken duurzaam, maar dat is lastig te zien. Misschien zijn ze recyclebaar. 9 is moeilijk te produceren, net als 1, 2, en 3. 8 en 6 zijn eenvoudig te produceren en hebben een goede vorm. 5 en 7 zijn denk ik wel van recyclebaar plastic. Respondent 8: Smalle en gladde flessen zijn het meest duurzaam, want die zijn makkelijker te maken. 4 lijkt me niet duurzaam om te maken, hij is onnodig groot en bevat veel materiaal. 9 en 3 kosten meer energie om te maken. Respondent 9: 5 heeft een organische en natuurlijke uitstraling, net als 7. De rest lijkt op elkaar. Respondent 10: 4, 6 en 8 bevatten veel plastic, 3 en 10 minder. 2 heeft onnodig veel en 9 heel weinig. 1 kost onnodig veel moeite. 5 bevat veel plastic en kost veel moeite om te maken. Respondent 11: 9 is het lichtst en bevat het minste materiaal 5 kost veel tijd om te maken. 4 neemt veel ruimte in tijdens transport. 1 is compact, stevig maar kost wel meer materiaal, dit geldt ook voor 8, 6 en 10. Respondent 12: 9 staat hoog want daar is moeite gedaan om minder plastic te gebruiken. 5 wil het lijken, maar is dat ook echt duurzamer? Net als 7. 3 bevat minder kunststof. 6, 8 en 10 zijn stevig en kun je vaker gebruiken. 4 lijkt me ook wel sterk. Respondent 15: 5 kost moeite en veel energie om te maken. Rechte flessen zijn duurzamer Respondent 16: 6 is stevig en kun je vaker gebruiken, net als 8 en 1. 5 is stevig. 3 en 9 lijken kwetsbaar en 4 vind ik lastig te bepalen. Respondent 17: 5 lijkt alsof het van verschillende soorten plastic is gemaakt. 4 heeft een onnatuurlijke vorm. 1 is wel duurzaam vanwege de vorm. 8 lijkt net een colafles, dus niet duurzaam. Respondent 18: 1 is stevig. 7 bevat blaadjes. 10 ziet er een beetje industrieel uit, dat doet wel duurzaam aan, 5 lijkt organisch maar kost wel veel moeite om te maken. Respondent 19: Bij 6 en 8 is de vorm wel duurzaam. 5 spreekt minder aan. Respondent 20: Weinig uitstraling en eenvoud.

Appendix C1

Main Study II: description of procedure.

Main Study II was executed in cooperation with Bachelor student Milou Gankema, who did this research for her Bachelor's assignment and used it as input for a design tool. The setup and analysis of the survey were done together. For the current research, we only used the results which were relevant for us. The complete research can be found in the following report: 'the design of an inspirational tool for packaging designers, to design packaging that will be recycled by the consumer.' By M. Gankema (01/2018).

The survey consisted of seven sections. The first section comprised a series of images of different types of packaging followed by different scales: sustainable – environmental unfriendly, attractive – awful, closed – inviting. Each package was judged on these criteria by filling in a 5-point Likert scale. In case of the test survey, the packaging shown was graphically manipulated. These manipulations were targeted at the graphics such as an addition of a more ecological appearance with nature imagery or targeted at information with logos or text to stimulate recycling. The form in terms of structure was not taken into account when manipulating the images, since the packages used mostly have standard forms which are derived from the material they are made from. For this reason, it would be difficult to change the form. However, the material appearance of some packages was adapted in order to create a more ecological look.

The second section consisted of images of packages and organic waste with the question where it should be thrown away. In the test survey the images of the packages were manipulated in the same manner as the first section. For each package the respondents could choose out of the five existing waste streams: glass, paper & cardboard, organic, PMD (plastic, metals and beverage cartons) and residual waste. In the third part of the survey respondents were requested to answer questions about packaging and sustainability, starting with a ranking of which aspects of the packaging are paid attention to when purchasing a product. This way it is possible to look into the importance of several attributes of the packaging-product combination according to consumers. A comparable question was also included in the survey of study I, however those aspects were related more to rankings. The attributes studied here were targeted more at information displayed on a package and how much attention consumers pay to those elements during purchase. These were the following: appearance, sustainability, shelf life, content, material, ingredients, allergens, method of preparation. The following question looked at how well respondents view a package during a purchasing process, based on a 5-point Likert scale ranging from not good at all to very good. Followed by how important they find sustainability on a 5-point Likert scale ranging from not important at all to very important. In the fourth section respondents had to give themselves two grades, one on recycling of packaging and one on environmental awareness, both ranging from one to ten. This was followed by how much attention is paid on whether packaging is sustainable and recyclable, both with a 5-point Likert scale from never to always. The fifth part of the survey looked into respondents' recycling behaviour on different locations. The differences between recycling at home, at work/school or at a sports club were studied with a 5-point Likert scale ranging from never to always. Then a personal definition of sustainable packaging had to be provided. The survey evolves around this subject and since there is no generic definition resulting in everyone thinking differently about this subject, it is good to know what definition respondents have themselves. This was followed by the question which packaging materials the respondents usually thrown away separately. The sixth part was only present in the test survey and asked respondents if they had noticed recycling logos and texts on the packages during the survey. The seventh and last part of the survey focused on existing (recycling) logos which can be found on packaging. Respondents were asked to indicate the usefulness of each logo on a 5-point Likert scale ranging from not useful at all to very useful.

Appendix C2

Main Study II: description of results.

According to the results of the second part of the survey, a number of packages would be thrown away incorrectly as the wrong waste stream was chosen. Results indicated that packages which are often thrown away wrongly, such as an empty pizza box and an empty bag of crisps, both belonging to residual waste, were also in this case thrown into the wrong bin (Welk afval waar?, 2017). The next section was targeted at the importance of several packaging-product attributes during purchase. The items were ranked from 1 (least important) to 8 (most important).

CONTROL GROUP		
1	Content	2,49
2	Appearance	3,31
3	Shelf life	3,33
4	Ingredients	3,56
5	Sustainability	5,23
6	Preparation method	5,79
7	Material	6,03
8	Allergens	6,26

TEST GROUP		
1	Content	2,34
2	Appearance	3,24
3	Shelf life	3,32
4	Ingredients	4,06
5	Sustainability	4,14
6	Preparation method	5,78
7	Material	5,80
8	Allergens	7,32

The order of items was the same for both the control group and test group but respondents of the latter group gave sustainability a higher position (4.14) than the ones of the control group (5.23). This indicated that the previous images of the test survey containing recycling logos, texts and nature imagery could have had an influence on the respondents' opinion on the importance of sustainability. Overall the answers on the questions indicated that sustainability and recyclability received more attention after having seen multiple adapted packages. Furthermore, the control group indicated to look better at packaging but the test group considered sustainability as more important. For the test group, the grade for recycling was lower (6.92 for control group and 6.84 for test group) but the grade for environmental awareness was higher (6.26 for control group and 6.94 for test group). This may be due to the fact that respondents of the test group were more critical towards themselves about their recycling behaviour but still environmentally conscious after having noticed what the research is actually about. At home people pay close attention to the separation of packaging materials, but at other locations this is less the case. In terms of the separation of waste, most respondents claim to separate their waste well, as is indicated by the high percentages. The percentages of the test group are slightly higher than those of the control group, but the differences are not significant. Notable in that case is that organic waste is not always separated, as a quarter of the respondents does not throw this into a special bin. The last part focusing on (recycling) logos showed that the test group consistently gave higher scores to recycling logos, which indicates that they automatically find it more important after having been confronted with such logos in the previous sections of the survey.

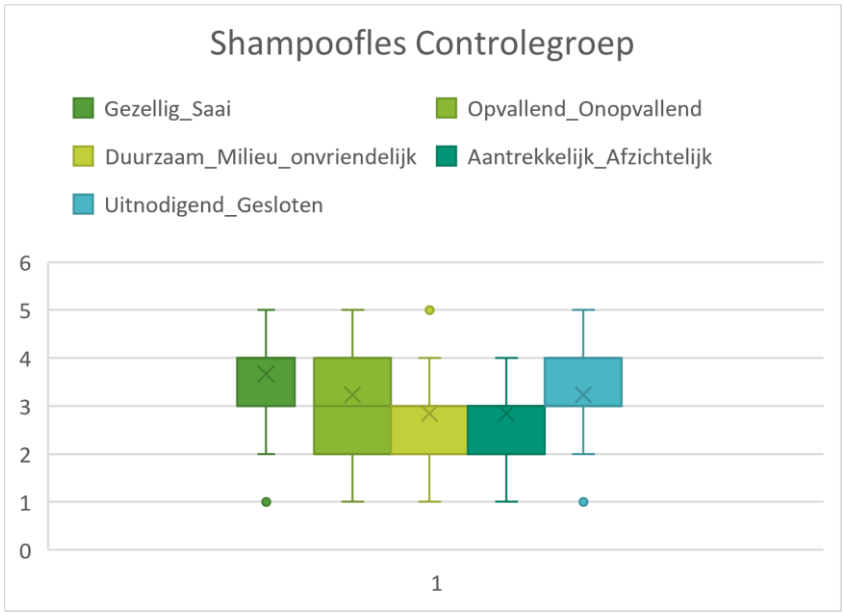
Appendix C3

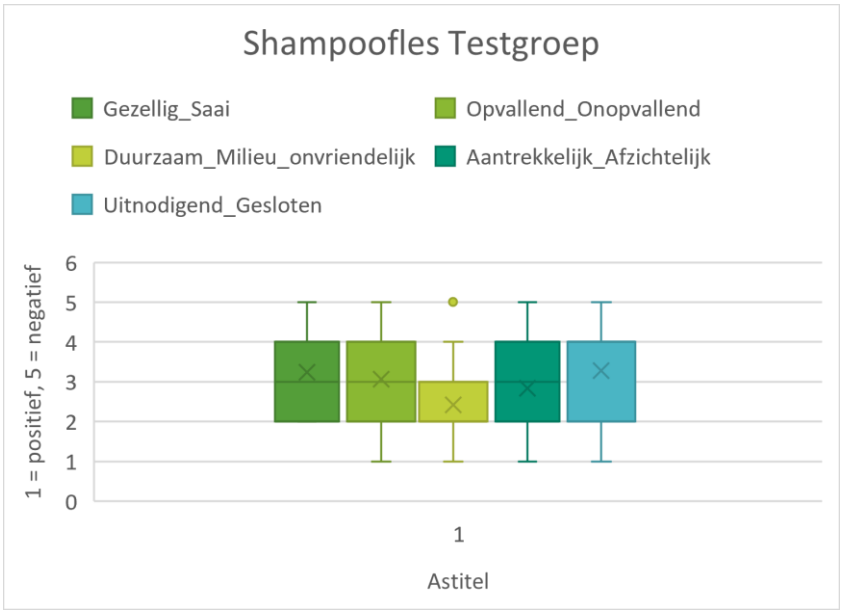
Main Study II: overview with examples of relevant results per question.
Survey was executed in Dutch.

Q1: Geef bij onderstaande verpakkingen aan in hoeverre ze volgens u aan de criteria in de schaalverdeling voldoen:

- Gezellig – Saai
- Opvallend – Onopvallend
- **Duurzaam – Milieu Onvriendelijk**
- **Aantrekkelijk – Afzichtelijk**
- Gesloten – Uitnodigend

Doel: vergelijken of respondenten de verpakkingen meer duurzaam vinden in testgroep.





Conclusies:
In de testgroep vond men de verpakkingen consequent duurzamer;
In de testgroep was men meestal positiever over de verpakkingen;
'gewoon een logo' werkt waarschijnlijk niet zo goed als geïntegreerde uitingen.

Q2: Wat is uw definitie van een duurzame verpakking?

- Recyclebaar
- Herbruikbaar
- Verbetert de houdbaarheid van een product
- Zo min mogelijk belastend voor het milieu
- Als het niet met restafval weg moet
- Voornamelijk papieren verpakking
- Zonder negatieve impact op het milieu of mensen
- Afbreekbaar / composteerbaar
- Zo min mogelijk materiaal
- Materiaal zo min mogelijk bewerkt
- Die niet verbrand wordt
- Gemaakt van eco-vriendelijk materiaal op plantaardige basis
- Weinig plastic
- Zo min mogelijk materialen

Q2: Wat vindt u van dit logo?

Doel: Ontdekken wat consumenten van logo's vinden en of er in hun ogen nuttige en minder nuttige logo's zijn

Schaalverdeling: Helemaal niet nuttig – Niet nuttig – Neutraal – Nuttig – Heel erg nuttig (1 t/m 5).

Gemiddelde Controlegroep: 3,23
Gemiddelde Testgroep: 3,37

Gemiddelde Controlegroep: 2,92
Gemiddelde Testgroep: 3,28

Gemiddelde Controlegroep: 2,49
Gemiddelde Testgroep: 3,74

Gemiddelde Controlegroep: 3,05
Gemiddelde Testgroep: 3,08

Gemiddelde Controlegroep: 3,51
Gemiddelde Testgroep: 2,62

Gemiddelde Controlegroep: 2,54
Gemiddelde Testgroep: 3,88

Gemiddelde Controlegroep: 2,82
Gemiddelde Testgroep: 3,47

Gemiddelde Controlegroep: 3,5
Gemiddelde Testgroep: 3,6

Opmerkingen:

- Van sommige weet ik de betekenis niet en daarom zijn ze niet nuttig
- 100% natuurlijk kende ik niet, maar wanneer is een product natuurlijk?
- Recycle logo's vind ik niet nuttig: ik kan zelf zien of ik het product moet scheiden of niet
- Opvallendheid is erg belangrijk en dat duidelijk is waar het om gaat
- Logo's als 100% natuurlijk etc zijn vaak helemaal niet onafhankelijk en gecertificeerd; green washing
- Sommige zijn te vaag; niet duidelijk wat je er precies mee moet doen
- Er zijn teveel keurmerken
- Het is een meerwaarde voor de consument als op de verpakking staat hoe het gerecycled kan worden, dan zit daar aansporing in
- Als product tegen je praat 'please recycle me!', helpt dat; product krijgt menselijke karaktertrekken
- Logo's op de voorzijde beinvloeden keuzes denk ik meer, achterzijde moet je maar net zien

Demografische informatie:

Controlegroep:

- Wat is uw geslacht?
  - Man: 30,8%
  - Vrouw: 69,2%
- Soort woning
  - Eengezinswoning: 35,9%
  - Flat, etagewoning, appartement: 17,9%
  - Boerderij: 5,1%
  - Op kamers/onzelfstandige wooneenheid: 7,7%
  - Studentenhuis: 30,8%
  - Andere woonruimte: 2%
- Hoogst afgeronde opleiding:
  - Middelbaar Algemeen Voortgezet Onderwijs: 2%
  - Middelbaar Beroepsonderwijs: 12,8%
  - Hoger Algemeen Voortgezet Onderwijs en VWO: 12,8%
  - Hoger Beroepsonderwijs: 25%
  - Wetenschappelijk Onderwijs: 43%
  - Weet niet / wil niet zeggen: 2%

Testgroep:

- Wat is uw geslacht?
  - Man: 28%
  - Vrouw: 72%
- Soort woning
  - Eengezinswoning: 40%
  - Flat, etagewoning, appartement: 20%
  - Boerderij: 4%
  - Op kamers/onzelfstandige wooneenheid: 4%
  - Studentenhuis: 20%
  - Andere woonruimte: 6%
- Hoogst afgeronde opleiding:
  - Middelbaar Algemeen Voortgezet Onderwijs: 4%
  - Middelbaar Beroepsonderwijs: 10%
  - Hoger Algemeen Voortgezet Onderwijs en VWO: 34%
  - Hoger Beroepsonderwijs: 24%
  - Wetenschappelijk Onderwijs: 28%

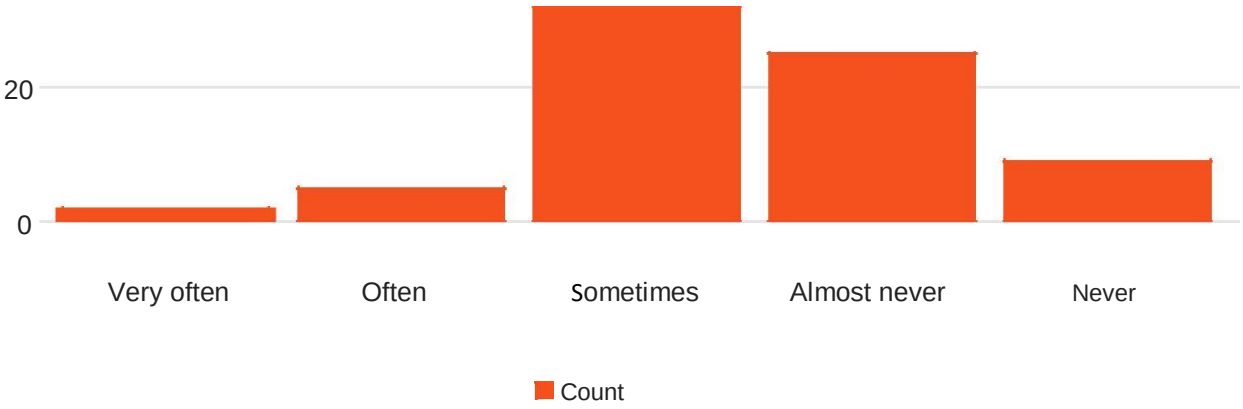
Algemene conclusies:

- Logo's en teksten aangaande recycling zorgen ervoor dat de consument de verpakking als duurzamer en positiever ziet
- Consumenten weten niet goed op welke manier ze bepaalde verpakkingen dienen te scheiden
- De invloed van de verpakking op het weten hoe te scheiden is twijfelachtig
- Niet alle consumenten lijken te weten waar 'PMD' of 'verpakkingen' precies voor staat
- Duurzaamheid is voor de consument significant belangrijker nadat ze meerdere beïnvloedde verpakkingen hebben gezien
- Thuis let men goed op het scheiden van verpakkingen, maar zodra ze op andere plaatsen zijn wordt dit veel minder
- Respondenten hebben allemaal verschillende percepties van wat duurzaam is en wat goed is
- De testgroep is over het algemeen positiever
- De ene respondent vindt logo's belerend, de ander denkt juist dat ze helpen

Appendix D1

Main Study I: overview of the results.

Q1 - Do you ever buy a bottle of water at the supermarket?



Q2 - If you were standing at the supermarket to buy a bottle of water and the price of each bottle would be the same, what would you pay attention to?

- Design, look and label
- Firmness, possibilty to use it again
- Handiness of bottle, drinking piece and bottle cap
- Origin of the water
- Volume
- Brand

Q3-Q7: rankings of bottles A-H: for each subject the bottles were ranked from 1- 8.

Appeal							
Field	Min	Max	Mean	Standard Deviation	Variance	Responses	Sum
A	1.00	8.00	5.27	2.13	4.56	73	385.00
B	1.00	8.00	5.62	1.71	2.92	73	410.00
C	1.00	8.00	3.14	1.88	3.54	73	229.00
D	1.00	8.00	4.27	1.85	3.40	73	312.00
E	1.00	8.00	4.89	2.02	4.07	73	357.00
F	2.00	8.00	6.60	1.60	2.57	73	482.00

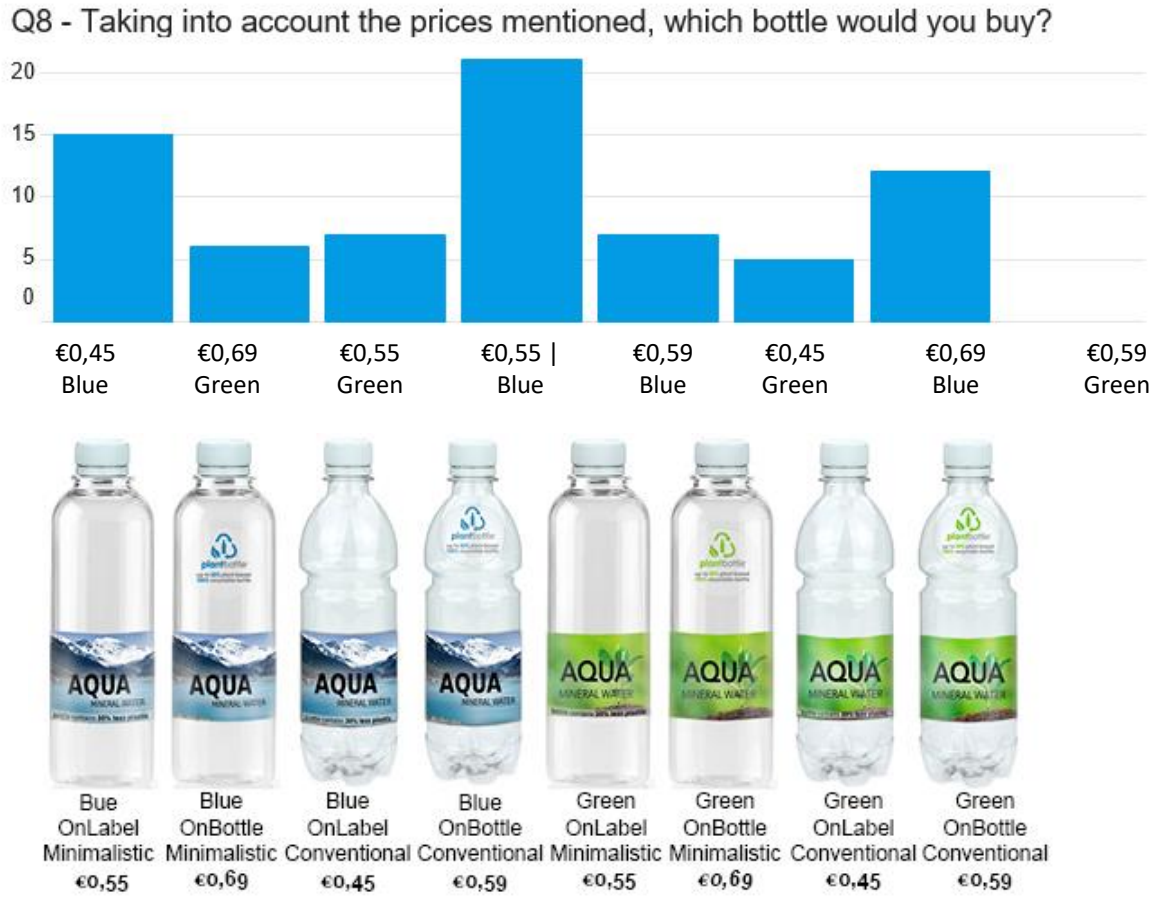
G	1.00	8.00	2.59	1.86	3.45	73	189.00
H	1.00	8.00	3.62	2.17	4.73	73	264.00

Recycling intention							
Field	Min	Max	Mean	Standard Deviation	Variance	Responses	Sum
A	1.00	8.00	5.01	2.37	5.60	73	366.00
B	1.00	8.00	3.55	2.00	4.00	73	259.00
C	1.00	8.00	4.99	1.83	3.36	73	364.00
D	1.00	8.00	5.23	1.86	3.47	73	382.00
E	1.00	8.00	4.15	1.93	3.72	73	303.00
F	2.00	8.00	6.11	1.88	3.52	73	446.00
G	1.00	8.00	3.42	2.18	4.76	73	250.00
H	1.00	8.00	3.53	2.61	6.82	73	258.00

Buying intention							
Field	Min	Max	Mean	Standard Deviation	Variance	Responses	Sum
A	1.00	8.00	5.01	2.06	4.26	73	366.00
B	2.00	8.00	5.58	1.76	3.09	73	407.00
C	1.00	8.00	3.26	1.97	3.89	73	238.00
D	1.00	8.00	4.21	1.99	3.94	73	307.00
E	1.00	8.00	4.92	2.08	4.32	73	359.00
F	2.00	8.00	6.75	1.49	2.21	73	493.00
G	1.00	8.00	2.60	1.73	3.01	73	190.00
H	1.00	8.00	3.67	2.16	4.69	73	268.00

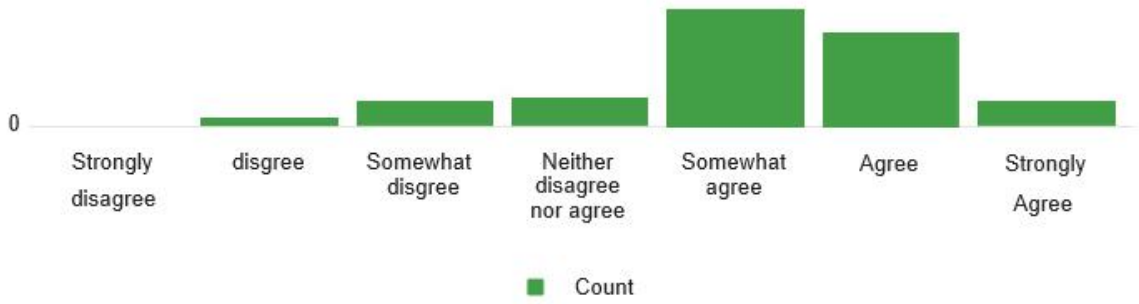
Environmental friendliness							
Field	Min	Max	Mean	Standard Deviation	Variance	Responses	Sum
A	1.00	8.00	5.26	2.11	4.47	73	384.00
B	1.00	8.00	2.84	1.70	2.88	73	207.00
C	1.00	8.00	5.64	1.86	3.46	73	412.00
D	1.00	8.00	5.26	1.94	3.78	73	384.00
E	1.00	8.00	4.03	1.73	2.99	73	294.00
F	2.00	8.00	5.66	2.02	4.09	73	413.00
G	1.00	8.00	3.93	2.29	5.24	73	287.00
H	1.00	8.00	3.38	2.59	6.73	73	247.00

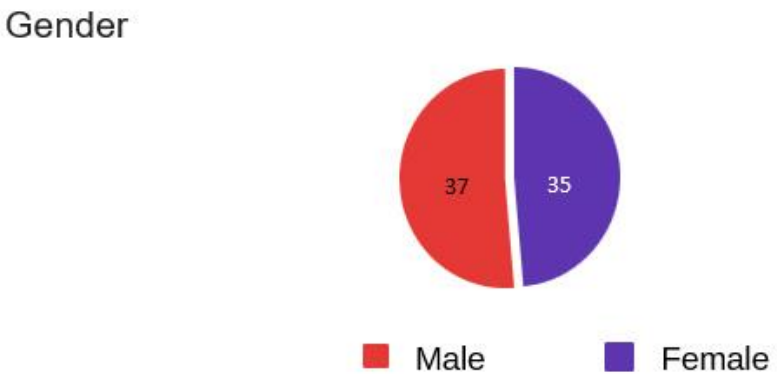
Reliability packaging producer							
Field	Min	Max	Mean	Standard Deviation	Variance	Responses	Sum
A	1.00	8.00	5.00	2.26	5.12	73	365.00
B	1.00	8.00	4.56	2.01	4.03	73	333.00
C	1.00	8.00	3.85	2.18	4.76	73	281.00
D	1.00	8.00	4.23	1.84	3.38	73	309.00
E	1.00	8.00	4.70	1.97	3.88	73	343.00
F	2.00	8.00	6.60	1.61	2.60	73	482.00
G	1.00	8.00	3.25	2.10	4.40	73	237.00
H	1.00	8.00	3.81	2.56	6.57	73	278.00

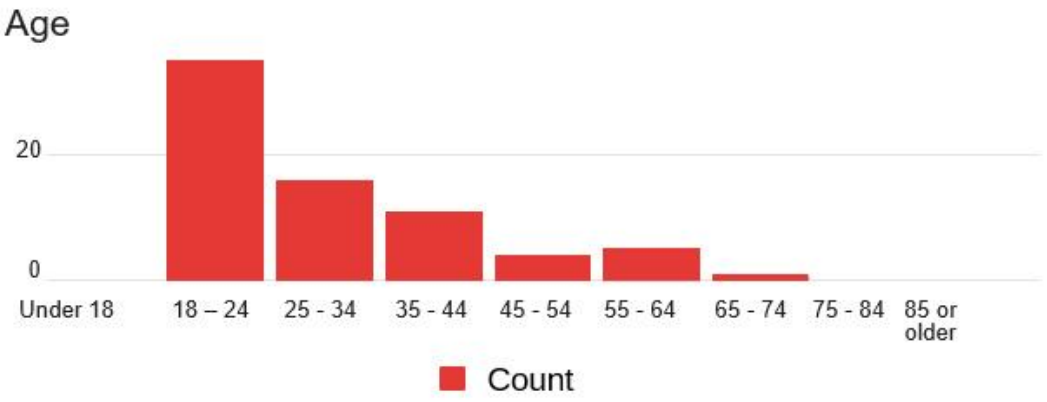


Category	Comments	Quantity
Price	Cheapest, price is most important, acceptable price	36
Performance	Re-usable, use it for longer, durable, sturdy, user friendly	28
Design	Nice looking, blue is associated with water, perceived high quality	19
Sustainability	Environmental friendly, sustainable, less plastic, (100%) recyclable, plant-based material	11

Q10 - In daily life, I usually consider the consequences of my behavior towards the environment.







Appendix E1

Main Study III: Photos bin counting.

Paper waste

PMD waste

Residual waste

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