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Can't You See? The Effect of Numeracy on Quantity
Perceptions and Evaluations of Products

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Abstract

Purchase decisions involve numerical information, such as the quantity information printed on the packaging of a product. Considering this piece of information is important to make consumer decisions that are optimal from a financial point of view. The present study investigates the effect of individual differences in numeracy on the attention to and use of quantity information on the packaging of a product. Eye tracking was used to test the hypothesis that the attention process per se for quantity information is different for high and low numerate individuals. The results revealed that high numerate individuals were more likely to look at the quantity information and more likely to use this information when stating their willingness to pay. Numeracy is an important predictor for the attention to and use of quantity information printed on the packaging of a product.

Keywords: numeracy, quantity information, consumer decisions, visual attention, eye tracking

Introduction

In 2007 an EU Directive (2007/45/EG) has modified two EU Directives concerned with the quantity of groceries (EUR-Lex, 2007). On the 21th of April 2009 this began to be enforced in Austria mainly in the “Fertigpackungsverordnung“ and changed the existing regulations in this area. Until then, the contained quantity was regulated for several product categories like sugar, milk or chocolate. It is claimed that this modification gives more freedom of action to the manufacturers and consumers, because the manufacturers can now offer the consumers exactly the quantity that they want to buy (EUR-Lex, 2007).

But do the consumers actually know what amount of the product they are buying? If this is not the case, manufacturers can easily reduce the quantity and maintain the same price – it would go unnoticed by consumers. If consumers fail to consider quantity and to make adequate price comparisons, they are likely to spend more money than necessary on goods or they will end up with too much of a product. Spending too much money can have financial consequences in the long run. Unused groceries expire and spoil, which contributes to rising levels of waste.

Research shows that quantity information is often widely ignored by consumers. The focus of attention is someplace else. An eye tracking study about the visual processing of food labels demonstrated that participants looked at the image, the brand, the ingredients and the nutritional information printed on a product, but the net content seemed less relevant for them (Ares et al., 2013).

Information sources used when inferring about product quantity

It is argued that consumers do not read product quantity information shown on packages, but instead they infer the contained quantity from their perception of packaging size (Ares et al., 2013; Ordabayeva & Chandon, 2013) or use the numbers of product units

displayed on consumer goods packages (Madzharov & Block, 2010). It is further argued that these perceptions are often biased (Ordabayeva & Chandon, 2013) and that manufacturers make use of this bias and produce packaging filled with air and packaging material. The only two ways to get the necessary quantity information to make adequate price comparisons between products are to use the unit price, for example the price per kilogram, or the quantity information printed on the packaging.

Why the unit price is not always useful

The food industry claims that the now abolished EU quantity regulation became unnecessary after the introduction of prices in relation to measuring units, the so-called unit price. This unit price, for example the price per kilo, should make it easier for consumers to make their purchase decisions. For most of the products, the unit price has to be in immediate vicinity of the final price and has to be “clearly visible” and “easily readable” (Verbraucherzentrale Nordrhein Westfalen, 2013). In reality the unit price is sometimes barely visible, especially for older people, miscalculated, or missing completely.

Quantity information

Another indicator for the quantity of a product is the quantity information printed directly on the product packaging. Packaging reaches consumers at the time of purchase and consumption (Chandon, 2013), critical moments for purchase decisions and use. Most research on product packaging has been concerned with food labels (Ares et al., 2013), nutrition labels (Bialkova & van Trijp, 2010), or packaging-based marketing claims (Chandon, 2013). Research concerning unit prices and quantity indications has shown that this information is often disregarded in purchase decisions (Lennard, Mitchell, McGoldrick, & Betts, 2001): There are several possible reasons why consumers may disregard this information. Reduced motivation, information overload, time constraints or

an imperfect knowledge of measurement systems (for example the difference between net weight and drained net weight) could be responsible for the disregard. It is also possible that consumers do not care about small differences or deem other information more important. Some consumers may believe strongly in consumer protection laws or they use alternative weight indicators like their past experience or their visual impression of the package size. The lack of visual clarity of the quantity information may prohibit consumers from taking them into account. The information may be written too small, printed on a poorly contrasting background or consumers may have problems locating it in the first place.

Another reason may be that the consumers have poor arithmetic skills (Lennard et al., 2001). Arithmetic skills and mathematical understanding may be important for the attention to and the use of quantity information printed on the packaging of products. A potentially valuable concept in this area is numeracy. Previous research has already shown that numeracy correlates with higher comprehension of food labels (Rothman et al., 2006), but so far it has not been directly linked to the attention to and the use of quantity information printed on product packaging.

Numeracy

Numeracy is defined as the ability to understand probabilistic and mathematical concepts (Peters et al., 2006). It is known to influence judgements and decisions (Dieckmann, Slovic, & Peters, 2009). There is evidence that the focus on sources of information differs according to numeracy (Dieckmann et al., 2009).

Low numerate individuals focus more on narrative evidence (Dieckmann et al., 2009). They are more influenced by nonnumeric information (Dieckmann et al., 2009; Hess, Visschers, & Siegrist, 2011) and irrelevant affective sources and they are more prone to framing effects (Peters et al., 2006). Low numerate individuals trust more in verbal

information and less in numeric information than high numerate individuals (Gurmankin, Baron, & Armstrong, 2004). Their affect based on numbers is weaker and less precise (Peters, 2012). Research also indicates that low numerate individuals are less able to extract information from numbers (Peters et al., 2006).

Preference construction and numeracy

Preferences do not always exist in the specific moment when individuals need to make a decision, so they construct their preferences on the spot, based on internal and external cues available at the moment (Peters, 2009). Preferences are likely to be constructed in unfamiliar situations, where individuals have a lack of experience with the available options, in situations where conflicting preferences and feelings are present and in situations where individuals do not have strong feelings (Peters, 2009). Decisions involving numeric information are situations where low numerate individuals are more likely to construct their preferences because they are less proficient with numbers than high numerate individuals (Peters, 2009) and may have lower self-efficacy when dealing with numbers (Hess et al., 2011).

When shopping for groceries, low numerate individuals may not use quantity information to the same extent as high numerate individuals do. They may not consider the quantity they are paying for and therefore may spend too much money or buy more than they would actually need. Low numerate individuals are more likely to depend on internal and external cues other than the numeric information available at the moment, so they may pay more attention to and make more use of additional cues on the product packaging, for example verbal cues.

Rationality

As quantity information printed on the packaging of a product is a rather easily understandable piece of information, a profound ability to understand probabilistic and mathematical concepts may not even be necessary for making use of it. In this case rationality may be a better predictor than numeracy. Rational individuals may want to make positive financial decisions and to avoid buying more than necessary. When stating their willingness to pay, they may consider the quantity information printed on packaging more than individuals who are less rational.

There is a significant positive correlation of $r = .23$ of numeracy and rationality (Brooks & Pui, 2010). The cognitive-experiential self-theory (CEST; Epstein, 1994) postulates two ways of cognitive processing, one experiential, intuitive and automatic process, and one rational, deliberative and analytical process. The rational, deliberative and analytical thinking may influence the attention to and use of quantity information printed on the packaging of products, so that highly rational individuals make more use of this information.

Visual Processing

Although there is some concrete knowledge about some effects of numeracy, little is known about how numeracy influences the perception and use of information (Reyna, Nelson, Han, & Dieckmann, 2009) such as the quantity information printed on the packaging of products. Because attention is not necessarily active and conscious, eye-tracking measures can be useful to study visual processing (Ares et al., 2013) and to indicate which information receives visual attention (Hess, Visschers, Siegrist, & Keller, 2011). It is believed that the information which is currently processed in working memory is fixated upon with the eyes and that the duration of the fixation is consistent with the duration of the information processing (Just & Carpenter, 1976). It is argued that when having a choice, individuals only fixate on information they can readily understand (Keller,

2011) and consider those aspects which are most informative to their goals first (Rayner, Miller, & Rotello, 2008). By that logic, high numerate individuals should fixate on quantity information sooner than low numerate individuals because of their better understanding.

Attention vs. processing

The influence of numeracy on judgements and decisions and the differences in the focus on sources of information could have two different origins. Attention per se could be different for high and low numerate individuals or the process of making use of numerical information after the information intake could be different. The following study sheds light on the idea that the attention process per se is different and high numerate individuals look for other information than low numerate individuals, or inversely that the attention process is the same. In this case, the process of making use of the numerical information may be different and high numerate individuals may use this information differently for their decision-making than low numerate individuals.

Research questions

The following study was conducted to investigate if low and high numerate individuals use different pieces of information for their evaluations of products. Evaluations of attractiveness, purchase intentions and willingness to pay were used, to cover a broad range of evaluation dimensions. As low numerate individuals may be more likely to construct their preferences on the spot, their consideration of additional cues may have an impact on all of the used evaluation dimensions, namely evaluations of attractiveness, purchase intentions and willingness to pay. In contrast high numerate individuals may just be guided by the numerical information about quantity, which should influence the stated willingness to pay, but not the evaluations of attractiveness or purchase intentions.

A second goal was to shed light on the idea that rationality is a better predictor than numeracy for making use of quantity information printed on the packaging of a product. The simplicity of this numeric information may indicate the role of rationality in making use thereof. Rational individuals may make more use of quantity information when stating their willingness to pay because of their desire to make decisions that are financially optimal.

Another goal was to investigate if the attention process per se for quantity information printed on the packaging of a product is different for low and high numerate individuals. High numerate individuals may pay more attention to this kind of information. Eye tracking data was used to examine visual attention.

Hypotheses

Product evaluations

Because of their better understanding of numeric information (Peters et al., 2006) high numerate individuals may make more use of the quantity information printed on the packaging of a product than the low numerate individuals when stating their willingness to pay. Thus, high numerate individuals should be willing to pay more for products with a higher quantity and low numerate individuals should not distinguish between products with high and products with low quantity. To examine this hypothesis, it is hypothesized that:

H1: High numerate individuals make more use of quantity information when stating their willingness to pay than low numerate individuals.

In contrast, low numerate individuals may make more use of additional cues printed on the packaging of a product than high numerate individuals. Because of their lower

ability and their lower self-efficacy concerning numeric information, they may focus on other information present to construct their preferences (Peters, 2009). As low numerate individuals are more likely to construct their preferences in decisions involving numeric information on the spot (Peters, 2009), additional cues may influence the evaluation of attractiveness, the purchase intentions and the willingness to pay for the product. Therefore, it is hypothesized that:

H2: Low numerate individuals make more use of additional cues when stating their evaluation of attractiveness, purchase intentions and willingness to pay than high numerate individuals.

To shed light on the idea that numeracy is really an adequate predictor for making use of the quantity information, rationality and its effects on the stated willingness to pay are taken into account. Individual differences in rational, deliberative and analytical thinking may influence the use of quantity information printed on the packaging of products more than individual differences in numeracy. Rationality may be a better predictor because of the simplicity of this piece of information. The needed numeric ability for understanding this kind of quantity information may not have to be especially pronounced.

Highly rational individuals may consider the quantity information more than individuals lower in rationality when stating their willingness to pay. If this is the case, highly rational individuals should be willing to pay more for a product with higher quantity than for a product with lower quantity. Individuals lower in rationality should not

distinguish between products with high and products with low quantity when stating their willingness to pay.

H3: Highly rational individuals make more use of the quantity information when stating their willingness to pay than individuals lower in rationality.

Attention

As high numerate individuals are more able to understand and make use of numeric information (Peters et al., 2006) they may be more likely to look at this piece of information than low numerate individuals. As quantity information may also be more informative to their goals, high numerate individuals may search more readily for this information and look at it at an earlier point of time:

H4a: High numerate individuals are more likely to look at the quantity information than low numerate individuals.

H4b: High numerate individuals look at the quantity information sooner than low numerate individuals.

Further, it is hypothesized that numeracy has an effect on the duration and on the frequency of the fixation on the quantity information of the product packaging. High numerate individuals may fixate on this information for a longer period of time and more often than low numerate individuals because it is more relevant for their decision. On the

other hand, it is also possible that high numerate individuals fixate on the quantity information for a shorter period of time and less often because they process this information more easily and do not have to spend much time looking at it. Therefore it is hypothesized that:

H4c: Numeracy has an effect on the fixation time of the quantity information.

H4d: Numeracy has an effect on the revisits of the quantity information.

In order to test these hypotheses, an eye tracking study was conducted. Numeracy and rationality were measured. Quantity information and additional cues printed on the packaging of products were manipulated.

Method

Participants

42 people took part in this study (21 female; $M_{age} = 24.86$ years, $SD_{age} = 3.21$); most of them were university students. A majority, 35 people, participated for partial credit toward fulfilment of a course requirement. The completion of the eye tracking part took about 10 minutes and the completion of the Unipark part took about 20 minutes. Out of 49 original participants, 7 had to be excluded because of poor calibration data (calibration values $> 0,9$).

Material and Design

The study applied a 2 (quantity low vs. high) x 2 (no additional cues present vs. additional cues present) within-subjects design. Numeracy and rationality scores were used

as predictors. The evaluations of the products and the eye tracking measures were used as dependent variables.

Stimuli

This study used pictures of groceries. Eight different products were used, namely pictures of a bag of coffee beans, a bag of chips, a bar of chocolate, prepackaged cheese, a pack of chewing gum, a canned energy drink, a bottled yoghurt drink and a yoghurt pot (adopted from Siffert, 2013). The original brand names were removed and replaced by fictional names. The high quantity product was two times the quantity of the low quantity product. The additional cues were either a change in the brand name font, a small Austrian or Swiss flag, a slogan like “Die fruchtige Sünde” or an additional verbal cue like the word “natural”, all of them placed directly on the packaging of the product.

For example, the bar of chocolate was displayed on 4 pictures; on one picture in low quantity (100g) without an additional cue, on a second picture in high quantity (200g) without an additional cue, on a third picture in low quantity (100g) with an additional cue, namely a small Swiss flag and on a fourth picture in high quantity (200g) with the small Swiss flag.

The pictures were 1680 x 1015 pixels. The stimulus monitor was a 22 Inch Screen with a resolution of 1680 x 1015 pixels. The refreshing rate was 60 Hz.

Numeracy

An abbreviated numeracy scale was used (Weller et al., 2012). This scale encompasses a greater range of difficulty than several other numeracy scales. As the participants in this sample are highly educated and most of them have at least a diploma from secondary school, their numeric skills are likely to be above average, as education and numeracy are correlated (correlation of SAT scores and numeracy $r = .26$ (Peters et al.,

2006)). The abbreviated numeracy scale consists of 8 items. These items are open-answer questions concerning mathematical calculations (e.g. “If the chance of getting a disease is 20 out of 100, this would be the same as having a _____% chance of getting the disease.”). The numeracy scores ($M = 5.36$, $SD = 1.59$) of the participants ranged between 1 (12.5% correct) and 8 (100% correct). A slightly negative skewness ($z = -0.87$, $p = .38$) was not significant.

Rationality

The REI-40 (Pacini & Epstein, 1999) was used as a measure for rationality. This scale measures the two ways of cognitive processing: the experiential, intuitive and automatic process, as well as the rational, deliberative and analytical process. It includes two subscales for each of the two pathways, in case of rationality these are rational ability (e.g. “I’m not that good at figuring out complicated problems”) and rational engagement (e.g. “I try to avoid situations that require thinking in depth about something.”). In the present study the combination of the two subscales, rational ability and rational engagement, was used as a measure for rationality. This rationality scale consisted of 20 items and Cronbach’s alpha was .87.

Procedure

Data collection was carried out using an eye tracker (SMI RED 500) and the software Unipark. The participants were tested in individual sessions in the Laboratory of Applied Social Psychology at the University of Vienna.

After signing an informed consent form, the participants were seated in front of a stationary eye tracker. They read an introduction that this study was concerned with the evaluation of products and that they would be presented with pictures of groceries for a

short time. After each presentation of a picture they would have to evaluate the attractiveness, purchase intention and willingness to pay for the product.

Each trial started with a black fixation cross in the centre of the screen. Only when participants fixated the cross for 1,000 ms it disappeared and a picture of a product was shown for 4,000 ms. The pictures were randomly presented. After each presentation of a picture the participants rated the attractiveness of the product and the purchase intention. These evaluations were made on 7-point scales ranging from 1 (*very unattractive* and *very unlikely*) to 7 (*very attractive* and *very likely*). For answering the questions, the participants had to use the keyboard. Finally, the participants had to answer an open question asking them to state their willingness to pay for the product.

After the completion of the eye tracking part, the participants were seated in front of a laptop in the same room. Then numeracy and rationality were measured and in the end they had to provide their demographic data. The participants were not provided with any material to help them to perform calculations for the numeracy scale.

Data Analysis

The analyses were made using the software STATA 13. The data was analyzed using a repeated measures regression with the abbreviated numeracy scale, additional cue, quantity and the interactions as predictors. A separate analysis was carried out with rationality instead of numeracy. Acceptable tolerances of the regression were ensured by mean-centering numeracy and rationality. Significant interactions were analyzed using simple slope analysis (Hayes & Matthes, 2009).

In order to analyze the results for visual attention, areas of interest (AOI) were defined for quantity information. For each AOI, entry times in milliseconds (first time an AOI is entered), dwell time in ms (total time spent looking at an AOI) and revisits (number

of times a participant looked back at an AOI) were calculated using SMI BeGaze™. The same was done for additional cues.

Results

Repeated measures regression was used to test the hypotheses concerning numeracy and additional cues and numeracy and quantity. Numeracy, additional cues, quantity and the interactions were used as predictors. This model did not significantly predict the rated attractiveness, $F(7, 41) = 1.49$, $p = .20$, $R^2 < .01$, or the purchase intentions, $F(7, 41) = 0.82$, $p = .58$, $R^2 < .01$, but predicted significantly the willingness to pay, $F(7, 41) = 4.77$, $p < .01$, $R^2 = .02$.

Product evaluations - numeracy and quantity

There was a significant interaction between numeracy and quantity for willingness to pay, $b = 0.15$, $t(35) = 2.36$, $p = .02$. The difference between high and low quantity was significant for high numerate individuals (1SD above the mean), $b = 0.06$, $t(38) = 3.93$, $p < .01$, but not for low numerate individuals (1SD below the mean), $b = 0.01$, $t(38) = 0.82$, $p = .42$. High numerate individuals were willing to pay more for a product with a higher quantity and low numerate individuals did not make a difference between a product with a high quantity and a product with a low quantity when stating their willingness to pay.

When considering only the participants who actually looked at the quantity information, the interaction was still marginally significant, $b = 0.04$, $t(35) = 1.76$, $p = .09$. The difference between high and low quantity was significant for high numerate individuals (1SD above the mean), $b = 0.17$, $t(38) = 3.73$, $p < .01$ but not for low numerate individuals (1SD below the mean), $b = 0.04$, $t(38) = 0.86$, $p = .39$.

Product evaluations - numeracy and additional cues

There was no significant interaction between numeracy and additional cues for attractiveness, $b = 0.01$, $t(35) = 1.72$, $p = .09$, purchase intentions, $b = 0.01$, $t(35) = 0.97$, $p = .34$, and willingness to pay, $b < -0.01$, $t(35) = -0.35$, $p = .73$. Low numerate individuals did not consider the additional cues more than the high numerate individuals for their evaluation of attractiveness, purchase intentions and their willingness to pay.

The model using numeracy, additional cues, quantity and the interactions as predictors indicated a significant main effect for quantity, $b = 0.04$, $t(35) = 4.15$, $p < .01$, meaning that participants were willing to pay more for a product with higher quantity than for a product with a lower quantity. A significant main effect for numeracy, $b = -0.10$, $t(35) = -2.25$, $p = .03$, demonstrated that in general low numerate individuals were willing to pay more. No significant main effect for additional cue was found, $b < -0.01$, $t(35) = -0.76$, $p = .453$.

Product evaluations - rationality and quantity

Repeated measures regression was also used to test if rationality significantly predicted the willingness to pay. Rationality, additional cues, quantity and the interactions were used as predictors. This model significantly predicted the willingness to pay, $F(7, 41) = 2.69$, $p = .02$, $R^2 = .02$. There was no significant interaction between rationality and quantity for the willingness to pay, $b < 0.01$, $t(35) = 0.28$, $p = .78$. Rationality did not influence the consideration of the quantity for the willingness to pay.

The model indicated a significant main effect for rationality, $b = -0.22$, $t(35) = -2.27$, $p = .03$, meaning that in general the less rational individuals were willing to pay more. A significant main effect for quantity, $b = 0.04$, $t(35) = 2.98$, $p < .01$, demonstrated that participants were willing to pay more for a product with higher quantity than for a product with a lower quantity. No significant main effect for additional cue was found, $b < 0.01$, $t(35) = -0.77$, $p = .45$.

Attention

To test the hypotheses concerning visual attention, only the participants who actually looked at the quantity information were considered. Numeracy predicted if the participants looked at the quantity information or not, $b = 0.01$, $t(40) = 2.61$, $p = .012$, $F(1, 41) = 4.32$, $p < .01$, $R^2 < .01$. High numerate individuals were more likely to look at the quantity information than low numerate individuals.

Numeracy did not predict entry time measured in milliseconds, $b = 3.62$, $t(40) = 0.36$, $p = .72$, $F(1, 41) = 0.13$, $p = .72$, $R^2 < .01$. High numerate individuals did not look sooner at the quantity information than low numerate individuals. Numeracy did not predict dwell time measured in milliseconds, $b = 7.76$, $t(40) = 0.95$, $p = .35$, $F(1, 41) = 0.90$, $p = .35$, $R^2 < .01$. There was no difference in dwell time for high and low numerate individuals. Numeracy did also not predict revisits, $b < -0.01$, $t(40) = -0.10$, $p = .92$, $F(1, 41) = 0.01$, $p = .92$, $R^2 < .01$. High numerate individuals did not look back at the quantity information more often.

Discussion

One goal of this study was to investigate if low and high numerate individuals use different pieces of information for their evaluations of products. The results show that high numerate individuals made more use of the quantity information, but low numerate individuals did not make more use of additional cues. A second goal was to shed light on the idea that rationality is a better predictor than numeracy for making use of quantity information printed on the packaging of a product. Rationality did not influence the consideration of this piece of information. A third goal was to find out if there are differences in the attention process per se for quantity information printed on the packaging of a product. High numerate individuals were more likely to look at the quantity

information than low numerate individuals. No other differences in viewing patterns were observed.

Product evaluations

Research shows that high numerate individuals are more able to extract information from numbers (Peters et al., 2006). In this study this finding could be replicated and expanded to the area of consumer decisions. High numerate individuals made more use of quantity information printed on the packaging of products when stating their willingness to pay than low numerate individuals. Thus the present study is the first to demonstrate that numeracy is a predictor for the use of this piece of information.

A finding that could not be replicated is that low numerate individuals are more influenced by nonnumeric information (Dieckmann et al., 2009; Hess et al., 2011). In the present study low numerate individuals did not make more use of additional cues, like verbal and graphical cues. A possible reason for this is that the cues were rather subtle and may not have been salient enough. More salient cues may make it more likely that low numerate individuals pay attention to them and construct their preferences based on them. A second reason may be that the additional cues were not informative in the way that no extra information could be inferred from them. Additional cues that actually carry information about the product that is not available in any other way on the packaging may get more attention and get used more by low numerate individuals.

Highly rational participants did not consider quantity information more when stating their willingness to pay than participants low in rationality. The usage of quantity information depends on numeracy but not on rationality. It seems that the role and use of simple numeric information in rationality is superseded by that of numeracy. Rational thinking is not enough when it comes to purchase decisions. An understanding of mathematical concepts is important to make positive financial decisions.

Attention

Numeracy is also a predictor for the attention to quantity information printed on product packaging. Research has shown that quantity information is often disregarded in purchase decisions (Ares et al., 2013; Lennard et al., 2001). This finding must be regarded with caution, as this study indicates that it depends on the individual differences in numeracy if the quantity information receives attention. High numerate individuals are more likely to pay attention to it. A possible explanation is that they consider quantity information because it is maximally informative to their goals (Rayner et al., 2008). This means that high numerate individuals may base their decisions largely on this piece of information. This fits with the finding that high numerate individuals trust more in numeric information than low numerate individuals (Gurmankin et al., 2004). Increased trust and the ability to extract more information from numbers (Peters et al., 2006) may make it more likely that quantity information receives attention.

This study shows that the differences in decisions between high and low numerate individuals are a matter of attention per se and also a matter of processing the information after paying attention to it. The results demonstrate that the differences are split between paying attention to and making use of information. High numerate individuals are more likely to pay attention to the quantity information, but when high and low numerate individuals both pay attention to it, there is still a difference in making use of this information.

Future Research

In this study the effects were found even though it included almost only highly educated participants in their early adulthood. Future research should transfer these findings to other samples in terms of age and education. Even greater differences could

become apparent if this study was conducted with a sample of a more balanced distribution of educational level and age.

Another point for future investigation could be the transfer of the findings of this study in a more realistic setting. Stationary eye tracking has the disadvantage of being limited to presenting experiments on a computer screen. The participants were aware that their eye movements were being tracked, so they may have paid more attention to information they thought they were supposed to look at (Keller, 2011). This is a problem that is difficult to avoid, but as the presentation time of the pictures was limited to 4,000 ms, the participants did not have a lot of time to reflect on their visual attention. Although the participants were asked to state their purchase intentions, there was no real purchase situation involved. The application of mobile eye tracking systems seems promising in this area (Duchowski, 2002), because real purchase situations could be implemented in this setting.

To make the setting even more realistic, future research should incorporate other cues which consumers might use for inferring quantity, like the packaging size. In this study the packaging size did not differ between high and the low quantity, so that the high quantity product had the same size on the computer screen as the low quantity product. In real settings, the packaging size differs. Research shows that people use this visual information about size to infer about product quantity size (Ares et al., 2013) but it also shows that this perception is often biased (Ordabayeva & Chandon, 2013). A correct guess about the contained quantity is not possible when relying on the visual perception of size.

To help low numerate individuals to make informed purchase decisions that are financially optimal, future studies should examine if certain cues about the quantity information can make the differences in attention and use of quantity information between high and low numerate individuals disappear. An optimal package design could help low

numerate individuals to pay more attention to this information and make more use of it. Visual clarity is in need of improvement. The quantity information should be in contrast with the background, it should be easy to locate and the font size should be big (Lennard et al., 2001). Especially older consumers, a growing market segment, are in need of a bigger font size (Underhill, 2009). Educating consumers about the importance of making use of the quantity information printed on the packaging of a product and the unreliability of other cues such as packaging size (Ares et al., 2013; Ordabayeva & Chandon, 2013) or the numbers of product units displayed on consumer goods packaging (Madzharov & Block, 2010) could also be beneficial.

Relevance

This study provides evidence that the attention process per se and the process of making use of numerical information are different for high and low numerate individuals. High numerate individuals are more likely to look at quantity information printed on the packaging of a product. They also make more use of this piece of information when stating their willingness to pay.

Low numerate individuals are at a disadvantage because they do not use quantity information for their willingness to pay to the same extent as high numerate individuals do. This renders the decisions of low numerate individuals not financially optimal. Buying more than needed can also contribute to rising levels of unnecessary waste. This study provides the first attempt to gain insight into the processes involved in order to get a better understanding of purchase decisions and possible negative outcomes.

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Appendix A: Material

A1: Eye Tracking Questionnaire

A1.1: Introduction

Herzlich Willkommen!

Stellen Sie sich vor, Sie sind in einem Supermarkt. Sie werden Produkte für kurze Zeit präsentiert bekommen. Anschließend werden Sie diese bewerten.

Sie werden **nach jedem Produkt** danach gefragt, wie **attraktiv** Sie dieses Produkt finden, **wie wahrscheinlich** Sie es **kaufen** würden, und wie viel sie dafür **zahlen** würden.

Wenn Sie bereit sind, drücken Sie die Leertaste.

A1.2: Products



Fig. 1. Coffee without additional cue and in low and high quantity



Fig. 2. Coffee with additional cue in low and high quantity.



Fig. 3. Chips without additional cue in low and high quantity.



Fig. 4. Chips with additional cue in low and high quantity.



Fig. 5. Chocolate without additional cue in low and high quantity.



Fig. 6. Chocolate with additional cue in low and high quantity.



Fig. 7. Cheese without additional cue in low and high quantity.



Fig. 8. Cheese with additional cue in low and high quantity.



Fig. 9. Chewing gum without additional cue in low and high quantity.



Fig. 10. Chewing gum with additional cue in low and high quantity.



Fig. 11. Energy drink without additional cue in low and high quantity.



Fig. 12. Energy drink with additional cue in low and high quantity.



Fig. 13. Yoghurt drink without additional cue in low and high quantity.



Fig. 14. Yoghurt drink with additional cue in low and high quantity.



Fig. 15. Yoghurt without additional cue in low and high quantity.



Fig. 16. Yoghurt with additional cue in low and high quantity.

A1.3: Questions

Wie attraktiv finden Sie das Produkt?

1 – sehr unattraktiv 7 – sehr attraktiv

Wie wahrscheinlich würden Sie dieses Produkt kaufen?

1 – sehr unwahrscheinlich 7 – sehr wahrscheinlich

Wie viel würden Sie für dieses Produkt bezahlen?

A2: Unipark Questionnaire

A2.1: Introduction

Herzlich Willkommen zu dieser Studienreihe!

Sie werden im Folgenden Fragebögen bearbeiten.

A2.2: Free recall of difference

Sie haben gerade verschiedene Produkte mehrfach am Eye-Tracker bewertet, also z.B. 4 mal ein Bild einer Chipspackung. Bitte beschreiben Sie kurz, in welchen Dimensionen sich die gleichen Produkte unterschieden haben, also inwiefern sich z.B. die Chipspackungen von einander unterscheiden haben.

Weiter

A2.3: Rational-Experiential-Inventory

Geben Sie bitte bei jeder dieser Aussagen an, ob die jeweilige Aussage auf Sie persönlich zutrifft oder nicht.

	starke Ablehnung	mittlere Ablehnung	leichte Ablehnung	leichte Zustimmung	mittlere Zustimmung	starke Zustimmung
Ich bin kein sehr analytischer Denker.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich bin nicht besonders gut im Lösen komplizierter Probleme.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich kann üblicherweise fühlen, wenn eine Person Recht oder Unrecht hat, auch wenn ich nicht sagen kann warum.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Mit Logik komme ich meistens ganz gut zurecht die Probleme in meinem Leben zu lösen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Im Allgemeinen verlasse ich mich nicht auf meine Gefühle als Hilfsmittel bei Entscheidungen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe Spaß an intellektuellen Herausforderungen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich möchte nicht von jemandem abhängig sein, der sich selbst als „intuitiv“ beschreibt.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich glaube nicht, dass es eine gute Idee ist, sich bei wichtigen Entscheidungen auf seine Intuition zu verlassen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Dinge sorgsam zu durchdenken, ist keine meiner Stärken.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Intuition kann ein sehr nützlicher Weg sein, um Probleme zu lösen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Weiter

Geben Sie bitte bei jeder dieser Aussagen an, ob die jeweilige Aussage auf Sie persönlich zutrifft oder nicht.

	starke Ablehnung	mittlere Ablehnung	leichte Ablehnung	leichte Zustimmung	mittlere Zustimmung	starke Zustimmung
Ich vermute, meine Vorahnungen sind genauso oft falsch wie richtig.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe einen eher logischen Verstand.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Denken entspricht nicht dem, was ich unter einer angenehmen Tätigkeit verstehe.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wenn es darum geht, Personen zu vertrauen, kann ich mich auf meine Gefühle verlassen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich versuche, Situationen zu vermeiden, in denen ich intensiv über etwas nachdenken muss.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich folge oft meinen Instinkten, wenn ich entscheiden muss wie ich mich verhalten soll.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich halte viel davon, meinen Vorahnungen zu vertrauen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Meine ersten, schnellen Urteile sind wahrscheinlich nicht so gut, wie die anderer Personen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich finde wenig Befriedigung darin, intensiv und eine lange Zeit über etwas nachzudenken.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich vertraue meinen ersten Gefühlen bei Personen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[Weiter](#)

Geben Sie bitte bei jeder dieser Aussagen an, ob die jeweilige Aussage auf Sie persönlich zutrifft oder nicht.

	starke Ablehnung	mittlere Ablehnung	leichte Ablehnung	leichte Zustimmung	mittlere Zustimmung	starke Zustimmung
Mit Ergebnissen „aus dem Bauch heraus“ komme ich meistens ganz gut zurecht, die Probleme in meinem Leben zu lösen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich mag es, mich auf meine intuitiven Eindrücke zu verlassen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wenn ich mich auf meine Gefühle verlassen müsste, würde ich oft Fehler machen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich tendiere dazu, mich bei Handlungen nach meinem Herzen zu richten.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich bin im logischen Denken viel besser als die meisten anderen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich irre mich kaum jemals, wenn ich auf meine innersten Gefühle höre, um eine Antwort zu finden.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe kein sehr gutes intuitives Gespür.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich glaube, es gibt Zeiten, in denen man sich auf seine Intuition verlassen sollte.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Es genügt mir, einfach die Antwort zu kennen, auch ohne die Begründung verstehen zu müssen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe gewöhnlich klare, erklärbare Gründe für meine Entscheidungen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

[Weiter](#)

Geben Sie bitte bei jeder dieser Aussagen an, ob die jeweilige Aussage auf Sie persönlich zutrifft oder nicht.

	starke Ablehnung	mittlere Ablehnung	leichte Ablehnung	leichte Zustimmung	mittlere Zustimmung	starke Zustimmung
Ich fände es reizvoll, neue Arten zu Denken zu erlernen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe kein Problem damit, etwas sorgfältig zu durchdenken.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe Spaß daran, Probleme zu lösen, die intensives Nachdenken erfordern.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich glaube, es ist töricht, wichtige Entscheidungen auf seine Gefühle zu gründen/basieren.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich kann Probleme, die eine logische Analyse erfordern nicht besonders gut lösen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich denke gerne in abstrakten Begriffen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich mag keine Situationen, in denen ich mich auf meine Intuition verlassen muss.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich bevorzuge komplizierte Probleme gegenüber einfachen Problemen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Unter Druck kann ich nicht gut überlegen.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich mag es nicht, viel nachzudenken.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Weiter

A2.4: Numeracy

Zur Beantwortung der folgenden Fragen ist es wichtig, dass Sie keine Hilfsmittel, wie Ihr Handy oder einen Taschenrechner, verwenden.
Versuchen Sie bitte, die Aufgaben möglichst **schnell, intuitiv und spontan** zu beantworten!

Weiter

Stellen Sie sich vor, dass mit einem fairen 6-seitigen Würfel 1000 Mal gewürfelt wird. Von 1000 Würfeln, wie oft würde eine gerade Zahl geworfen werden?

Weiter

In einer Lotterie beträgt die Chance einen Preis von 10,00EUR zu gewinnen 1%. Wie hoch ist Ihrer Meinung nach die Anzahl der Personen, die 10,00EUR gewinnen würden, wenn 1000 Leute ein Los für diese Lotterie haben?

 Personen

Weiter

In einer Lotterie beträgt die Chance, ein Auto zu gewinnen 1 zu 1000. Wie viel Prozent der Lotterielose dieser Lotterie gewinnen ein Auto?

%

Weiter

Welche von den folgenden Nummern repräsentiert das größte Risiko, eine Krankheit zu bekommen?

- 1 in 100
- 1 in 1000
- 1 in 10

Weiter

Welche von den folgenden Nummern repräsentiert das größte Risiko, eine Krankheit zu bekommen?

- 1%
- 10%
- 5%

Weiter

Wenn das Risiko, eine Krankheit zu bekommen, für Person A 1% in 10 Jahren ist, und das Risiko zweimal so hoch für Person B ist, wie hoch ist das Risiko für Person B?

% in Jahren

Weiter

Wenn das Risiko, eine Krankheit zu bekommen, für Person A 1:100 in 10 Jahren ist, und das Risiko zweimal so hoch für Person B ist, wie hoch ist das Risiko für Person B?

in Jahren

Weiter

Wenn die Chance, eine Krankheit zu bekommen 10% ist, wie viele Personen würden diese Krankheit erwartungsgemäß bekommen?

A: Von 100? Personen
 B: Von 1000? Personen

Weiter

Wenn die Chance, eine Krankheit zu bekommen 20 von 100 ist, wäre dies das Gleiche wie eine Chance von

% zu haben, diese Krankheit zu bekommen.

Weiter

Die Chance, eine Virusinfektion zu bekommen ist 0,0005. Von 10000 Personen, wie viele werden sich erwartungsgemäß infizieren?

Personen

Weiter

Welche der folgenden Nummern repräsentiert das größte Risiko, eine Krankheit zu bekommen?

- 1 von 12
- 1 von 37

Weiter

Nehmen Sie an, dass sich eine Bekannte von Ihnen wegen einem Knoten in der Brust einer Mammographieuntersuchung unterzieht. Von 100 Frauen wie Ihre Bekannte, haben 10 tatsächlich Brustkrebs und 90 haben keinen Brustkrebs. Von den 10 Frauen, die tatsächlich Brustkrebs haben, werden 9 von der Mammographie korrekt diagnostiziert und eine fälschlicherweise so diagnostiziert, dass sie keinen Brustkrebs hätte. Von den 90 Frauen, die keinen Brustkrebs haben, werden 81 korrekt durch die Mammographie diagnostiziert und 9 inkorrekt diagnostiziert, dass sie Brustkrebs hätten. Die unten angeführte Tabelle fasst all diese Information zusammen. Stellen Sie sich vor, das Ergebnis der Mammographie Ihrer Bekannten ist eine Diagnose auf Brustkrebs. Was ist die Wahrscheinlichkeit, dass sie tatsächlich Brustkrebs hat?

	Mammographie diagnostiziert Brustkrebs	Mammographie diagnostiziert keinen Brustkrebs	Summe
Hat tatsächlich Brustkrebs	9	1	10
Hat tatsächlich keinen Brustkrebs	9	81	90
Summe	18	82	100

von

Weiter

Stellen Sie sich vor, dass Sie ein Seminar belegen, bei dem Ihre Chance, während der ersten Woche eine Frage gestellt zu bekommen, 1% ist, und dass diese Chance sich jede Woche verdoppelt (d.h., dass Sie eine 2% Chance in der zweiten Woche haben, eine 4% in Woche 3, eine 8% Chance in Woche 4, etc.). Was ist die Wahrscheinlichkeit, dass Ihnen in Woche 7 eine Frage gestellt wird?

%

Weiter

Nehmen wir an, dass von jeden 10000 Ärzten in einer bestimmten Region einer mit dem SARS-Virus infiziert ist. In der gleichen Region gibt es eine bestimmte Risikogruppe, von denen jeweils 20 von 100 Personen auch mit dem Virus infiziert sind. Ein Virustest gibt ein positives Resultat (d.h., Virus ist vorhanden) für 99% von den infizierten und in 1% von den nicht-infizierten Personen wider. Ein zufällig ausgewählter Arzt und eine zufällig ausgewählte Person der Risikogruppe in dieser Region werden beide positiv auf diese Krankheit getestet. Bei wem ist die Krankheit wahrscheinlicher?

- Beide hatten positive Testergebnisse für SARS und die Wahrscheinlichkeit, die Krankheit tatsächlich zu haben, ist demnach für beide gleich.
- Beide hatten positive Testergebnisse für SARS und die Wahrscheinlichkeit, die Krankheit tatsächlich zu haben, ist größer für den Arzt.
- Beide hatten positive Testergebnisse für SARS und die Wahrscheinlichkeit, die Krankheit tatsächlich zu haben, ist größer für die Person aus der Risikogruppe.

Ein Schläger und ein Ball kosten zusammen 1,10 Euro. Der Schläger kostet 1,00 Euro mehr als der Ball. Wie viel kostet der Ball?

Euro

Wenn fünf Maschinen 5min brauchen, um fünf Produkte herzustellen. Wie lang würden 100 Maschinen benötigen um 100 Produkte herzustellen?

min

In einem See wächst eine bestimmte Seerosenart. Jeden Tag verdoppelt sich die Anzahl der Seerosen in dem See. Der See wächst innerhalb von 48 Tagen durch diese Seerosen vollständig zu. Wie viele Tage dauert es bis die Hälfte des Sees zugewachsen ist?

Tage

A2.5: Demographic data

Abschließend möchten wir Sie noch um Angaben zu Ihrer Person bitten.

Alter

Geschlecht

- weiblich
- männlich

höchster Bildungsabschluss

Ggf. Abiturnote od. Maturadurchschnitt

Ggf. aktuelles Studienfach

Monatliches Einkommen (netto)

 Euro

Monatlich zu Verfügung stehendes Geld (nach Abzug der Fixkosten)

ca. Euro

Spenden Sie regelmäßig für einen gemeinnützigen Zweck?

- Nein
- Ja

A2.6: Check for prior participation

Haben Sie schon einmal an einer Studie mit den selben Produktbildern teilgenommen?

- Ja
- Nein
- Weiß nicht mehr

An welcher Studie haben Sie schon einmal teilgenommen?

Bitte geben Sie den Zeitraum an und den Inhalt/Ablauf (soweit Sie sich erinnern).

Hat diese vorherige Teilnahme Ihre Entscheidungen beeinflusst?

- Ja
- Nein

A2.7: Check for food intolerance

Haben Sie eine Lebensmittelunverträglichkeit oder eine Lebensmittelallergie?

- Ja
 Nein

Weiter

Welche Art von Lebensmittelunverträglichkeit oder Lebensmittelallergie haben Sie?

Weiter

A2.8: Check for diet

Halten Sie momentan Diät?

- Ja
 Nein

Weiter

A2.9: Check for course participation

Haben Sie schon einmal ein Seminar oder eine Vorlesung besucht, in der die Inhalte dieser Studie besprochen wurden?

- Ja
 Nein
 Weiß nicht mehr

Weiter

Um welches Seminar bzw. welche Vorlesung handelt es sich?

Bitte geben Sie den Zeitraum und den Inhalt an (soweit Sie sich erinnern).

Hat ihr Wissen über den Inhalt der Studie Ihre Entscheidungen beeinflusst?

- Ja
 Nein

Weiter

Wie hat dies Ihre heutigen Entscheidungen beeinflusst?

Weiter

A2.10: Purpose of study

Worum ging es Ihrer Meinung nach in den einzelnen Studien?

Weiter

Ist Ihnen aufgefallen, dass in der Eyetracking-Testung die gleichen Produkte sich in Ihren Gewichten unterschieden haben?

- Ja
 Nein

Ist Ihnen aufgefallen, dass in der Eyetracking-Testung die gleichen Produkte mit unterschiedlichen Werbeinformationen dargeboten wurden?

- Ja
 Nein

Weiter

Haben Sie Anmerkungen zu der Studie oder etwas was Sie uns zur heutigen Studie mitteilen möchten?

Weiter

A2.11: End

Vielen Dank für die Teilnahme an diesen Studien!

Bitte melden Sie sich nun beim Versuchsleiter, damit dieser die nächsten Studien starten kann.

Appendix B: Scales

B1: Numeracy (abbreviated scale)

Stellen Sie sich vor, dass mit einem fairen 6-seitigen Würfel 1000 Mal gewürfelt wird. Von 1000 Würfeln, wie oft würde eine gerade Zahl geworfen werden?

Weiter

In einer Lotterie beträgt die Chance einen Preis von 10,00EUR zu gewinnen 1%. Wie hoch ist Ihrer Meinung nach die Anzahl der Personen, die 10,00EUR gewinnen würden, wenn 1000 Leute ein Los für diese Lotterie haben?

 Personen

Weiter

In einer Lotterie beträgt die Chance, ein Auto zu gewinnen 1 zu 1000. Wie viel Prozent der Lotterielose dieser Lotterie gewinnen ein Auto?

 %

Weiter

Wenn die Chance, eine Krankheit zu bekommen 10% ist, wie viele Personen würden diese Krankheit erwartungsgemäß bekommen?

A: Von 100? Personen

B: Von 1000? Personen

Weiter

Wenn die Chance, eine Krankheit zu bekommen 20 von 100 ist, wäre dies das Gleiche wie eine Chance von % zu haben, diese Krankheit zu bekommen.

Weiter

Nehmen Sie an, dass sich eine Bekannte von Ihnen wegen einem Knoten in der Brust einer Mammographieuntersuchung unterzieht. Von 100 Frauen wie Ihre Bekannte, haben 10 tatsächlich Brustkrebs und 90 haben keinen Brustkrebs. Von den 10 Frauen, die tatsächlich Brustkrebs haben, werden 9 von der Mammographie korrekt diagnostiziert und eine fälschlicherweise so diagnostiziert, dass sie keinen Brustkrebs hätte. Von den 90 Frauen, die keinen Brustkrebs haben, werden 81 korrekt durch die Mammographie diagnostiziert und 9 inkorrekt diagnostiziert, dass sie Brustkrebs hätten. Die unten angeführte Tabelle fasst all diese Information zusammen. Stellen Sie sich vor, das Ergebnis der Mammographie Ihrer Bekannten ist eine Diagnose auf Brustkrebs. Was ist die Wahrscheinlichkeit, dass sie tatsächlich Brustkrebs hat?

	Mammographie diagnostiziert Brustkrebs	Mammographie diagnostiziert keinen Brustkrebs	Summe
Hat tatsächlich Brustkrebs	9	1	10
Hat tatsächlich keinen Brustkrebs	9	81	90
Summe	18	82	100

von

[Weiter](#)

Ein Schläger und ein Ball kosten zusammen 1,10 Euro. Der Schläger kostet 1,00 Euro mehr als der Ball. Wie viel kostet der Ball?

Euro

[Weiter](#)

Wenn fünf Maschinen 5min brauchen, um fünf Produkte herzustellen. Wie lang würden 100 Maschinen benötigen um 100 Produkte herzustellen?

min

[Weiter](#)

In einem See wächst eine bestimmte Seerosenart. Jeden Tag verdoppelt sich die Anzahl der Seerosen in dem See. Der See wächst innerhalb von 48 Tagen durch diese Seerosen vollständig zu. Wie viele Tage dauert es bis die Hälfte des Sees zugewachsen ist?

Tage

[Weiter](#)

B2: Rationality (rational engagement, rational activity)

Dinge sorgsam zu durchdenken, ist keine meiner Stärken.

Mit Logik komme ich meistens ganz gut zurecht die Probleme in meinem Leben zu lösen.

Ich bin kein sehr analytischer Denker.

Ich bin nicht besonders gut im Lösen komplizierter Probleme.

Ich habe Spaß an intellektuellen Herausforderungen.

Es genügt mir, einfach die Antwort zu kennen, auch ohne die Begründung verstehen zu müssen.

Ich habe gewöhnlich klare, erklärbare Gründe für meine Entscheidungen.

Ich habe einen eher logischen Verstand.

Denken entspricht nicht dem, was ich unter einer angenehmen Tätigkeit verstehe.

Ich versuche, Situationen zu vermeiden, in denen ich intensiv über etwas nachdenken muss.

Ich finde wenig Befriedigung darin, intensiv und eine lange Zeit über etwas nachzudenken.

Ich bin im logischen Denken viel besser als die meisten anderen.

Ich denke gerne in abstrakten Begriffen.

Ich mag es nicht, viel nachzudenken.

Ich fände es reizvoll, neue Arten zu Denken zu erlernen.

Ich habe Spaß daran, Probleme zu lösen, die intensives Nachdenken erfordern.

Ich bevorzuge komplizierte Probleme gegenüber einfachen Problemen.

Ich habe kein Problem damit, etwas sorgfältig zu durchdenken.

Ich kann Probleme, die eine logische Analyse erfordern nicht besonders gut lösen.

Unter Druck kann ich nicht gut überlegen.

Zusammenfassung

In Kaufentscheidungen spielen unter anderem numerische Informationen eine Rolle, wie beispielweise auf der Produktverpackung abgedruckte Mengenangaben. Um finanziell optimale Entscheidungen treffen zu können, kann es notwendig sein, diese Information zu berücksichtigen. Die vorliegende Studie beschäftigt sich mit dem Effekt der individuellen Differenzen in Numeracy auf die Aufmerksamkeit und die Verwendung von diesen Mengenangaben. Um die Hypothese zu testen, dass die auf die Mengenangabe gerichtete Aufmerksamkeit je nach Numeracy-Fähigkeit unterschiedlich ist, wurde eine Eye Tracking Studie durchgeführt. Die Ergebnisse haben gezeigt, dass Individuen, die eine hohe Numeracy-Fähigkeit besitzen, eher auf die Mengenangabe achten und diese Information auch eher für die Angabe ihrer Zahlungsbereitschaft nutzen. Numeracy ist ein wichtiger Prädiktor für die Aufmerksamkeit und die Verwendung von auf Produktverpackungen abgedruckten Mengenangaben.

*Curriculum Vitae***Personal Data**

Name	Karin Christina Wischenbart
Place of Birth	Linz
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Education

Since 2008	Study of Psychology at the University of Vienna (Diplom)
February - May 2012	Washington and Jefferson College (USA)
2000 - 2008	Akademisches Gymnasium Linz
1996 - 2000	Römerbergschule Linz

Internships / Research Experience

September - December 2013	Internship at BIPA Parfumerien Gesellschaft m.b.H. <i>(Customer Relationship Management and Customer Research)</i>
October 2012 - June 2013	Student Research Associate at the Department of Applied Psychology at the University of Vienna <i>(Applied Social Psychology and Consumer Research)</i>
September 2012	Internship at USECON The Usability Consultants GmbH <i>(Consulting and Marketing)</i>
March - June 2011	Internship at the Department of General Psychology at the University of Vienna

February 2010

Internship at the Department of Social Psychology and
Economic Psychology at the Johannes Kepler
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Skills and Qualifications

Languages

German (native), English (fluent), French (basic),
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Computer Skills

SPSS, Globalpark, MS Office