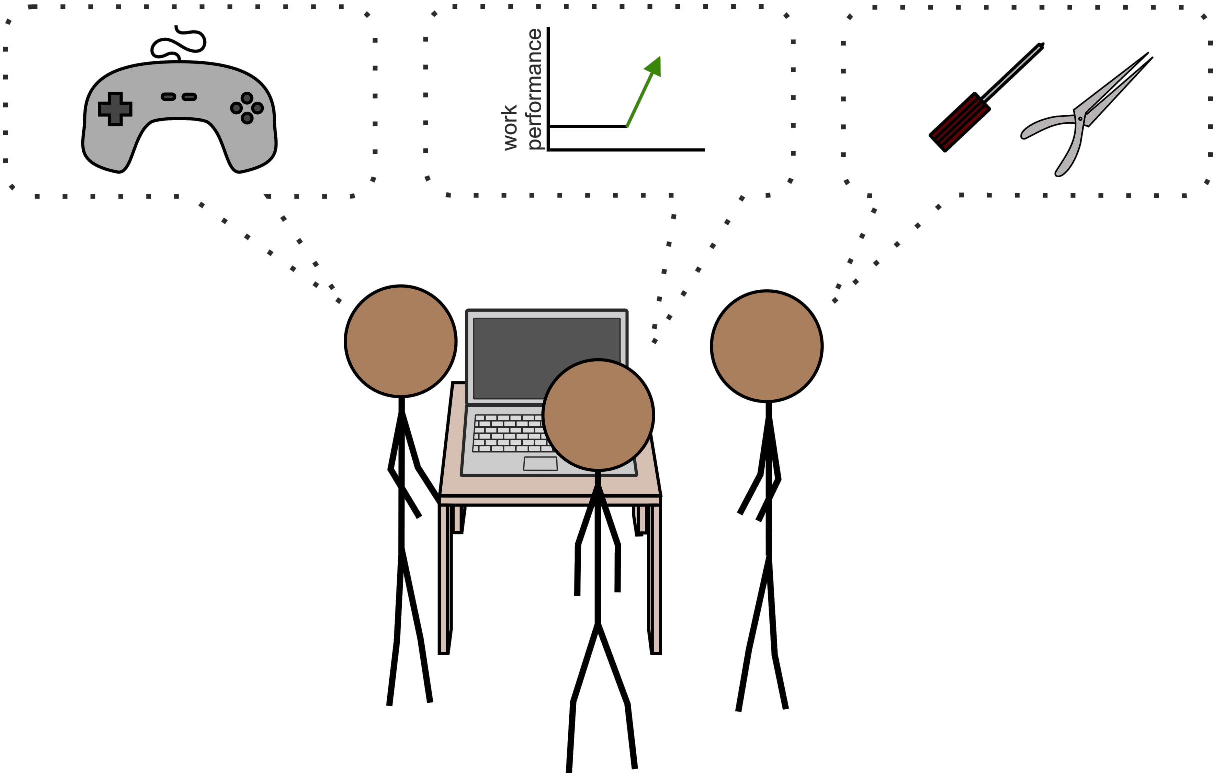
Development of an Implicit Picture Story Exercise Measuring Personal Motives for the Interaction with Technical Products



Bachelorthesis

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17.06.2013

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Table of Contents

Abstract

The present paper describes the development of an implicit picture story exercise (PSE) intended to measure individual differences in the perception and use of technical products and categorize individuals accordingly into behavioral tendencies. Special focus lay on the behavioral tendency "geekism", which describes intrinsically motivated interaction with technological products without any apparent external rewards. Further behavioral tendency categories were hedonism and utilitarianism. Hedonism describes use of technical products motivated by biologically based needs and desires and utilitarianism describes the use of technical products for the achievement of external goals and easement of task that are not directly linked to the fulfillment of biologically based desires. A scoring form with categories of description for geekism, hedonism and utilitarianism and 15 pictures with ambiguous visual cues related to these categories of description were developed. An experiment including the PSE, where the respondents had to write a short story about 8 of the 15 pictures, an explicit geek questionnaire, a material possession love scale, a need for cognition scale, the Schwartz value scale and a Stroop task was conducted with a sample of 61 respondents. The text responses of the PSE were scored according to the scoring form, which produced three behavioral tendency scores (geekism, hedonism and utilitarianism). In order to test the accuracy of the scoring form, correlations and linear regression models were estimated between the behavioral tendency scores of the PSE and the scores from the scales and the Stroop task expected to measure the same underlying constructs. On the one hand, the results indicate an acceptable level of differentiability of the categories of description of geekism and utilitarianism. On the other hand, a moderate overlap between those two categories was found. The categories of description of hedonism showed no coherence with measures expected to measure the same underlying construct. The pictures were sorted for the amount of scored geek items per 1000 words ("pull") and then arranged into a high pull and a low pull version of the PSE, each containing 8 pictures and intended to measure different levels of geekism. The differentiation of individual behavioral tendencies makes it possible to categorize persons into technical product user groups and predict their attitudes and behavior towards technical products. This could produce new implications for the development of new technical products that fit better to the needs and desires of their target group.

Samenvatting

Dit document beschrijft de ontwikkeling van een impliciet picture story exercise (PSE) gericht op het meten van individuele verschillen in de waarneming en in het gebruik van technische producten en het categoriseren van personen afhankelijk van hun gedrags-tendensen. Bijzondere focus lag hierbij op de gedrags-tendens "geekism". Deze werd als intrinsiek gemotiveerde interactie met technische producten vrij van extrinsieke beloningen gedefinieerd. Verdere gedrags-tendens categorieën waren hedonisme en utilitarisme. Hedonisme beschrijft het gebruik van technische producten om lichamelijk gebaseerde behoeftes en verlangen na te komen. Utilitarisme beschrijft het gebruik van technische producten gericht op het bereiken van externe doelen en het vereenvoudigen van taken die niet direct op het vervullen van biologische verlangen gericht is. Een scoring formulier werd ontwikkeld met beschrijvende categorieën voor geekism, hedonisme en utilitarisme. Verder werden 15 beelden met visuele aanduidingen (cues) gerelateerd aan de beschrijvende categorieën ontwikkeld. Een experiment inclusief de PSE, waar de respondenten een kort verhaal over 8 van de 15 beelden moesten schrijven, een expliciete geek vragenlijst, een vragenlijst over liefde tegenover materiële bezittingen, een need for cognition vragenlijst, de Schwartz waarde vragenlijst en een Stroop taak werd met een steekproef van 61 respondenten uitgevoerd. De tekst responsies van de PSE werden met behulp van de scoring formulier gescoord. Dit produceerde drie gedrags-tendens scores (geekism, hedonisme en utilitarisme). Om de juistheid van de scoring formulier te toetsen werden correlaties en lineaire regressie modellen tussen de gedrags-tendens scores van de PSE en de scores van de vragenlijsten, van die verwacht werd dezelfde onderliggende constructen te meten, en de Stroop taak berekend. De resultaten duiden op een middelmatig onderscheidend vermogen van de beschrijvende categorieën geekism en utilitarisme, maar er werd wel een overlap tussen deze twee beschrijvende categorieën gevonden. Voor de beschrijvende categorie hedonisme werd geen samenhang met meetinstrumenten van die verwacht wordt hetzelfde onderliggende construct te meten gevonden. De beelden werden naar menigte van gescoorde items per 1000 woorden (pull) gesorteerd. Twee test versies, een met hoge pull en een met lage pull met telkens 8 beelden werden samengesteld om verschillende niveaus van geekism te kunnen meten. De onderscheiding van individuele gedrags-tendensen maakt het mogelijk mensen in groepen van technische product gebruikers te sorteren en hun houding en gedrag tegenover technische producten te voorspellen. Dit kan tot nieuwe implicaties voor de ontwikkeling van technische producten leiden die de behoeftes en verlangen van hun doelgroep beter ondersteunen.

1. Introduction

The development of modern technological products in the domain of Human-Computer Interaction (HCI) is strongly influenced by psychological evaluation of human desires, attitudes and behavior. In order to develop technologies that conform with the needs and wishes of the customer, it is necessary to understand the product-associated reactions of the target group and why they prefer certain technologies over others. Any new insights in the customer's motives of use should help the developers of new technologies to broaden their target group, adapt the products better to their target group and in consequence, build more profitable and enjoyable products. The goal of this thesis is to develop a new measurement intended to broaden the understanding for the reasons of technical product use and to make them more measurable.

The qualities of technological products are nowadays analyzed in utilitarian and hedonistic terms. The evaluation of these qualities by the user is defined as User Experience (UX). (Schmettow, Noordzij & Mundt, 2013).

Utilitarian qualities describe in how far a product supports the achievement of personally important goals. A product with utilitarian qualities would be one that eases tasks, which fulfill a certain purpose (Wertenbroch & Dhar, 1999), or in other words 'makes life easier'. According to Toomim, Kriplean, Pörtner & Landay (2011), computer interfaces have to be user friendly and the use has to be easy to learn to be chosen in the presence of competing interfaces. Therefore, specific utilitarian categories would be ease of learning, ease of use and efficiency. However, utilitarian motivated HCI is not limited to the facilitation of already existing goal oriented tasks. Utilitarian qualities of a technical product can also influence the tasks a person sees as important (Toomim et al., 2011). For example, a person could choose to look up a fact on Wikipedia, not because he needs this fact to fulfill a certain task, but because the effort to look up the respective information is much lower than it was before Wikipedia existed.

Hedonistic qualities describe how (visually) appealing a user finds a product, how far a user can identify with the product and whether the product is something the user wants to be associated with by others. The main aspect of the concept of hedonism is the attainment of pleasure. From the hedonistic perspective, a product brings pleasure when it fits to the social identity of a person and the social environment sees the possession of it as desirable. The evaluation of hedonistic qualities in the context of HCI is called hedonomics. Oron-Gilad and Hancock (2005) define the goals of hedonomics as improving the enjoyment of human-technology interaction. According to them, hedonistic factors of a product influence a person's emotions and these emotions influence how a person thinks about and interacts with the product. In hedonomic evaluation, the more positive affects a product generates in the user, the better it is, because positive affects generate positive attitudes towards the product.

The problem with the classical HCI evaluation approach is that it neglects individual differences in product evaluation (Schmettow et al., 2013). Hedonistic or utilitarian qualities have usually been seen as qualities of the product, not of the customer. If individual differences in the evaluation of technological products exist, the unknown factors can prevent parts of the target group from using a certain product, because it has to support the needs and wishes of an individual in order to be chosen and used.

Here, the individual needs and wishes will be arranged into behavioral tendency (BT) categories that steer the user's behavior into a certain direction and possibly are linked to biologically based motives. A motive can be defined as a person's desire, comparable to an animalistic drive (McClelland, Koestner & Weinberger, 1989), that has an influence onto the selection and motivation of a particular behavior. In the context of technical product interaction, it is unlikely to find biologically based motives that are directly linked to the use of technical products, because technical products existed for a too short time to influence the evolutionary drift. However, the BT's hedonism and utilitarianism may be linked to underlying biological motives, which they may fulfill.

Schwartz (1992) found several 'motivationally distinct value types' that are related to "desirable end states or behavior" These have been shown to have reasonably comparable meaning in 20 different countries. Therefore, they can be interpreted as relatively free of cultural influences. One of the explored value types is hedonism. Schwartz (1992) defines the hedonistic motivational concept as pleasure associated with the satisfaction of physical needs. The respective values are defined as "pleasure" and "enjoying life". These are expected to be linked to the hedonistic behavioral tendency (BT-H). The utilitarian behavioral tendency (BT-U) is compatible with Schwartz's (1992) value type "achievement" with the respective values "ambitious", "influential", "capable, "successful" and "intelligent". Schwartz (1992) sees the value types "hedonism" and "achievement" as compatible, because they both focus on self-indulgence. This means a person could possess both hedonistic and achievement values at the same time.

Because "biologically based variations in the need for stimulation and arousal, conditioned by social experience, may produce individual differences in the importance of stimulation values" (Schwartz, 1992, p. 7), hedonism and utilitarianism can be seen as influencing behavior on the individual level. Therefore, the analysis of these concepts in the development of technical products must not be limited to the product itself, but must be used to account for individual motivational differences.

Besides utilitarianism and hedonism there might exist a third behavioral tendency that is important in the evaluation of technological products: geekism (BT-G). In the context of this study, geekism shall be defined as the intrinsic motivated interaction with a technological product. Opposed to utilitarian and hedonistic behavioral tendencies, geekism describes the achievement of pleasure purely through the interaction with technology, without expectance of extrinsic rewards. Expected geek behavior would be long term interaction with technology excluding any social component or specific utilitarian goals, or the manipulation of technological products pure out of interest. Another expected behavior would be the development of emotional feelings towards technical products. Because of their long term interaction with technical products, such a trait should be more probable for geeks than for non-geeks. Furthermore, it would reinforce the interaction with technical products. Necessary preconditions for the development of intrinsic motivation are the fulfillment of the psychological needs for competence, autonomy and relatedness. (Ryan & Deci, 2000) Therefore it can be expected that these biological needs are linked to BT-G.

McClelland et al. (1989) distinguish between self-attributed and implicit motives, which usually have no significant correlation with each other. Implicit motives are related to activities where the execution itself brings pleasure. Self-attributed motives are cognitive elaborated and usually related to social incentives. Interestingly, with the measurement of implicit motives, it is possible to make general statements about expected behavior, whereas the measurement of explicit motives can only make statements about behavioral probabilities in specific situations, because certain social incentives must be present to trigger the behavior (McClelland et al., 1989). Therefore the measurement of implicit motives should be much more useful for the estimation of future behavior.

The expected motives underlying utilitarianism and hedonism motives can be defined as self-attributed, because they are cognitive elaborated and aim at certain goals. For utilitarian BT's this goal is the gain of opportunities, whereas for hedonistic BT's the goals are the approval of others and to live out certain roles or identities. Still, these motives can influence behavior on an implicit level. A person needs not be aware of peer pressure, esthetical or efficiency factors that influence his behavioral choices. The intrinsic character of BT-G classifies possible underlying motives as implicit, but a person can still be aware of his positive attitude towards the use of technological products.

Usual ways to estimate the user's motives for certain behavior are explicit self reports in the form of questionnaires or interviews. An explicit questionnaire measuring BT-G was developed by Sander (2013). The problem with this approach is that we are not aware of all of our implicit motives and we are not able to estimate the amount of their influence properly. Therefore, implicit motives cannot be measured by only using an explicit test. A reliable way to measure also the implicit motives is the use of picture-story exercises (PSE), where the respondent has to describe the situation shown in ambiguous pictures in text form. The responses are then scored according to predefined categories of description related to the implied motives (McClelland et al., 1989). The concept of a PSE assumes that the respondent is influenced in his creative process by implicit drifts, needs and desires. A thirsty person for example would be more likely to write about drinking, and an aggressive person would be more likely to describe a confrontation. This means implicit motives shall manifest themselves in the picture descriptions and therefore become score able.

The projective Thematic Apperception Test (TAT), developed by Henry A. Murray and Christiana D. Morgan, is a picture-story exercise that measures implicit personality dispositions, but was originally developed to measure the need for achievement. Usually, 4 to 6 pictures are shown to the respondent, who has to write down the situation he interprets from the pictures. The creative process is partly controlled by 4 questions about the situation. The responses are scored via a content analysis, where after the score (originally nAch, or nAchievement) can reach from 1 to 11. (Tuerlinckx, De Boeck & Lens, 2002) In the present paper, a qualitative picture story exercise, based on the thematic apperception test (TAT), is developed to measure geek behavioral tendencies in an implicit manner and distinguish them from utilitarian and hedonistic influences on the interaction with technological products. The implicit manner of measurement is important, because the implied BT is expected to consist of implicit motives. The goal of the test-development is a reliable test with the ability to determine the amount of internally motivated use of technologies of a person and separate it from external motives like social feedback, esthetical appeal and material rewards. All interaction with technology for its own sake will be interpreted as geekism.

Given that the existence of the implied BT's and the consistence of its expected underlying motives cannot be directly assessed and observed (Schmitt, 2006), the developed PSE shall be conducted together with Sander's (2013) geek scale to combine quantitative and qualitative measurements in a multimethod approach. The comparison of explicit and implicit measurement results shall give a good picture of the convergent validity of the implied behavioral tendency of geekism. Convergent validity of BT-H and BT-U shall be estimated by comparison with results of the Schwartz (1992) value scale measuring amongst others the value types described above that are expected to belong to BT-H and BT-U.

2. Method

The development of the described PSE consisted of 6 steps. In the first step, categories of description were made up for the assumed motives of hedonism, utilitarianism and geekism. In the second step, pictures for the PSE were generated. In the third step, the sample of respondents was chosen. In the fourth step, the test was executed, in the fifth step, the data were analyzed and in the last step, the quality of the generated pictures and the categories of description were evaluated.

2.1 Categories of description

When a person feels a need in a specific situation, a motive to fulfill that need can produce goal-directed activities (Pang, 2010). For a certain motive, a particular response category would be expected in a given situation. For the need for affiliation for example, one would expect the description of activities supporting and facilitating social contact (Pang, 2010). In the context of geekism, the relevant category of description would be the wish to learn about, or interact with technology, even if no extrinsic rewards can be expected. Even though probably no single biologically based need can be linked to geekism, geek behavior possibly elicited by different, or a combination of needs can be easily classified. With the application of lists of expected response categories, it is possible to score text responses. Every time a response is seen to fit into a specific category, the score in this category is raised by one point.

For the subcategories of hedonism and utilitarianism, the "value types" from Schwartz (1992) were used for orientation. The subcategories of geekism were generated out of the results of a qualitative study of the concept of geekism by Passlick (2013). In his study, Passlick interviewed 10 respondents, who classified themselves as geeks, about what it means to be a geek and geek related behavior, drives and emotions. The responses were then classified into descriptive categories using the Grounded Theory approach (Passlick, 2013). Only those categories that could be related to the use of technological products were used for the generation of geek subcategories of the PSE. All subcategories were expanded by personally expected responses, which are intentionally chosen to fit in the concept of HCI. These subcategories are not mentioned by Schwartz (1992), but were deduced from the main concepts of hedonism and utilitarianism and tailored to the interaction with technical products.

The categories of description for the concept of hedonism are Schwartz's (1992) values "pleasure" and "enjoying life" and the personally added categories "esthetical appreciation" and "expected social appreciation". The latter two are expected to be common concepts in the hedonistic evaluation of technical products. The categories "pleasure" and "enjoying life" were combined into one subcategory because they describe the same concept (positive affect) with different temporal margins. Pleasure is a short-termed positive affect, whereas life enjoyment is formed of the long-term existence of pleasure.

The utilitarian categories of description are Schwartz's (1992) values "ambition", "influence", "capability", "success" and "intelligence" and the personally added categories "improving efficiency" and "ease of use". The categories "ambition" and "success" were combined into one subcategory of utilitarianism, because ambition can be seen as a consequence of the wish to succeed in a particular task. The categories "improving efficiency" and "ease of use" were also merged into one subcategory, because ease of use is a necessary precondition for high efficiency. Positive affects following from the ease of use do not belong to this subcategory, but to the hedonistic category "pleasure".

Geekism consists of the categories of description "expertise", "high time investment", "interest in progress of technology", "interest in deeper understanding/curious about functioning", "joy through knowledge/joy through challenge", "interest in versatile products/re-using products" and "being in control of one's device/data" from the study of Passlick (2013).

Overview - sources of BT-subcategories: see Appendix 4

The novelty of the topic of implicitly measured geekism made the development of completely new categories of description necessary. Therefore, a Grounded Theory approach was used as much as possible under the given economical circumstances. The main aspects in the Grounded Theory approach is, that constant adaption of the constructs or categories is emphasized and that the reaction of the described persons to the descriptions is important to the researcher. (Corbin & Strauss, 1990) Because of economical confinements, it was not possible to conduct one, or even several fully developed pretests with expected hedonists, utilitarians and geeks in relation to technology as the Grounded Theory approach would demand. Therefore, in order to adjust the categories of description for the assumed hedonistic, utilitarian and geek motives, some people expected to score high on one of the categories were asked to describe verbally whether they see the categories as an appropriate and complete description. No subcategories had to be removed or added because of this feedback session, but the feedback made it possible to expand the descriptions of the subcategories in order to make apparently overlapping subcategories more differentiable. As a result, the geek subcategories "interest in deeper understanding" and "high time investment" were adjusted by assigning learning processes and long term time investment related to an extrinsic goal explicitly to the utilitarian behavioral tendency. The geek subcategory "joy through challenge" and the utilitarian subcategory "success" were limited to exclude the joy related to the achievement of an external goal, which is scored in the hedonistic subcategory "pleasure".

Scoring form: see Appendix 1

2.2 Picture development

Pang (2010) describes the necessary tasks in the pretest phase as the selection of picture cues, scoring systems and the collection of pilot data. A PSE should consist of 5-8 pictures, because longer tests tend to produce fatigue and distributions of the responses tend to be skewed to the left when less than 5 pictures are used. (Pang, 2010) That means most respondents give few or no evaluable responses. In the developmental phase 15 pictures were generated, because some pictures may turn out to be unfitting to differentiate between the three topics or low- and high-scorers. In order to compensate for the lack of a fully developed pretest, people expected to score high or low on one of the implied motives were asked to describe the situation shown in the pictures verbally. The gained information was used to revise the pictures and thereby improve the differential power of the pictures. Pictures with distracting or confusing cues were duplicated and the respective cues were changed in the new picture according to the received feedback.

According to Pang (2010), the relevant qualities of a picture in a PSE are the 'pull', 'relevance' and 'ambiguity'.

The pull describes how many codeable responses a picture generally produces. A picture that seldom produces any codeable responses can be seen as worthless for use in a PSE. A picture can be defined as having a high pull when at least 50% of the participants give a codeable response (Schultheiss & Brunstein, 2001). In order to minimize non-code able responses, the pull of the generated pictures should be as high as possible.

Relevance describes whether a respondent can reflect his own motives onto a specific picture (Pang, 2010). The respondent must be able to identify with the demonstrated persons or situations to do so. In order for a picture to have a high relevance, it must fit to certain target group's characteristics like age, clothing, social identity, or gender. Which characteristics are relevant, is defined by the investigated topic. Because the test is intended to measure personal motives for the use of technological products, the content of the picture should be linked to technological products either.

Cue ambiguity describes whether a picture contains explicit cues for one motive, or several less explicit cues for multiple motives. High ambiguity increases the variance of responses and makes it possible to differentiate between people with strong and weak motives, because strongly motivated people associate more ambivalent situations to the same motive (Pang, 2010). When the cue in the picture is universal understandable, it has no practical worth, because every respondent would demonstrate the same motive. Furthermore, the use of ambivalent pictures makes it possible to test for several motives at the same time. Here, ambivalent pictures are used, containing cues of the three predefined motives hedonism, utilitarianism and geekism. Every picture contains cues for at least two of the motives and it has been tried to keep the relevance of the cues on an equal level. This makes it possible to compare the strength of the three assumed motives.

All 15 pictures were designed on the computer with a graphical vector program. It was tried to present an easily identifiable situation. The graphics were kept minimalistic by avoiding distractive details that were expected to have no relation to the assumed motives. In order to test its effect on pull and cue ambiguity, some pictures were split into two versions with slightly different changes like a different arrangement of an arm. Each picture contains at least one agent, but the presentation reaches from showing whole persons over robots as the only agent to showing just the hand of a person. The human agents were given no facial expressions and were designed as androgynous as possible to facilitate a broad spectrum of interpretations.

Pictures: see Appendix 5

Picture 1 - Messy computer desk

A person sits at a desk in front of a computer monitor. The desk is filled with trash, food and drinks. A hedonist would probably focus on the (un-) esthetical aspect of the situation, or describe a gaming situation. An utilitarian could see the trash as a threat for work productivity, whereas a geek would probably see the person as deeply sunken into an interesting task, where the appearance of his desk is secondary.

Picture 2 - Multiple displays

A person sits at a desk with two computer monitors and a keyboard in front of him. In front of the right monitor stands a notebook. The left hand of the person lies on the separate keyboard and the right hand lies on the keyboard on the touchpad of the notebook. A hedonist would focus on visual appearances of the computer system and the pride of the owner. A utilitarian should focus on the efficiency of such a computer system, while a geek would describe a person with high interest in technical products.

Picture 3 - Two persons in front of notebook 1

Two persons stand in front of a desk with a notebook on top of it. The left person points with one arm to the monitor. The right person has raised one arm, but it is not clear whether it points at the monitor or scratches the head of the person. An utilitarian should describe a goal-oriented task. A geek could describe a non-goal oriented learning situation. A hedonist would focus on aspects of pleasure like 'watching a nice video' or 'boring learning situation' or social incentives like 'showing off the new computer'.

Picture 4 - Two persons in front of notebook 2

The difference to the last picture is that the right person has not raised an arm. The person looks more passive, which should make the description of a learning situation more probable than in the last picture. Furthermore, descriptions of the right person being highly involved in the task should be less probable than in the last picture, because the movement of the arm cannot be interpreted as the caricatural 'head scratching while thinking'.

Picture 5 - Aid robot 1

A person sits on his knees and raises his hands towards a nearly human-sized robot which also stretches its robot arms towards the human. The description of an entertaining situation or feelings of intimidation by the robot would be seen as a hedonistic response. Utilitarian responses would be the description of aid provided by the robot. Responses describing creative future possibilities gained by the use of robots can be scored as geekism.

Picture 6 - Aid robot 2

The difference to the last picture is that the human sits on a chair, which gives him nearly the same height as the robot. This should make descriptions of an intimidating robot less probable and descriptions of a gaming situation or aid provided by the robot more probable.

Picture 7 - Gaming with robot

A person sits on a chair in front of a table with a board game on it. On the other side of the table stands a robot holding one of the playing pieces. It is to be expected that nearly all respondents will describe a board game between a human and a robot. The focus of attention lies in the sort of interaction described. A hedonist would probably just focus on the fun the human has, an utilitarian would describe the robot's function as an entertainment robot, whereas geeks could describe a real social interaction with two self-determined individuals.

Picture 8 - 'DOS'-display 1

A person sits in front of a desk with a computer monitor, a keyboard and a mouse with mouse pad on it. The person's left hand lies on the keyboard, the right hand lies on the mouse. The computer monitor shows "C:\ _" indicating the use of a DOS-computer system or the windows console. A hedonist would interpret the person as undesirable or problematic, because it produces no pleasure. A utilitarian would describe the use of the DOS-prompt as goal-oriented, whereas a geek could even have fun with the use of it.

Picture 9 - 'DOS'-display 2

The difference to the last picture is that both hands of the person lie on the keyboard. This should prevent experienced PC users from interpreting the person as a layman, because the use of the mouse is not possible while working in the DOS-prompt or Windows console.

Picture 10 - Opened PC

A person kneels in front of an opened PC. One hand reaches into the computer with a screwdriver. A tuning or repair based on a necessity would be interpreted as utilitarian. Hedonists would focus on the negative emotional consequences of a possible problem. Geeks could describe a repair, a tuning-operation or a learning situation. In opposite to the utilitarian, the geek would not focus on the necessity of the task. That means a geek would not describe a purpose behind a repairing operation. Descriptions about the person repairing his own PC would be a sign for geekism, whereas calling a handyman can be seen as utilitarian.

Picture 11 - People drinking with robot 1

Three persons stand positioned towards a smiling robot. The two persons on the left and the robot hold brown bottles. A hedonist would describe the fun technology produces. An utilitarian would describe the aid provided by the robot. (bringing drinks) A geek could describe aspects of technological progress, or a high level of social interaction with the robot ('having a real drinking evening with a robot').

Picture 12 - People drinking with robot 2

The difference to the last picture is that the robot does not smile. This should make utilitarian responses more probable and descriptions of fun or social interaction with the robot less probable.

Picture 13 - Robot speech

A robot with an opened mouth stands behind a speaker's desk with a microphone. Its left arm is bent and aims upwards. A hedonist would focus on pleasurable activities like 'the robot was programmed to tell a joke'. An utilitarian would describe the robot as fulfilling an important or necessary task like 'teaching'. A geek would ascribe personal goals to the robot like 'persuading somebody of something'.

Picture 14 - Robot walking dog

On the left side of the picture stands a dog. On the right side stands a robot which holds the dog on a leash. An utilitarian would focus on the fact that robots can make life easier. A hedonist would focus on an annoying task falling away. The geek would see the robot as self-determined and therefore would probably see the dog as the robot's possession.

Picture 15 - Smartphone advanced options

A hand holds a smart phone with a touch display. The thumb presses the 'advanced options' button. An utilitarian should describe a goal-oriented task. A geek could describe a non-goal oriented learning situation like 'learning what my phone can do'. A hedonist would focus on visual appearances or the displeasure of a task.

In the classic TAT picture story exercise, no significant influence of picture-positions onto the motive-responses was found. (Pang & Schultheiss, 2005) However pictures with high and low pull should be mixed to compensate for the satisfaction of the motive (Pang, 2010). Because of the lack of pretest data it was not possible to sort the pictures according to pull. To compensate for possible interaction effects between pictures, 8 different test versions were composed. Each version consisted of 8 different pictures of the total 15 pictures. No test version contained both models of a split picture that differ only slightly.

2.3 Sampling

The sample of respondents was chosen to consist of three groups. The first group was meant to be composed of people scoring high on the geek behavioral tendency. This group consisted of students from the technical sciences of the University of Twente, because their studies focus on the use and development of technical products and people who choose these studies can be expected to have a natural interest in technical products. These respondents were paid 12 € for the participation. Flyers, which advertised the participation in our experiment, were displayed in social network groups of these study courses. The second group was expected to score low on BT-G. This group consisted of students from the behavioral sciences of the University of Twente. These were expected to score low or moderate on geekism, because their studies have no specific focus on technical products and the manipulation of them. The second group was recruited via the SONA- system, an experiment system which gives the respondents experimental credits (EC's) for the participation in experiments. This group was a convenient choice, because the students of behavioral sciences at the University of Twente have to collect 15 of these EC's in order to complete their study program. The participation in the experiment was rewarded with 3,5 EC's. The third group was expected to have a great variance over the three BT categories. It was a snowball sample group collected via the online social network Facebook and verbal promotion. No factor except the use of Facebook and a general level of cooperativeness (they were not paid) connected the members of this group. All samples excluded persons whose mother tongue is not Dutch or German, persons who are completely unable to use a computer and persons with dyslexia.

2.4 Measures

The experiment consisted of two parts and was conducted either in Dutch or in German, according to the mother tongue of the respondents. Between the conduction of the two parts was a temporal gap of at least one day, but never more than a week.

The first part with a duration of approximately 50 minutes consisted of the described PSE, followed by the Schwartz value scale (Schwartz, 1992), a geekism scale developed by Sander (2013) and a set of questionnaires from a multimethod geek research from Geesen (2013) containing a material possession love scale (MPL) (Lastovicka & Sirianni, 2011) and a need for cognition scale (Cacioppo, Petty & Kao, 1984). The material possession love scale, the need for cognition scale and the geekism scale were used to test for a possible correlation with the geek motive measured in the developed PSE. The subscales of the Schwartz value scale were expected to correlate respectively with one of the motives measured by the PSE. The autonomy subscale was expected to correlate with the PSE's geek motive, the hedonism subscale with the PSE's hedonism motive and the success subscale with the PSE's utilitarian motive.

The second part of the experiment with a duration of approximately 25 minutes consisted of a Stroop-task measuring for each respondent individually which of the following constructs geekism, utilitarianism or hedonism are most strongly associated to the use of technical products and a second execution of the geekism scale from the first part of the experiment.

2.5 Procedure

During the sampling process and the execution of the experiment, respondents were not informed about the true purpose of the experiment to prevent social desirability influencing the responses. The experiment was promoted under the name "the perception of modern technological products. Respondents and potential respondents who asked questions regarding the experiment's purpose were told that these questions would be answered after the experiment.

Before the beginning of the first part of the experiment, respondents had to read and sign the form of clarification, which made them aware of their rights (see appendix 2). Hereafter, they received the questionnaire and started with the PSE after reading the instructions. (see appendix 3) During the conduction of the PSE, a researcher with a stop watch sat next to the respondents. After the respondents looked at a picture for 10 seconds, the researcher asked them to turn the page to the text field with four aid questions on top (see appendix 6) and to start writing the picture's story. The researcher had to pay attention that the respondents don't turn the page back to the picture to prevent a simple description of the picture's content instead of inventing a story. After three minutes of writing time, the researcher asked the respondents to finish the last sentence and then switch to the next picture. The researcher had to take care that the respondents don't look at the next picture prematurely to prevent distraction from the previous picture, or that the respondents see the picture for longer than 10 seconds. If all participating respondents were ready before the three minutes were over, the researcher allowed them to switch to the next picture before the official writing time is over. After the PSE was finished, the researcher informed the respondents that the rest of the questionnaire does not fall under temporal control and that they may continue in their own desired speed. Technical questions of the respondents were answered by the researcher, as long as they had no influence on the nature of the responses.

At the beginning of the second part of the experiment, the Stroop-task was conducted on PC's and notebooks. In the practice condition, 24 thematically neutral pictures were shown to the respondents. After each picture, a nonsense word was shown written in the color red, green or blue. The respondent had to press an arrow key on the keyboard according to the color (red = left, green = down, blue = right). Hereafter, the actual experiment started. In 6 rounds à 12 trials, pictures from the three categories 'control' (daily objects like clothes), 'neutral' (computers) and 'geekism' (opened computers, complex GUI's and robots) were shown to the respondent. After each picture, a hedonistic, utilitarian or geek word written in the color red, green or blue was shown to the respondent. Again, the respondent had to press an arrow on the keyboard according to the color of the word. The response times were recorded. After each round of 12 trials, the respondent had to take a break of at least one minute. Hereafter, he was able to continue by pressing a key. The test concept was based on the priming effect described in the theory of spreading activation (Anderson, 1983). According to this theory, the reaction to the presented word color should be delayed if the presented picture and the presented word fall into a shared mental concept of the respondent, because the respondents attention shifts from the word color to the word content (Schmettow, Noordzij & Mundt, 2013). The geekism scale was filled in after the Stroop-experiment as a pen and paper version. After the experiment, the participants were debriefed. The real goals of the test were explained to the respondent.

2.6 Analysis

The first step of data analysis was to score the responses of the TAT according to the scoring manual. According to Pang (2010), image responses with fewer than 30 words should be removed from analysis, because they are expected to be unscorable. In this analysis, no response was removed because of its word length, because no pattern between response length and scorability was found. Sometimes, even a single word is a clear indicator for a motive category (though no response was just one word long). Examples would be the word "happy" for the hedonistic motive, or the word "multitasking" for the utilitarian motive.

A response that fits into the described categories, or subcategories, raised the score on the category's superior motive. If a sentence contained more than one word that fits into a category of description, but the words do not describe the same concept, each of the words got scored. If a statement could not be clearly assigned to a specific category, it was not scored.

The total score on every motive of a picture got divided through the amount of written words about the picture and multiplied by 1000. This corrected score represents the amount of expressed motives per 1000 words. To calculate the total test scores for each category, the corrected scores of the respective category were added and then divided by 8. This produced the amount of expressed motives per 1000 words generalized over the whole PSE. The total scores of all individuals were then converted into z-scores, which describe their position in relation to the sample's mean value in terms of standard deviations. This made it easier to compare the scores of different individuals.

In order to guarantee a high reliability of the scoring form and a reproducibility of the scoring scheme, 7 picture responses were evaluated by 3 raters and inter-rater reliability was determined by calculating Cohen's kappa. When different raters scored clearly the same concept as the same BT-category, but in different lengths, it was still scored as an inter-rater agreement. An example would be "..where a robot is supposed to help a handicapped person standing up" compared to "the human simulates a situation where a robot is supposed to help a handicapped person standing up".

For picture story exercises, internal consistency seems to be no suitable measurement for validity. The reason here for is that expressing a motive will satisfy the same for a short time. (Pang, 2010) This means that the expression of geekism would suppress the geek motive for the next few responses. Therefore, the combined scores over the whole test should give a better picture about a respondent's motives than internal consistency does. Furthermore, the great amount of possible responses to a picture story or in other words the great amount of possibly activated motives by an ambiguous picture story is another argument against the utility of internal consistency as a measurement for validity. (Pang, 2010)

Correlations between the three motive scores of the PSE were calculated to investigate possible overlaps between the motives or the categories in the scoring form. In order to validate the motives of the PSE, correlations between the motive scores of the PSE and other scales were calculated. The correlations of the geek score of the PSE with the need for cognition scale, the material possession love scale and the Schwartz self-determination scale were determined. For the utilitarian motive of the PSE it was calculated whether it is correlated with the need for cognition scale, the material possession love commitment subscale and the Schwartz value success subscale. Furthermore, correlations between the hedonist score of the PSE, the hedonism subscale of the Schwartz value scale and the subscales passion and intimacy from the material possession love scale were estimated. For significant and relevant findings, regression models and the coefficient of determination (R^2) were estimated.

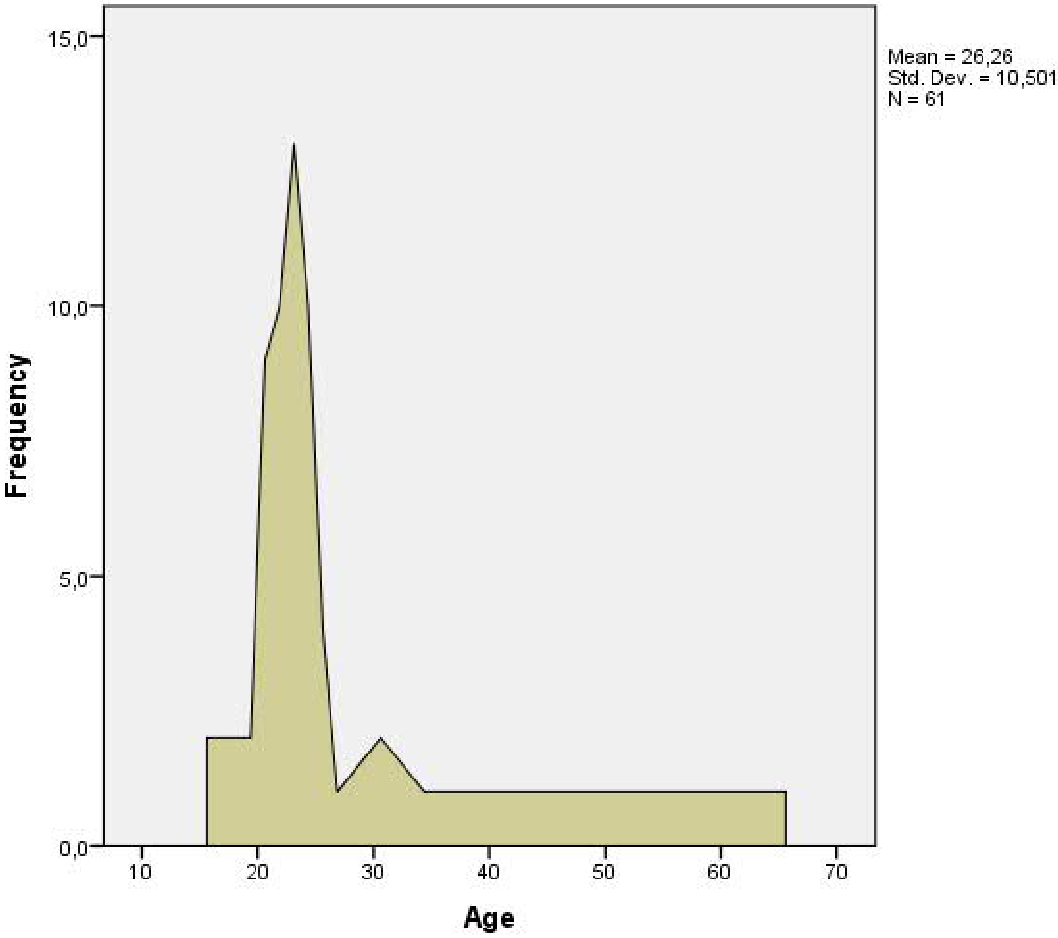
Interaction effects for the response times in the Stroop task were calculated in a generalized linear model between the three motive scores of the PSE and presented word categories in the Stroop task. In a second analysis, the presented image categories of the Stroop task were also added to the interactional model.

The pull of each picture was estimated by adding the corrected scores of a picture from all respondents and all three motive categories and dividing the sum through the amount of respondents whose test version contained this picture. In order to compare the distribution over the three motive categories the pull was also estimated for each motive category separately. This comparison made it possible to make statements about a pictures cue ambiguity.

3. Results

The group we expected to score high on BT-G consisted of 3 Computer-Science students, 4 Creative-Technology students, 1 Electrical Engineering student and 10 students from other technical study courses of the University of Twente between 15 and 25 years. The group we expected to score low consisted of 23 students of the faculty of Behavioral Sciences of the University of Twente. The third group that was expected to show a great variance of BT-G had a size of 21 respondents and consisted of pupils, laboring people independent from their profession and voluntary students from all studies except the technical studies. The total sample consisted of 27 women (44,3 %) and 34 men (55,7 %).

Graphic 1 - Age distribution of the sample



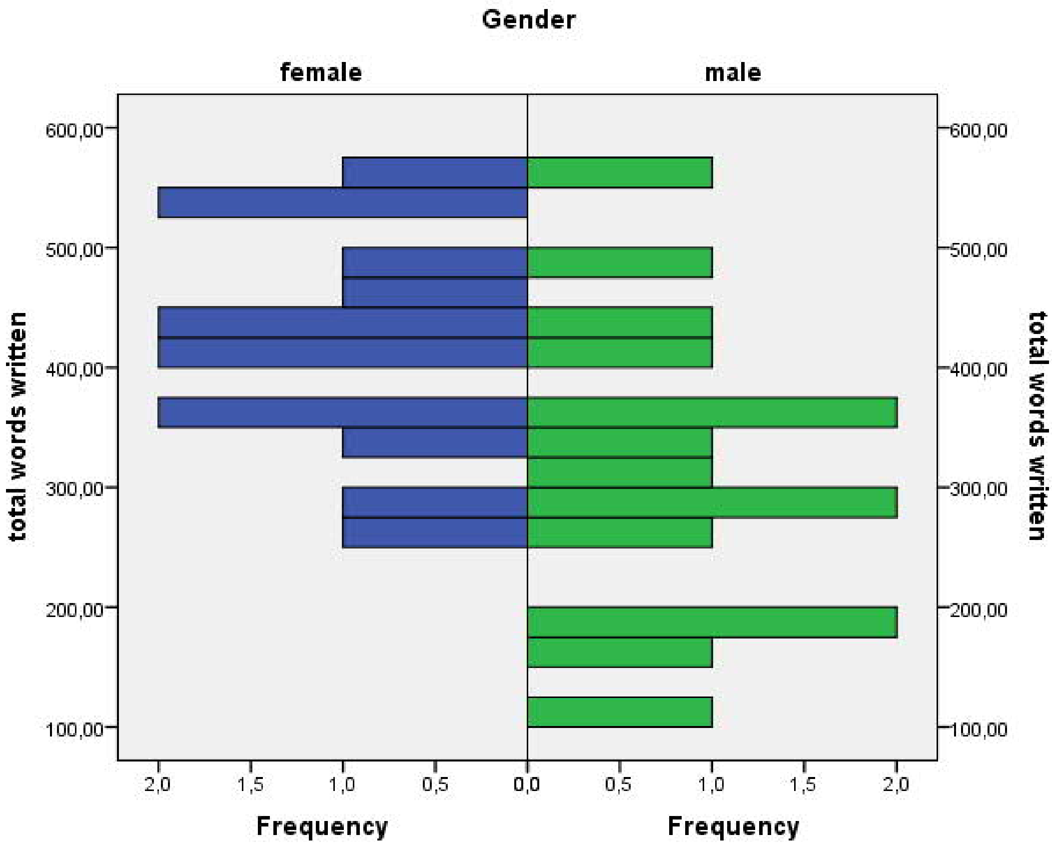
Graphic 1 shows the age distribution of the sample. Most respondents were between 15 and 30 years old. The youngest respondent was 15, the oldest respondent was 66 years old. The top of the age distribution was at 23 years with 13 respondents. The mean age was 26,26 years.

Table 1 - Amounts of total written words

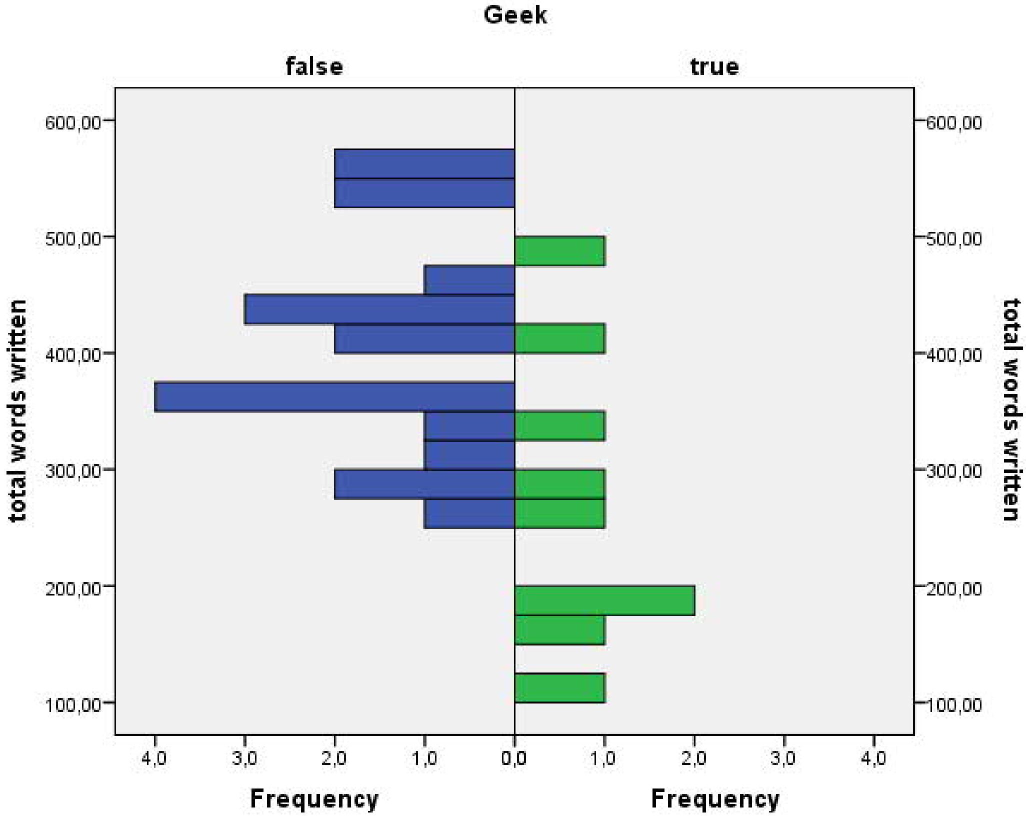
		total words written			
		Mean	Maximum	Minimum	Standard Deviation
Gender	female	421,07	563,00	274,00	92,66
	male	317,47	555,00	117,00	124,50
Geek	false	408,05	563,00	274,00	92,90
	true	269,44	484,00	117,00	122,87

Table 1 shows great differences between male and female respondents in the mean amount of total words written in the PSE, as well as between geeks and non-geeks. Respondents were categorized as geeks or non-geeks according to their study or field of work. Respondents following a technical study or profession were categorized as geeks, all others were categorized as non-geeks. Female respondents wrote 32,6% more words than male respondents and non-geeks wrote 51,4% more words than geeks. Both the gender differences ($t(27) = 2.527$, $p = .018$) and the geek grouping differences ($t(26) = 3.324$, $p = .003$) are statistically significant. For the word count distribution see graphic 2 and 3.

Graphic 2 - Gender differences in the distribution of total written words



Graphic 3 - Differences in distribution of total written words between geeks and non-geeks

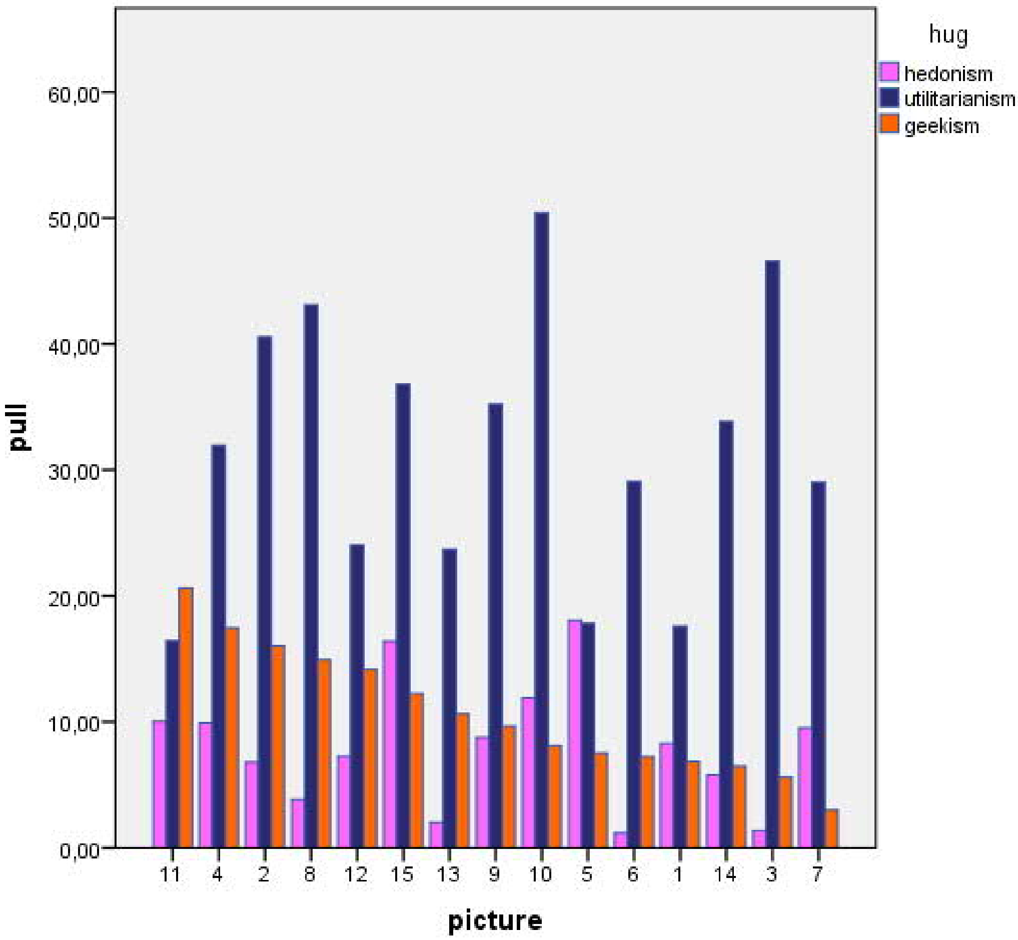


Based on 104 scored items, the average item length was estimated to be 5,34 words (555 words / 104 Items). Words that have concordantly not been scored were counted and divided through the average item length to calculate the amount of false-false scorings in the Cohen's Kappa calculation. Based on an observed inter-rater agreement of .74 and an expected agreement of .422, Cohen's Kappa was estimated to be .55, which is an acceptable level of inter rater reliability for the first evaluation of a scoring form (Fleiss, Levin & Paik, 1981).

Transcript: see Appendix 7

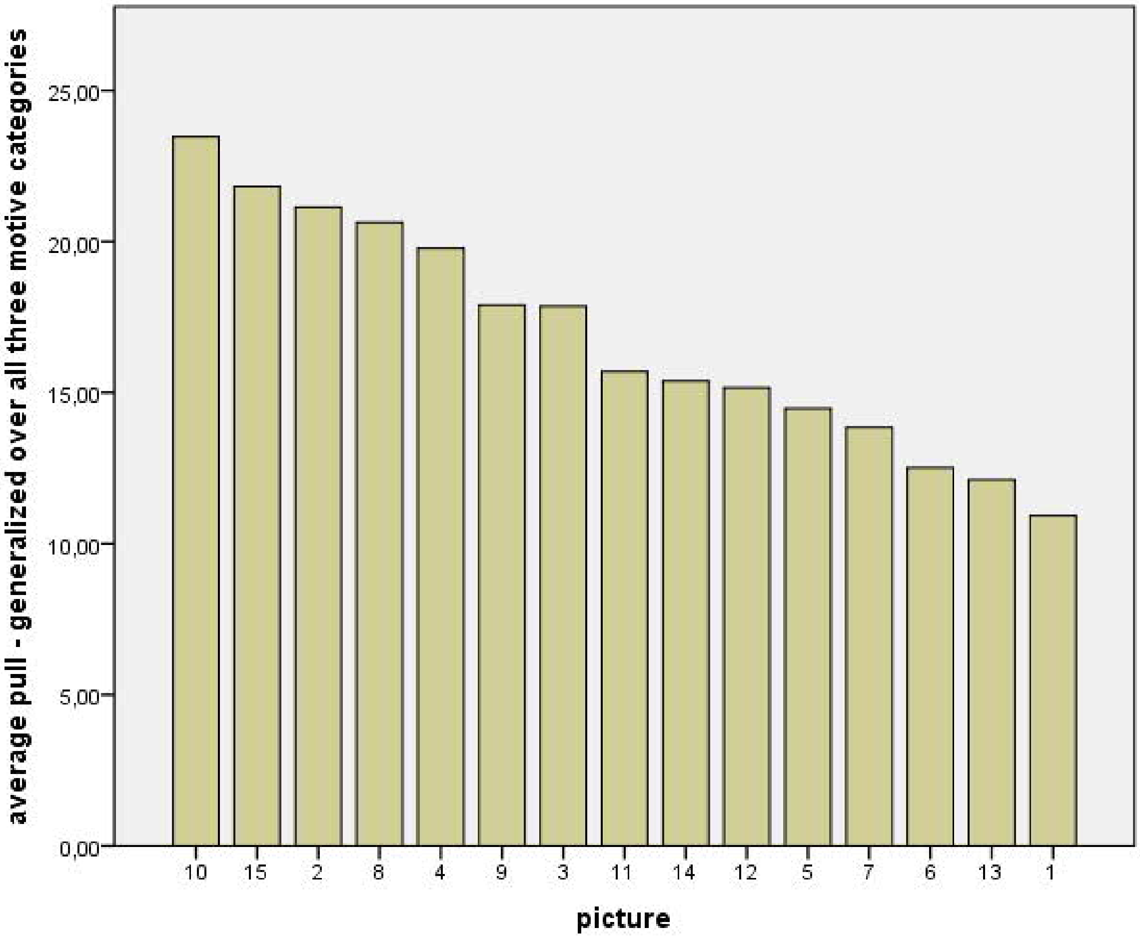
Inter-rater agreement table: see Appendix 8

Graphic 4 - Pull of PSE pictures, separated motives



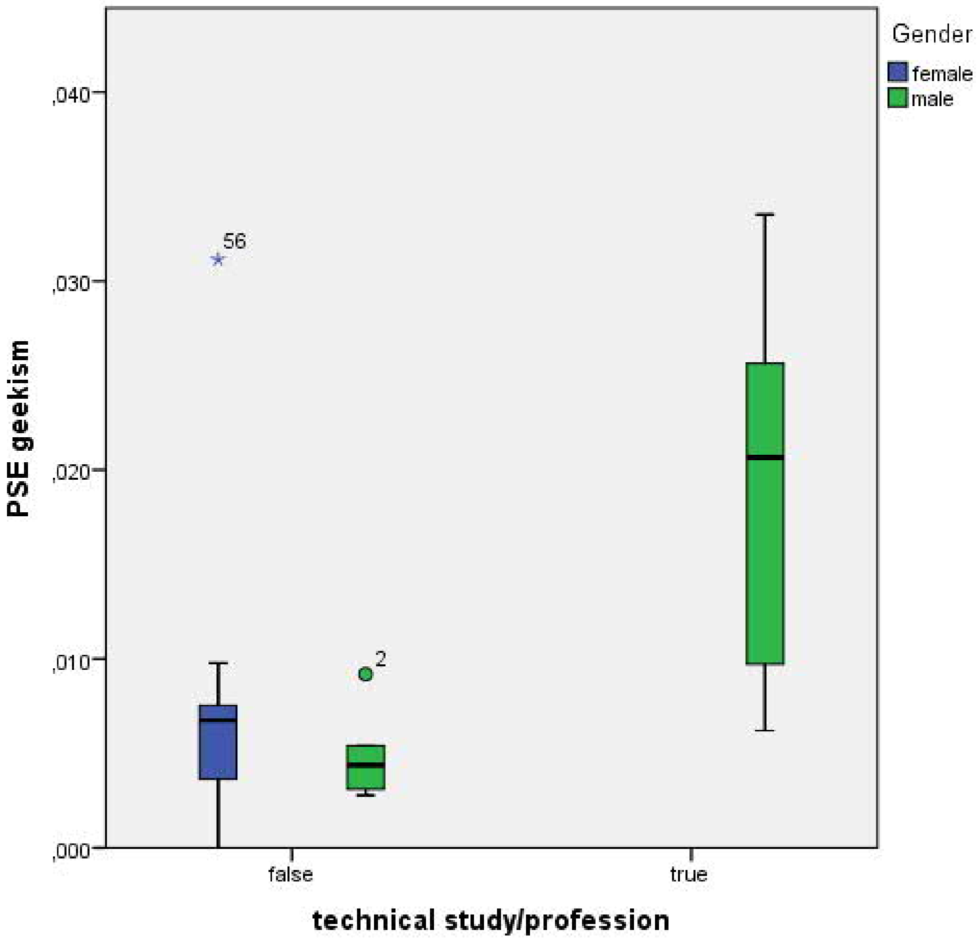
All pictures except the pictures 5 and 11 have a much higher pull for the utilitarian BT than for the geek and hedonism BT. The pictures 2, 3, 8 and 10 have the highest pull for utilitarianism, the pictures 1, 5 and 11 have the lowest, but still a reasonably high pull for the utilitarian motive. The pictures 5 and 15 have the highest pull for hedonism, the pictures 3, 6, 8 and 13 have a very low pull for hedonism. High pull pictures for the geek motive are the pictures 2, 4, 8, 11 and 12, the numbers 1, 3, 5, 6, 7 and 14 are in the lower pull area for the geek motive.

Graphic 5 - Pull of PSE pictures, generalized over the three motives



As graphic 5 shows, there are no dramatic differences in pull generalized over all three behavioral tendency categories between the 15 pictures. No picture has an average of less than 10 or more than 25 scored items per 1000 words. The pictures 1 (pull = 10,93), 6 (pull = 12,51) and 13 (pull = 13,86) have the lowest, the pictures 2 (pull = 21,14), 10 (pull = 23,48) and 15 (pull = 21,83) the highest average pull generalized over all three BT's.

Graphic 6 - Variance of BT-G scores split for gender and study/profession



Graphic 6 shows that students with a technical study or profession scored much higher on BT-G than other people. The technical group contained no women. Generalized over study and profession, men scored higher on BT-G than women. The study/profession difference ($t(11.67) = -3.55$, $p < .01$) in mean BT-G is statistically significant, but the gender difference ($t(25.45) = -1.87$, $p = .07$) slightly misses statistical significance.

Table 2 - Correlations between PSE behavioral tendency responses

		PSE - Hedonism	PSE - Utilitarianism	PSE - Geekism
PSE - Hedonism	Pearson Correlation	----		
	Sig. (2-tailed)			
	N			
PSE - Utilitarianism	Pearson Correlation	,064	----	
	Sig. (2-tailed)	,742		
	N	29		
PSE - Geekism	Pearson Correlation	,218	,509**	----
	Sig. (2-tailed)	,257	,005	
	N	29	29	

**. Correlation is significant at the 0.01 level (2-tailed).

Table 1 shows a moderate and statistically highly significant correlation ($r = .509$, $p < .01$) between the geek and utilitarian responses of the PSE. This means respondents scoring high on BT-U in the PSE are expected to also score high on BT-G. Respondents scoring low on BT-U shall also score low on BT-G. An analysis of linear regression with BT-U as predictor and BT-G as dependent variable (table 3) shows a statistically highly significant velocity ($\beta 1 = .509$, $p < .01$), but no significant constant ($\beta 0 < .001$, $p = 1$). The estimated model can be seen in graphic 7. The noted R^2 of .259 indicates that 25,9 % of the BT-G variation can be explained by the BT-U variable.

Table 3 - Regression coefficients PSE Utilitarianism - PSE Geekism

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1,211E-016	,163		,000	1,000
	PSE - Utilitarianism	,509	,166	,509	3,076	,005

a. Dependent Variable: PSE Geekism

Graphic 7 - Regression model PSE Utilitarianism - PSE Geekism

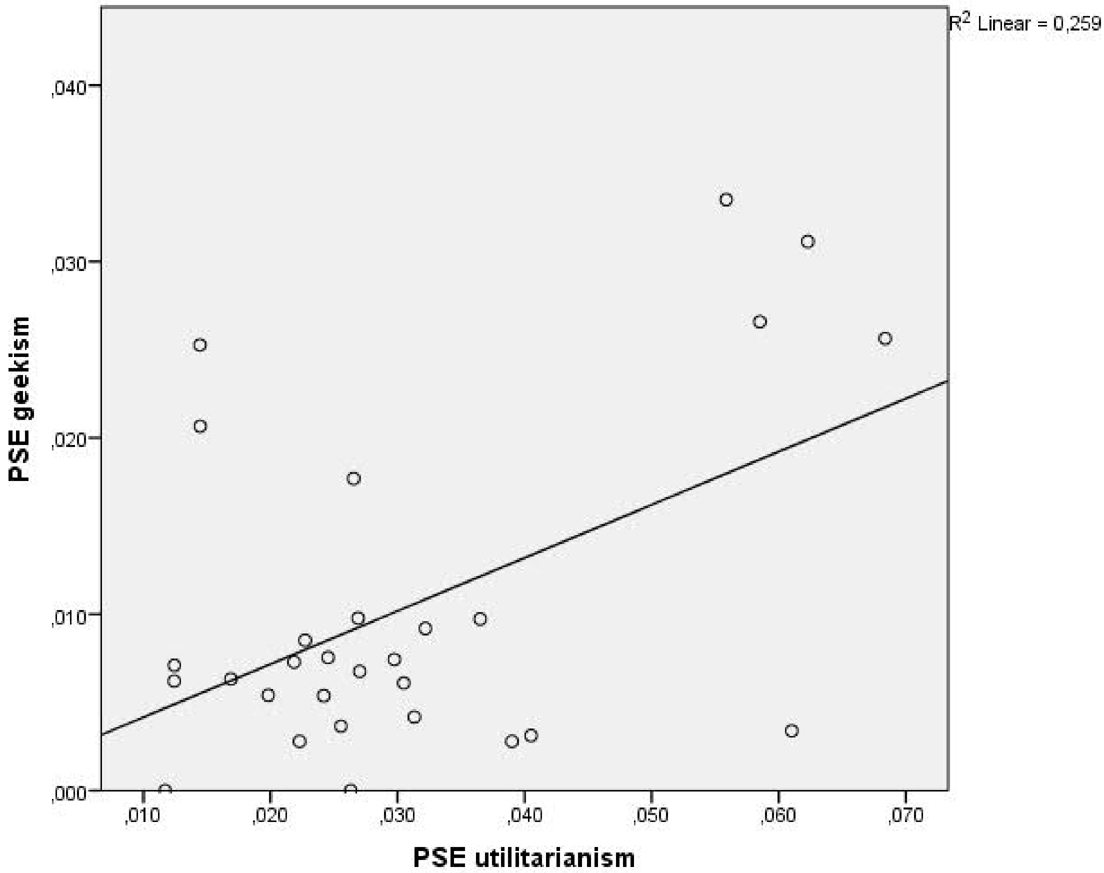


Table 4 - Geek behavioral tendency correlations

		PSE - Geekism	Geekism - questionnaire	Need for Cognition	Material possession love	Self-determination
PSE - Geekism	Pearson Correlation	----				
	Sig. (2-tailed)					
	N					
Geekism - questionnaire	Pearson Correlation	,536**	----			
	Sig. (2-tailed)	,003				
	N	29				
Need for Cognition	Pearson Correlation	,227	,357**	----		
	Sig. (2-tailed)	,236	,005			
	N	29	61			
Material possession love	Pearson Correlation	,066	,489**	,116	----	
	Sig. (2-tailed)	,735	,000	,373		
	N	29	61	61		
Self-determination	Pearson Correlation	,041	,209	,191	,110	----
	Sig. (2-tailed)	,832	,105	,140	,400	
	N	29	61	61	61	

**. Correlation is significant at the 0.01 level (2-tailed).

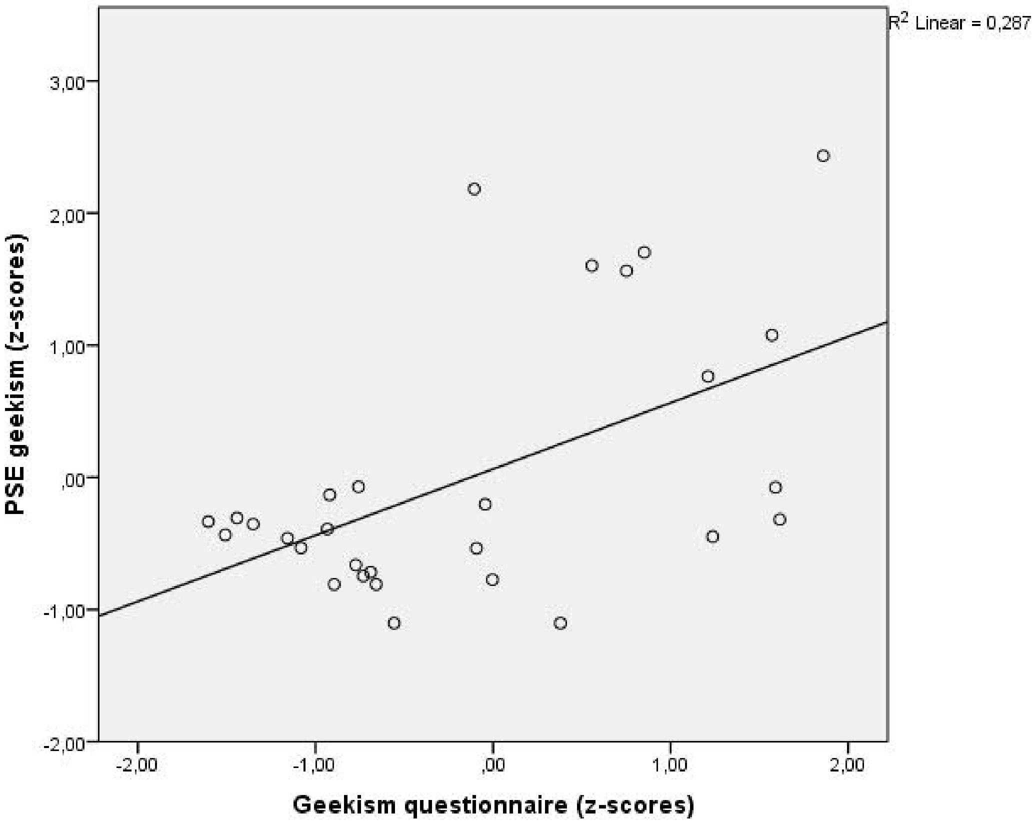
Table 4 shows a moderate and statistically highly significant correlation (r = .536, $p < .01$) between the geek motive responses of the PSE and the geekism questionnaire by Sander (2013). This means high geekism scores in the PSE are related to high scores in Sander's geekism questionnaire and low geekism scores in the PSE are related to low scores in Sander's geekism questionnaire. The corresponding regression model (table 5) shows a statistically significant velocity ($\beta1$ = .501, $p < .01$), but no significant constant ($\beta0$ = .064, $p > .05$). The estimated model is illustrated in graphic 8. The R^2 of .287 shows that 28,7% of the BT-G variation can be explained by the responses of the geekism questionnaire. The other scales in table 4 did show no statistically significant correlations with BT-G, but the geekism questionnaire by Sander (2013) correlated statistically significantly with the need for cognition scale (r = .357, $p < .01$) and the material possession love scale(r = .489, $p < .001$). Both correlations have a moderate strength and are positive, which means that high scores in the geekism questionnaire are related to high scores in the need for cognition and material possession love scale.

Table 5 - Regression coefficients geekism questionnaire - PSE geekism

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,064	,161		,396	,695
	Geekism - questionnaire	,501	,152	,536	3,299	,003

a. Dependent Variable: PSE geekism

Graphic 8 - Regression geekism questionnaire - PSE geekism



Given that the MPL scale correlates statistically significant with the geekism questionnaire, but not with the BT-G, another linear regression model is estimated with BT-G and MPL as predictors and the geekism questionnaire as dependent variable. Table 6 shows that the predictors BT-G ($\beta 1 = .535$, $p < .01$) and MPL ($\beta 2 = .614$, $p < .001$) are both statistically significant. According to the R^2 in table 7, both predictors together explain 58,5% of the variation in the geekism questionnaire.

Table 6 - Regression coefficients PSE geekism and MPL - geekism questionnaire

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-,055	,134		-,410	,685
	PSE - Geekism	,535	,136	,500	3,950	,001
	Material possession love	,614	,142	,547	4,318	,000

a. Dependent Variable: Geekism questionnaire

Table 7 - Regression model summary PSE geekism and MPL - geekism questionnaire

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,765[a]	,585	,553	,71547

a. Predictors: (Constant), Material possession love, PSE - Geekism

Table 8 - Utilitarian behavioral tendency correlations

		PSE - Utilitarianism	Success	Need for Cognition	Commitment
PSE - Utilitarianism	Pearson Correlation	----			
	Sig. (2-tailed)				
	N				
Success	Pearson Correlation	,493**	----		
	Sig. (2-tailed)	,007			
	N	29			
Need for Cognition	Pearson Correlation	,043	,191	----	
	Sig. (2-tailed)	,826	,140		
	N	29	61		
Commitment	Pearson Correlation	-,174	-,067	-,155	----
	Sig. (2-tailed)	,365	,607	,234	
	N	29	61	61	

**. Correlation is significant at the 0.01 level (2-tailed).

As shown in table 8, BT-U correlates significantly and positively with the success subscale of the Schwartz value scale ($r = .493$, $p < .01$). This means high BT-U scores are related to high success scores. The correlations of BT-U with the need for cognition scale and the commitment subscale of the material possession love scale are not statistically significant.

Table 9 - Hedonist behavioral tendency correlations

		PSE - Hedonism	Schwartz - Hedonism	Passion	Intimacy
PSE - Hedonism	Pearson Correlation	----			
	Sig. (2-tailed)				
	N				
Schwartz - Hedonism	Pearson Correlation	-,029	----		
	Sig. (2-tailed)	,883			
	N	29			
Passion	Pearson Correlation	-,370*	,014	----	
	Sig. (2-tailed)	,048	,914		
	N	29	60		
Intimacy	Pearson Correlation	-,345	,007	,932**	----
	Sig. (2-tailed)	,067	,958	,000	
	N	29	60	61	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 9 shows a significant negative correlation between the hedonistic behavioral tendency and the passion subscale of the MPL scale($r = -.37$, $p < .05$). This means high BT-H scores are moderately related to low passion scores. The correlation between BT-H and the hedonism subscale of the Schwartz value scale is not statistically significant ($p > .05$).

Table 10 - Tests of generalized linear model effects

Source	Type III		
	Wald Chi-Square	df	Sig.
(Intercept)	934,248	1	,000
Stroop word prime * BT-H	1,061	3	,786
Stroop word prime * BT-U	3,923	3	,270
Stroop word prime * BT-G	4,734	3	,192

Dependent Variable: Response time

Model: (Intercept), Stroop word prime * BT-H, Stroop word prime * BT-U, Stroop word prime * BT-G

Table 10 shows that none of the behavioral tendency categories in the PSE has a significant interaction effect with the response times in the Stroop task according to word categories. This means for none of the behavioral tendency categories the categories of presented words in the Stroop task had a statistically significant influence on the response time in the Stroop task.

Table 11 - Generalized linear model parameter estimates

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	637,194	20,8469	596,335	678,053	934,248	1	,000
[geek word] * BT-H	-1,845	24,3652	-49,600	45,910	,006	1	,940
[hedonist word] * BT-H	4,846	33,1271	-60,082	69,774	,021	1	,884
[utilitarian word] * BT-H	-7,532	22,1968	-51,037	35,973	,115	1	,734
[geek word] * BT-U	-25,592	24,5033	-73,617	22,434	1,091	1	,296
[hedonist word] * BT-U	-10,741	24,5752	-58,908	37,426	,191	1	,662
[utilitarian word] * BT-U	-16,502	24,6195	-64,755	31,751	,449	1	,503
[geek word] * BT-G	6,245	27,6222	-47,893	60,384	,051	1	,821
[hedonist word] * BT-G	-13,620	30,9341	-74,249	47,010	,194	1	,660
[utilitarian word] * BT-G	8,553	28,8372	-47,967	65,073	,088	1	,767
(Scale)	50101,103						

Dependent Variable: Response time
Model: (Intercept), Stroop word prime * BT-H, Stroop word prime * BT-U,
Stroop word prime * BT-G

Table 11 shows that the response time for hedonistic words in the Stroop task is the longest for respondents scoring high on hedonism in the PSE. The response time for utilitarian words is the highest for respondents scoring high on hedonism in the PSE, even higher than for people scoring high in utilitarianism in the PSE. The response time for geek words is the highest for people scoring high on utilitarianism in the PSE, but only slightly higher than for respondents scoring high on geekism in the PSE. However, none of these results reaches an acceptable level of statistical significance.

Table 12 - Tests of generalized linear model effects

Source	Type III		
	Wald Chi-Square	df	Sig.
(Intercept)	921,657	1	,000
Stroop word prime * Stroop picture prime * BT-G	15,364	9	,081

Dependent Variable: Response time

Model: (Intercept), Stroop word prime * Stroop picture prime * BT-G

According to table 12, the generalized linear model with the Stroop word category, the Stroop picture category and the geek behavioral tendency as predictors and the Stroop response time as dependent variable has nearly a statistically significant level ($p = .81$). Table 13 (appendix 9) shows that for the presentation of geek words, people scoring high on BT-G have the longest response time when they saw a neutral picture before and the shortest response time when they saw a control picture before. For the presentation of hedonist words, people scoring high on BT-G have the longest response time when they saw a geek picture before and the shortest response time when they saw a control picture before. For the presentation of utilitarian words, people scoring high on BT-G have the longest response time when they saw a geek picture before and the shortest response time when they saw a control picture before. However, none of these regression parameters reaches a statistically significant level.

4. Discussion

The evaluation of the developed PSE consists of three steps. In the first step, the functionality and accuracy of the scoring form and its categories of description are evaluated. Second, the quality of the pictures and the picture order are evaluated. In the last step, implications for future executions of the PSE are introduced

The inter-rater reliability (Cohen's Kappa) of .55 is acceptable for a test conduction without pretests given that values between .4 and .75 are seen as 'fair to good' (Fleiss, Levin & Paik, 1981). However, a functional scoring form with clear scoring instructions does not guarantee high construct validity. The behavioral tendency scores must also correlate statistically significant with the scores of tests measuring the same construct.

The fact that no statistically significant correlation was found between the hedonism subscale of the Schwartz value scale (1992) and the hedonistic behavioral tendency of the PSE raises the question whether it is possible to generate categories of description for an implicit test (PSE) from categories of description for an explicit test (Schwartz value scale) that is not designed for a technological context. Another uprising question is how far it can be expected that explicit hedonistic tendencies correlate with implicit hedonistic tendencies. These questions could be answered by conducting an experiment including the PSE, the Schwartz value scale and another implicit test measuring hedonistic tendencies. If the new implicit test of hedonism would correlate with BT-H, than the problem can be expected to lie in the incongruence of explicit and implicit hedonistic tendencies or in the Schwartz value scale's lack of technological context. If on the other hand, the new implicit test of hedonism would correlate with Schwartz's hedonism subscale, but not with BT-H, one would have to conclude that explicit and implicit hedonistic tendencies are at least partly congruent, but also that categories of description from an explicit test are not suited to be used as categories of description of an implicit test.

The moderate correlation between BT-U and the success subscale from the Schwartz value scale ($r = .493$, $p < .01$) implies that the deduction of utilitarian categories of description from the Schwartz values was more successful than the deduction of the hedonistic categories of description. A possible explanation would be that utilitarian implicit and explicit values are more congruent than hedonistic implicit and explicit values. Given that utilitarian values seem to be much more socially desirable than hedonistic values, it can be easily expected that people tend to deny their implicit hedonistic tendencies. Whereas utilitarians can be seen as diligent and efficient, hedonists operating the pleasure principle can be seen as egoists (Sober, 2000) following their animalistic nature. The facts that nearly all pictures have a much higher pull for utilitarianism than for hedonism and geekism and that BT-U shows a moderate and statistically significant correlation with BT-G, suggest a too broad definition of the utilitarian categories of description. The differences between intrinsic motivated and extrinsic motivated tasks must be made more clearly in the scoring form to minimize the overlap between the utilitarian and geek categories of description.

The moderate correlation ($r = .536$, $p < .01$) between the geek behavioral tendency from the PSE and the geekism questionnaire from Sander (2013) shows that the questionnaire and the scoring form of the PSE describe a common underlying concept. Also, as expected, people from technical studies or professions scored significantly higher on BT-G than other people. This is a good step towards isolating the described concept of geekism and making it measurable. It also shows that the explicit geek tendencies measured by the PSE and the implicit geek tendencies measured by the geek questionnaire are at least partly congruent. That both BT-G and the material possession love scale correlate statistically significant with the geekism questionnaire, but not with each other, indicates that they measure different subcategories of the geekism questionnaire. The fact that the explained variance (R^2) in the linear regression model between BT-G and the geek questionnaire rises from .287 to .585 when the material possession love scale is added as an explanatory variable for the geek questionnaire also supports this implication. In order to get an implicit counterpart of the geekism questionnaire, the concepts contained in the material possession love scale should be processed into additional geekism categories of description for the PSE. Given that the knowledge of implicit motives is much more useful to predict future behavior (McClelland et al., 1989), an implicit geek test should describe the user's needs and wishes related to technical products much better than the explicit questionnaire. Because of the stability over time of responses for the same cues in a PSE (Schultheiss, Liening & Schad, 2008), the measured behavioral tendencies should also be relatively stable over time.

As seen in graphic 4, most developed pictures have a much higher pull for utilitarianism, than for geekism or hedonism and table 2 shows moderate positive correlation between the utilitarian and geek motive responses. The reason for this lies probably in a too broad description of the utilitarian subcategories in the scoring form. The pull for hedonism and geekism are generalized over all pictures on a comparable level, but there are significant differences between the pictures. None of the pictures seemed to be totally inadequate for measuring one of the three behavioral tendencies, because all pictures had a mean pull above zero for all three behavioral tendencies.

In order to adjust the mean pull for geekism to the expected strength of the geek behavioral tendency of respondents, the pictures are sorted into a low pull and a high pull version of the test according to the pull for geek behavioral tendencies. The low pull version consists of the pictures 1, 3, 5, 6, 7, 9, 10, 14 and should be given to people expected to score high on geekism. The high pull version consists of the pictures 2, 4, 8, 9, 11, 12, 13, 15 and should be executed by people expected to score low on geekism. The adjusted pull level makes it possible to differentiate high scorers from extremely high scorers and low scorers from extremely low scorers, because extremely high scorers would even react to a really inconspicuous cue for geekism, whereas an extremely low scorer could even ignore totally explicit cues. However, it must be kept in mind that the total scores of the two new test versions are not yet comparable. A non-geek can easily reach the same score as a geek when all geek cues are much more explicit. The total scores have still to be adjusted according to the mean pull for geekism of the two versions.

This experiment is just the first round in the development of a reliable picture story exercise dedicated to measure the construct of geekism. Repeated conduction with more pictures is necessary to identify possible subgroups, to improve the scoring manual, and to assemble a picture set with a great variance of ambiguity and explicitness of the categorical cues. Latter would allow to make clear distinctions between geeks, moderate geeks and non-geeks.

In future conductions, the PSE's should be scored separately for each subcategory of the behavioral tendency categories to be able to evaluate the accuracy and requirement of the subcategories in the scoring form. Scoring categories that produce an unusually great amount of scored items should be made more specifically to prevent an inflation of the other subcategories of the respective motive. Correlational studies of the subcategories could detect unintended overlaps between subcategories from different motive categories.

In the long run, the two test versions differing in pull for geekism could be replaced by an adaptive computer test. The computer could choose the picture set and order adaptively according to earlier responses of the participant. Hereby, extreme high or low scorers can be classified even more accurately by slowly raising or lowering the explicitness of categorical cues. However, the picture order should still be sorted in a way that pictures with a higher than average pull for geekism are followed by pictures with a lower than average pull for geekism and the other way round. This minimizes possible interaction effects caused by satisfaction of possible underlying motives via consummatory force (Tuerlinckx et al., 2002). The task of an adaptive test would be to mix high and low pull pictures and simultaneously to raise or lower the average pull of the pictures according to earlier responses. The challenge would be to develop a program that is able to evaluate texts according to a qualitative scoring form. Also, many more pictures with a great variance of pull for geekism would be needed to guarantee flexibility in picture set arrangement.

Furthermore, the items in a picture story exercise developed to measure geekism must be adapted every few years to the progress of technology to ensure relevance of the pictures, because geeks can be expected to be part of the early adopters group of new technological products. The presentation of out-dated computer systems would prevent geeks from associating themselves with the presented situation in the pictures.

Although society's image of "geeks" and "geekism" seems to have changed to a more positive image in the last years, it is still regularly associated with introversion and strange social habits. In the context of research, this can lead to problems like stigmatization of the target group by the presentation of clichés, or biased data because of the wish of the respondents to present them self in a social desirable manner. Therefore, it should be considered whether another descriptive term like "intrinsic motivated technology user", "tech-ace" or "tech-master" would be a better choice.

The development of the described PSE into a fully reliable and practicable measurement of technological product users behavioral tendencies could give developers of technical products valuable insights into implicit wishes and needs of the users. The clear differentiation of geek behavioral tendencies from hedonistic and utilitarian behavioral tendencies would make it possible to classify technology-users more accurately, better predict their behavior and develop technologies that are more compatible with their wishes.

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Appendix

Appendix 1 - scoring form

SCORING MANUAL - PSE HEDONISM, UTILITARIANISM, GEEKISM

The response to every picture is scored apart. First, every response from participants using insults or violent language are removed from analysis. Second, the word count for every picture is determined. If a respondent describes one picture in several parts, or answers the aid-questions apart, the total word count for this picture takes all parts into account. In the third step, the picture stories are scored for the motives hedonism (H), utilitarianism (U) and geekism (G) by classifying them according to the subcategories below.

HEDONISM (H)

- pleasure/enjoying life

  The attainment of instant pleasure or displeasure by the use of technological product fall into this category. Cue words are "fun", "boring" etc.

- esthetical appreciation

  Positive, or negative descriptions regarding the visual appearance fall into this category. Cue words are "ugly", "neat", "esthetical", "stylish" etc.

- (expected) social appreciation

  Describes the evaluation of a product from the angle of an assumed social norm. Any response occupied with the thought to be evaluated by another person fits into this category. Cue words are "shame", "guilt", "famous", "modern", "popular", "proud" etc.

UTILITARIANISM (U)

- ambition/success

  Describes the importance of a certain goal that a person wants to achieve. In this category, the goal itself is important, not the joy to achieve it. Recognition of success or failure to achieve a certain goal also belong to this category. This excludes evaluation by others linked to the success or failure, which should be scored as 'hedonism - social appreciation'.

- influence

  Statements describing the gain or loss of power fall into this category.

- capability/intelligence

  Describes the availability, or achievement of skills or tools needed to fulfill a particular task. Absence of such skills or tools can also be sorted into this category.

- improving efficiency/ease of use

  Describes in how far a technological product can ease a certain task and make it more productive. Possible negative influences of technical products on efficiency, or a bad usability also fall into this category.

GEEKISM (G)

- expertise

  Expressions about the wish to become an expert in a certain technological domain fall into this category. Also, every form of described technological expertise, that is not linked to the achievement of a specific goal can be assigned to this category.

- high time investment

  Statements describing unusual high time investment in the interaction with technological products fall into this category. Exceptions are high time investments in achieving an extrinsic goal, these should be scored as 'utilitarianism - ambition'.

- interest in progress of technology

  Curiosity or speculations about future technologies fall into this category. Future implications of a new product, the description of AI(artificial intelligence), artificial feelings or building up a social relationship with a technical product, program or robot are clear signs for this category.

- interest in deeper understanding/curious about functioning/

  Describes the wish to understand how technological products work. Cue words are "curious", "interested" etc. Exceptions are learning processes directed towards extrinsic rewards. These should be scored as 'utilitarianism - capability'.

- joy through knowledge/joy through challenge

  Describes the joy gained by learning more about technological products, or succeeding in a task related to technology. The success itself creates the joy, not the end product or gained possibilities.

- interest in versatile products/re-using products

  Statements describing the multitude of possible uses of a product, the advantages of re-usability, or the plan to manipulate the original purpose of a product fall into this category. Exceptions are specifically goal directed descriptions of multiple functions that are already built into a technical product. These should be scored as 'utilitarianism - capability', or 'utilitarianism - influence' if the situation is described as an improvement of possibilities compared to earlier situations.

- being in control of one's device/data

  Describes the wish to understand technology in order to have control over the situation. This category might be associated with the wish to make use of the full potential of a device. The fear that one's data might be misused is an exception that should be scored as 'utilitarianism - influence'.

A response that fits into the described categories, or subcategories, raises the score on the category's superior motive. If a sentence contains more than one word that fits into a category of description, but the words do not describe the same concept, each of the words gets scored. If a statement cannot be clearly assigned to a specific category, it should not be scored. The total score on every motive of a picture gets divided through the amount of written words about the picture and multiplied by 1000. This corrected score represents the amount of expressed motives per 1000 words.

Example: 120 words written, H=1, U=3, G=0

$H = 1 / 120 * 1000 = 8,33$

$U = 3 / 120 * 1000 = 25$

$G = 0 / 120 * 1000 = 0$

To calculate the total scores for each category, the corrected scores of the respective category are added and the sum is divided by 8. This produces the amount of expressed motives per 1000 words generalized over the whole PSE.

Appendix 2.1 - German form of clarification

EINWILLIGUNG NACH AUFKLÄRUNG GW.07.130

Ich, ... *(Name des Respondenten)*

willige ein, an einer Untersuchung mitzumachen, die durchgeführt wird von

Julian Keil, Nick Sander und Franziska Geesen

Ich bin mir bewusst, dass die Teilnahme an dieser Untersuchung freiwillig ist. Ich kann meine Teilnahme jederzeit beenden und die Daten, die sich aus der Untersuchung ergeben, zurückbekommen oder löschen.

Die folgenden Punkte wurden mir erklärt:

1. Das Ziel dieser Untersuchung ist es mehr Einblicke in die Wahrnehmung von technologischen Produkten zu bekommen.
2. Meine Aufgabe wird es sein, unterschiedliche Fragebögen auszufüllen und den Stroop-Task zu machen.
   Die gesamte Untersuchung wird ungefähr 120 Minuten dauern. Am Ende wird der Untersucher erklären, worum die Untersuchung ging.
3. Teilnahme an dieser Untersuchung sollte keinen Stress oder Unbehagen hervorrufen.
4. Die Daten, die sich aus der Untersuchung ergeben, werden anonym verarbeitet.
5. Der Untersucher wird alle weiteren Fragen zur Untersuchung jetzt oder im weiteren Verlauf beantworten.

Unterschrift Untersucher: .... Datum: ....

Unterschrift Respondent: .... Datum: ....

Appendix 2.2- Dutch form of clarification

GEÏNFORMEERDE TOESTEMMING

GW.07.130

Ik, …………………………………………………………………….. *(naam proefpersoon)*

stem toe mee te doen aan een onderzoek dat uitgevoerd wordt door

Julian Keil, Nick Sander en Franziska Geesen

Ik ben me ervan bewust dat deelname aan dit onderzoek geheel vrijwillig is. Ik kan mijn medewerking op elk tijdstip stopzetten en de gegevens verkregen uit dit onderzoek terugkrijgen, laten verwijderen uit de database, of laten vernietigen.

De volgende punten zijn aan mij uitgelegd:

1. Het doel van dit onderzoek is meer inzicht te krijgen in de perceptie van technologische producten.
2. Er zal mij gevraagd worden om verschillende vragenlijsten in te vullen en te Stroop Task te doen.
   Het hele onderzoek zal ongeveer 120 minuten duren. Aan het einde van het onderzoek zal de onderzoeker uitleggen waar het onderzoek over ging.
3. Er behoort geen stress of ongemak voort te vloeien uit deelname aan dit onderzoek.
4. De gegevens verkregen uit dit onderzoek zullen anoniem verwerkt worden en kunnen daarom niet bekend gemaakt worden op een individueel identificeerbare manier.
5. De onderzoeker zal alle verdere vragen over dit onderzoek beantwoorden, nu of gedurende het verdere verloop van het onderzoek.

Handtekening onderzoeker: ……………………………………… Datum: …………………..

Handtekening proefpersoon: ……………………………………… Datum: …………………..

Appendix 3.1 - German introduction text

Im folgenden Abschnitt werden dir 8 Bilder für jeweils ca. 10 Sekunden gezeigt. Auf jedes einzelne Bild folgt eine Pause von 3 Minuten. Blättere nach Beginn der Pause eine Seite weiter, sodass du das letzte Bild nicht mehr siehst. Schreibe in den 3 Minuten eine kurze Hintergrundgeschichte zu dem zuvor gezeigen Bild auf die Rückseite des Blattes. Blättere nicht zurück zum Bild! Sollte dir nichts einfallen, so kannst du dich auch an den 4 Hilfsfragen auf den Antwortformularen orientieren, aber deine Geschichten müssen diese Hilfsfragen nicht zwingend beantworten. Nach 3 Minuten, blättere für 10 Sekunden zum nächsten Bild.

Appendix 3.2 - Dutch introduction text

In het volgende onderdeel zul je 8 plaatjes voor telkens 10 seconden zien. Op iedere plaatje volgt een pauze van 3 minuten. Sla het blad na begin van de pauze om, zodat je het laatste plaatje niet meer kunt zien. Schrijf in 3 minuten een korte, de situatie van het laatste plaatje beschrijvende verhaal. Kijk niet nog een keer naar het laatste plaatje! Als je niet weet wat je moet schrijven, dan kun je de 4 steunende vragen op het responsformulier ter ondersteuning gebruiken, maar het is niet verplicht deze te met het verhaal te beantwoorden. Draai het formulier na 3 minuten om en kijk voor 10 seconden naar het volgende plaatje.

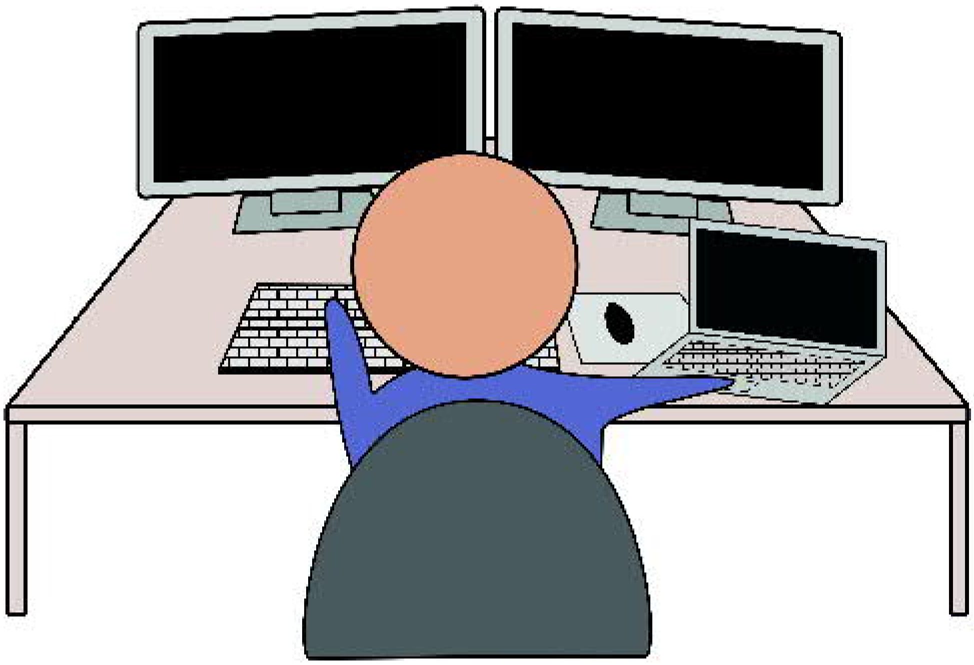
Appendix 4 - Sources of the behavioral tendency subcategories

Source	BT - Hedonism	BT - Utilitarianism	BT - Geekism
Schwartz (1992)	Pleasure / Enjoying life	Ambition / Success Influence Capability / Intelligence	
Passlick (2013)			Expertise High time investment Interest in progress of technology Interest in deeper understanding / Curious about functioning Joy through knowledge / Joy through challenge Interest in versatile products / Re-using products Being in control of one's device/data
Personally added	Esthetical appreciation Expected social appreciation	Improving efficiency / Ease of use	

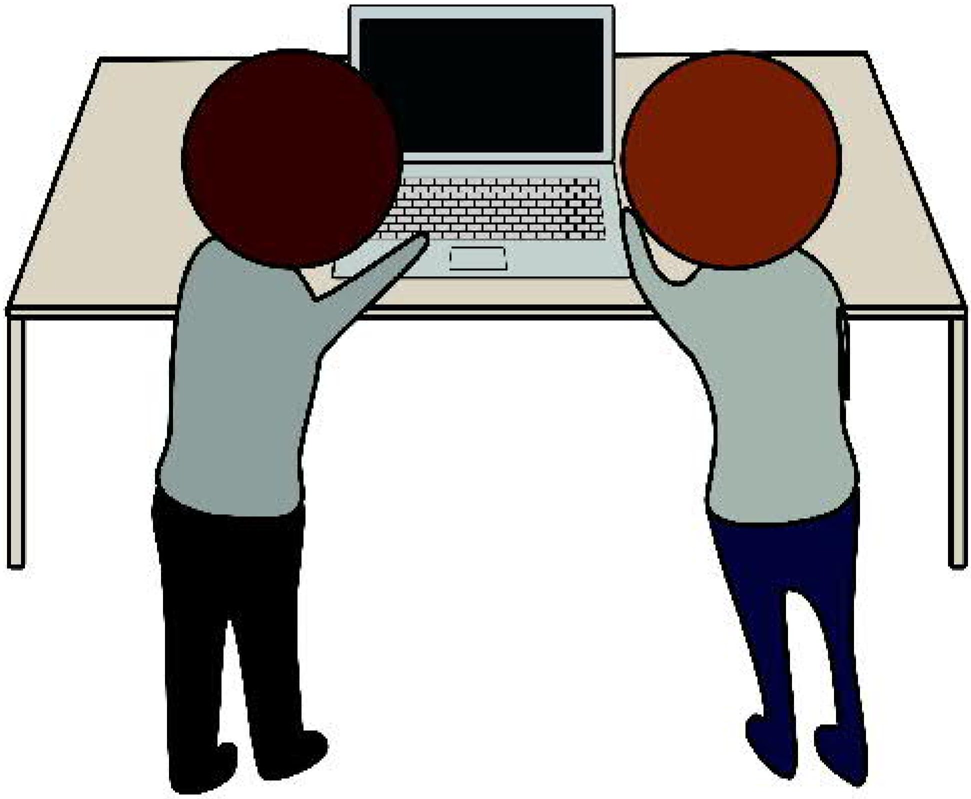
Appendix 5 - PSE images

I-1

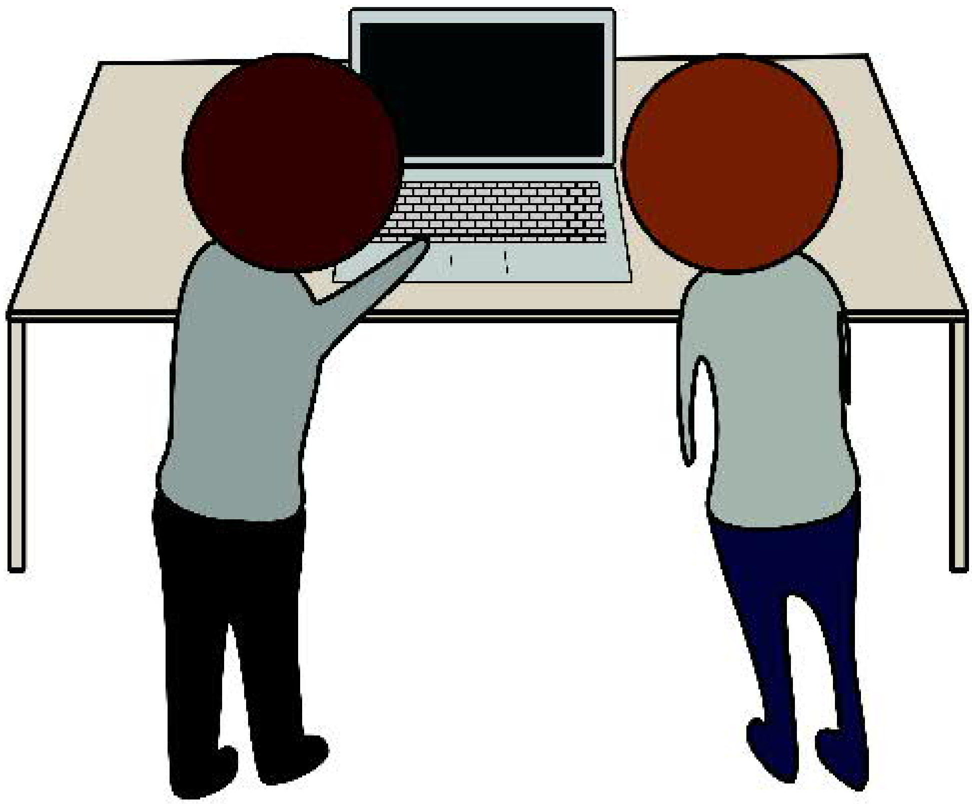
I-2



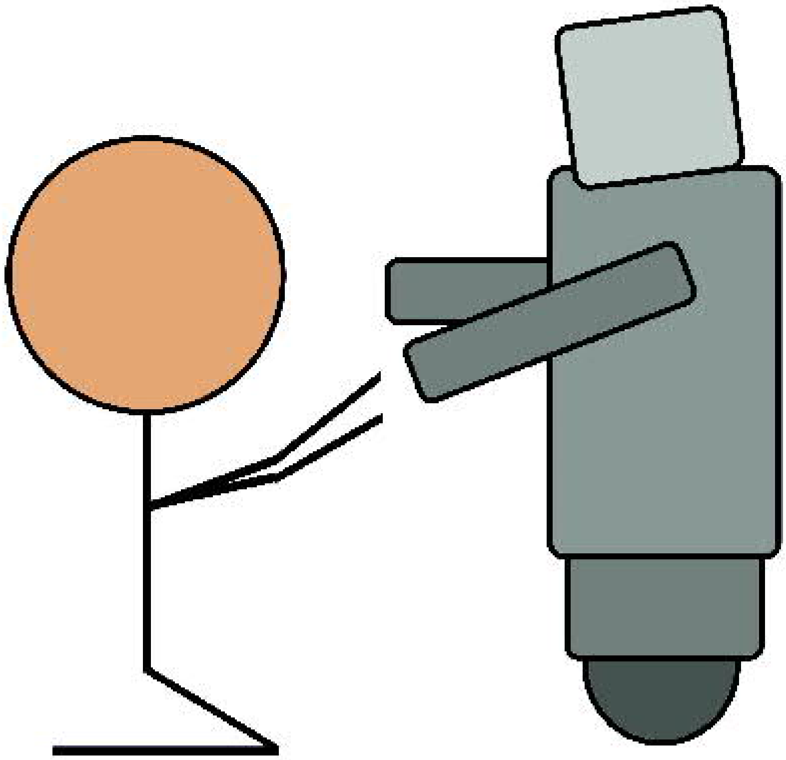
I-3



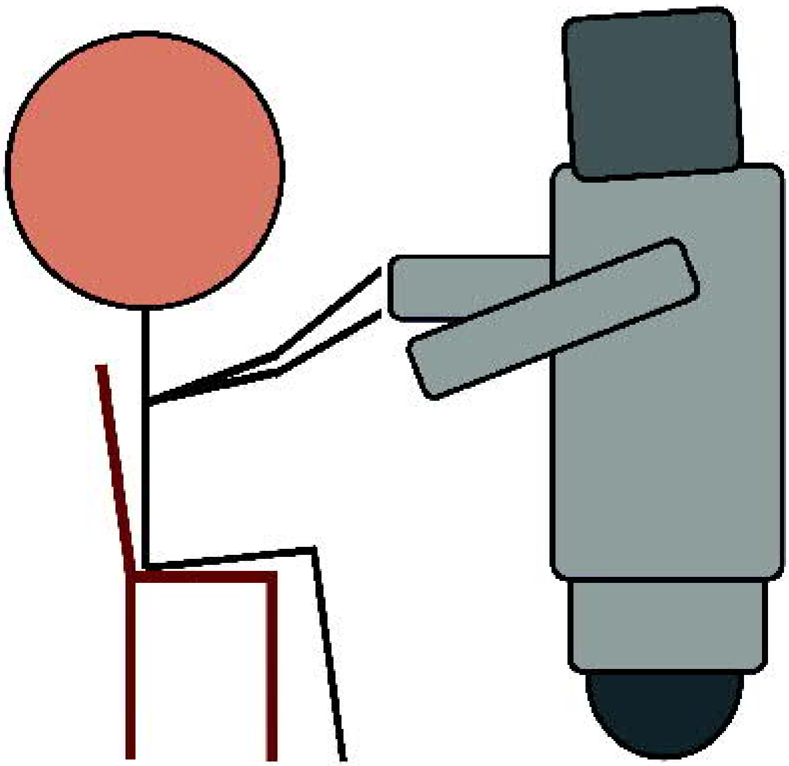
I-4



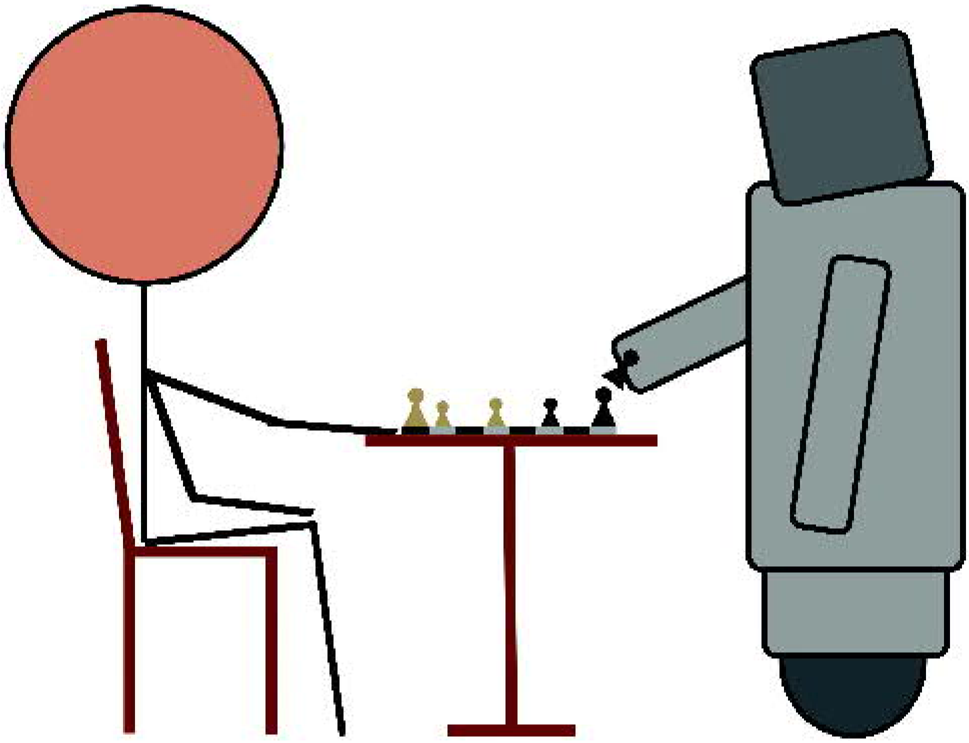
I-5



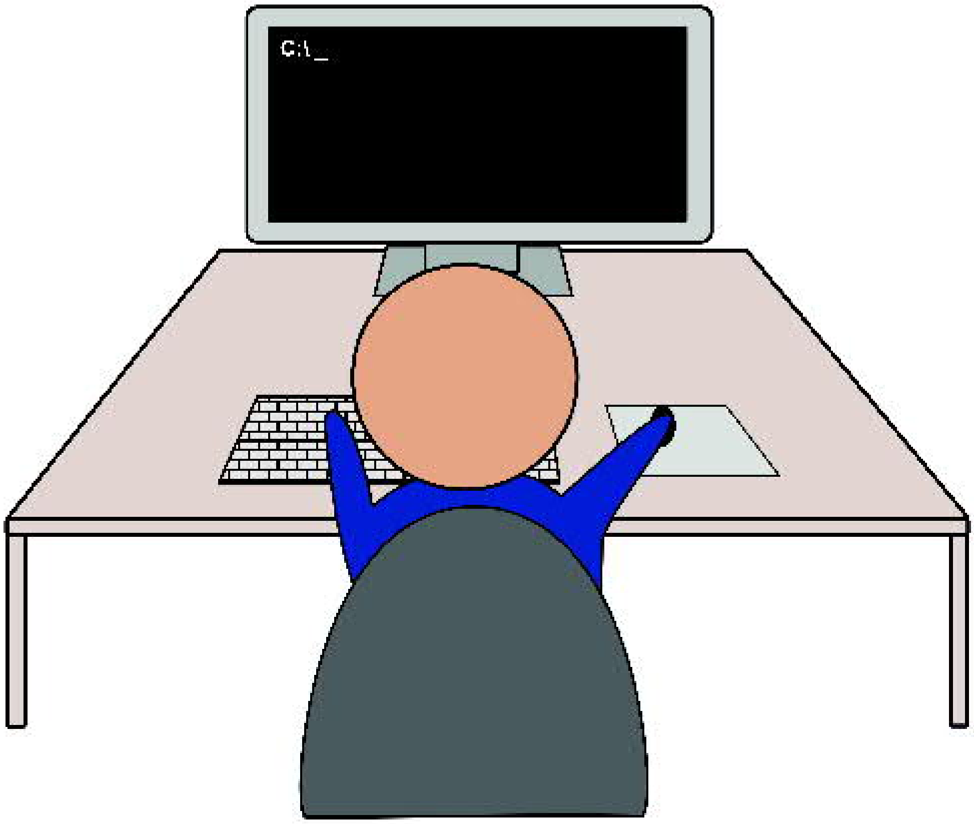
I-6



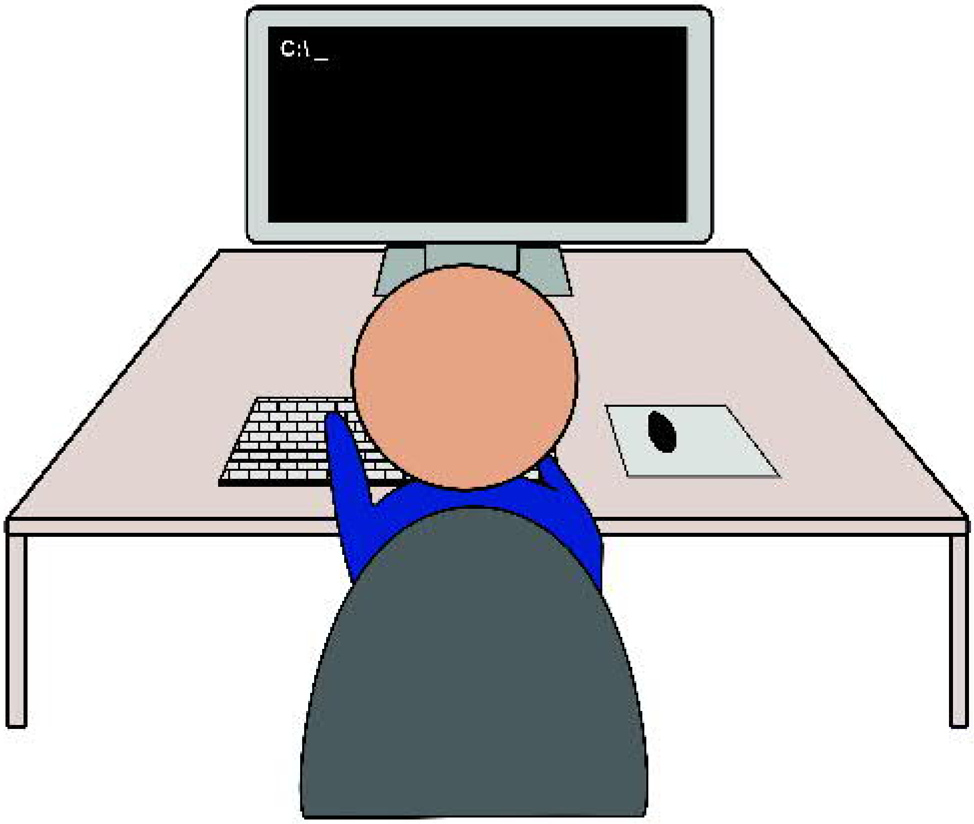
I-7



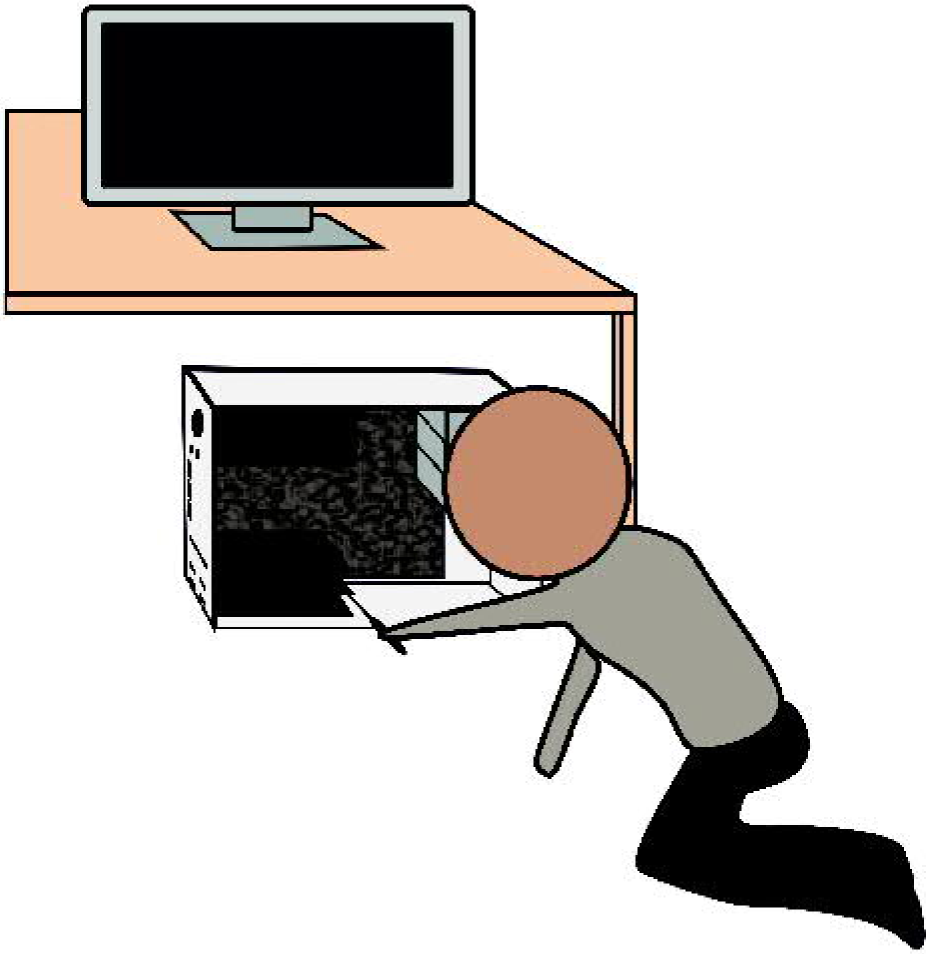
I-8



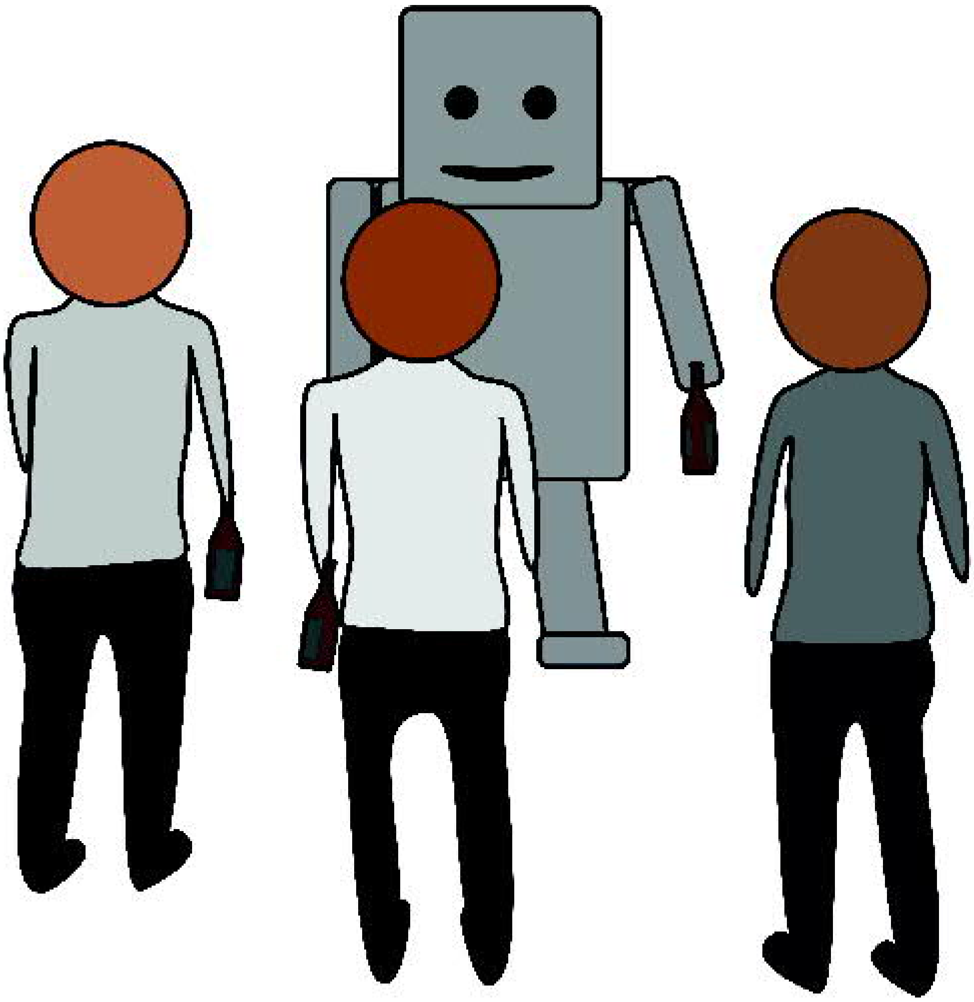
I-9



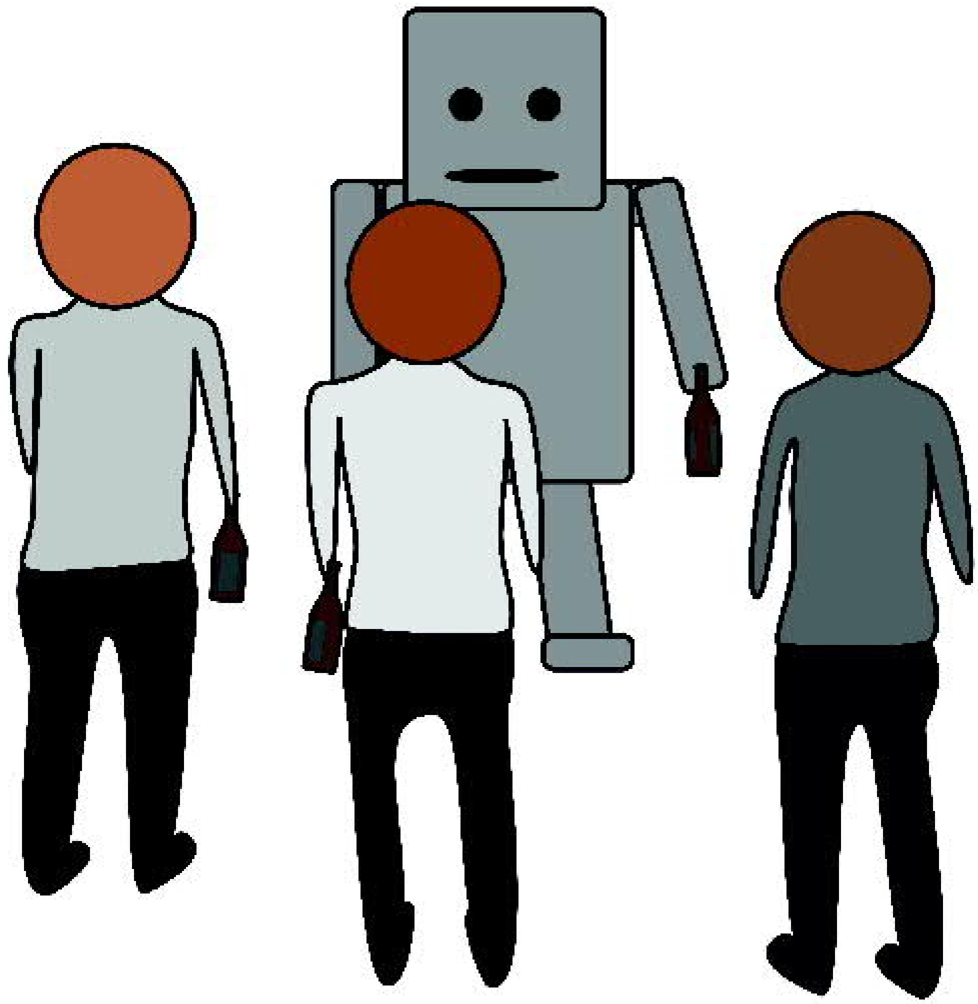
I-10



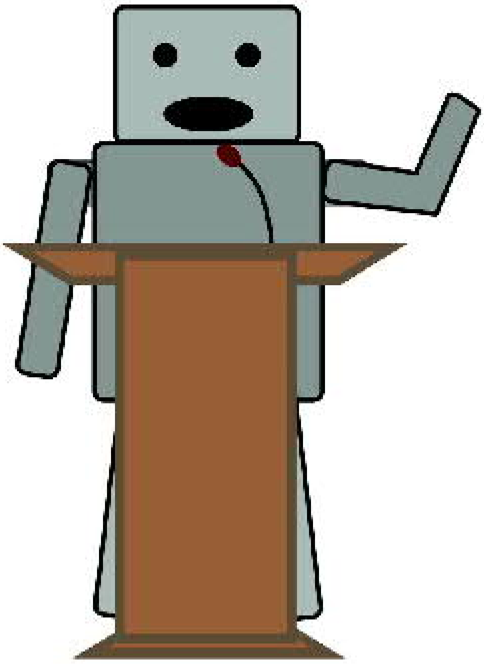
I-11



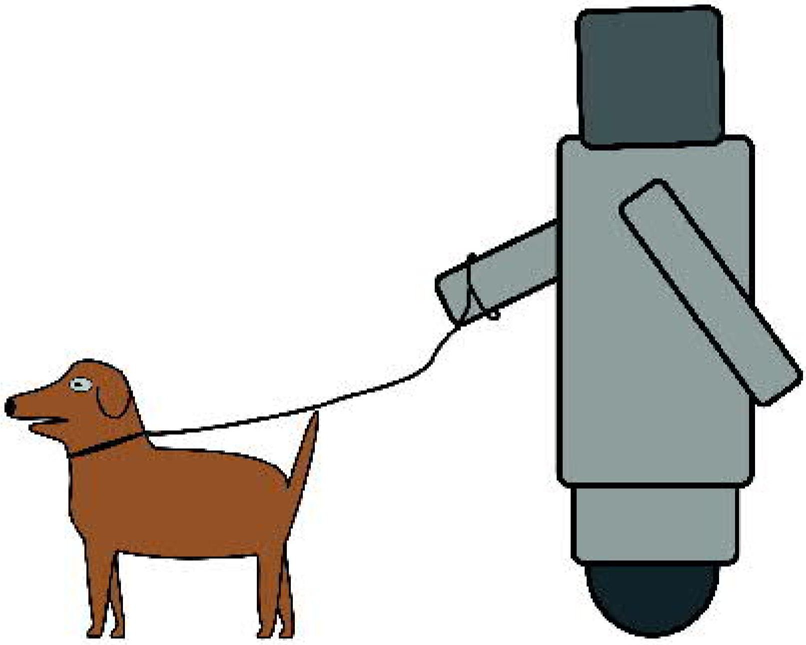
I-12



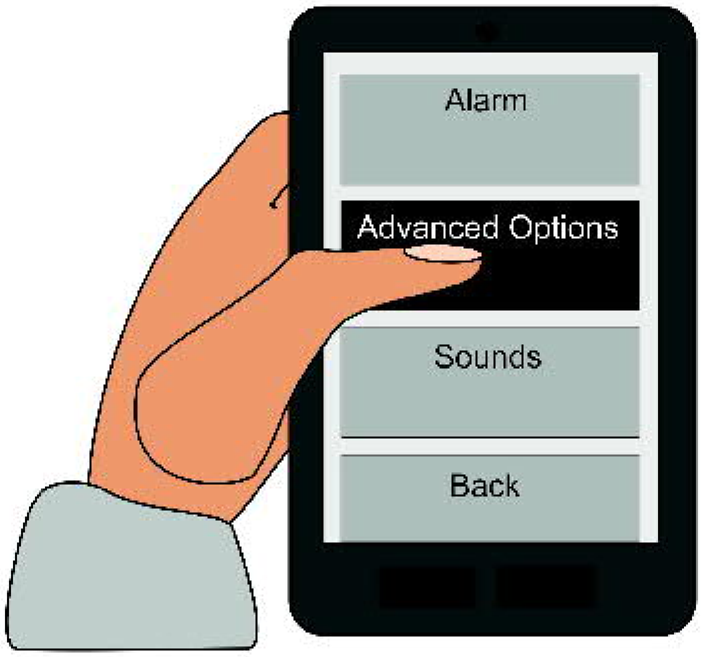
I-13



I-14



I-15



Appendix 6.1 - German response form

Hilfsfragen:
- Was führte zu der gezeigten Situation?
- Was geschieht gerade?
- Was fühlen und denken die gezeigten Personen?
- Wie wird die Geschichte ausgehen?

Appendix 6.2- Dutch response form

steunende vragen:

- Wat leidde tot de getoonde situatie?
- Wat gebeurt momenteel?
- Wat voelen en denken de getoonde personen?
- Hoe zal het verhaal eindigen?

Appendix 7 - Transcript of responses used for Cohen's Kappa estimation

Key: Hedonism, Utilitarianism, Geekism

Image 1

Referential coding:

Der Junge auf dem Bild hat Schwierigkeiten Leute kennenzulernen. Weil er schüchtern is[t] traut er sich nicht Leute anzusprechen fühlt sich auch auf Feiern und Orten wo viele Leute sind, unwohl . Im Internet und bei Online-Spielen jedoch, hat er schon viele Leute kennengelernt. Hier fühlt er sich sicher und akzeptiert.

Second coding:

Der Junge auf dem Bild hat Schwierigkeiten Leute kennenzulernen. Weil er schüchtern is[t] traut er sich nicht Leute anzusprechen fühlt sich auch auf Feiern und Orten wo viele Leute sind, unwohl . Im Internet und bei Online-Spielen jedoch, hat er schon viele Leute kennengelernt. Hier fühlt er sich sicher und akzeptiert.

Third coding:

Der Junge auf dem Bild hat Schwierigkeiten Leute kennenzulernen. Weil er schüchtern is[t] traut er sich nicht Leute anzusprechen fühlt sich auch auf Feiern und Orten wo viele Leute sind, unwohl. Im Internet und bei Online-Spielen jedoch, hat er schon viele Leute kennengelernt. Hier fühlt er sich sicher und akzeptiert.

Image 2:

Referential coding:

Die Person auf diesem Bild arbeitet als Grafikdesigner. Sie befindet sich gerade im Büro bei der Firma, wo sie tätig ist und arbeitet an einem Auftrag . Da auch häufig große und detail[l]ierte Fotos bearbeitet werden müssen, hat die Person zwei groß[e] Bildschirme + einen Laptop an dem administrative Dinge erledigt werden können.

Second coding:

Die Person auf diesem Bild arbeitet als Grafikdesigner. Sie befindet sich gerade im Büro bei der Firma, wo sie tätig ist und arbeitet an einem Auftrag . Da auch häufig große und detail[l]ierte Fotos bearbeitet werden müssen, hat die Person zwei groß[e] Bildschirme + einen Laptop an dem administrative Dinge erledigt werden können.

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Image 3:

Referential coding:

Auf diesem Bild sieht man zwei Schüler im Klassenraum, die zusammen an einem Projekt für den Unterricht arbeiten. Auch wenn sie noch etwas unerfahren mit Powerpoint sind , freuen sie sich endlich einmal am Laptop arbeiten zu dürfen . Sie nehmen die Präsentation ernst und haben auch etwas Angst, da sie sie später vor der Klasse vorstellen sollen.

Second coding:

Auf diesem Bild sieht man zwei Schüler im Klassenraum, die zusammen an einem Projekt für den Unterricht arbeiten. Auch wenn sie noch etwas unerfahren mit Powerpoint sind , freuen sie sich endlich einmal am Laptop arbeiten zu dürfen . Sie nehmen die Präsentation ernst und haben auch etwas Angst, da sie sie später vor der Klasse vorstellen sollen.

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Auf diesem Bild sieht man zwei Schüler im Klassenraum, die zusammen an einem Projekt für den Unterricht arbeiten. Auch wenn sie noch etwas unerfahren mit Powerpoint sind , freuen sie sich endlich einmal am Laptop arbeiten zu dürfen . Sie nehmen die Präsentation ernst und haben auch etwas Angst, da sie sie später vor der Klasse vorstellen sollen.

Image 4:

Referential coding:

Dieses Bild zeigt eine Person, die einen frisch entwickelten Roboter testet. Dieser Roboter soll bei vielen alltäglichen Situationen Hilfestellung leisten können . Der Mensch simuliert hier eine Situation, bei der der Roboter einer körperlich eingeschränkten Person beim Aufstehen helfen soll.

Second coding:

Dieses Bild zeigt eine Person, die einen frisch entwickelten Roboter testet. Dieser Roboter soll bei vielen alltäglichen Situationen Hilfestellung leisten können . Der Mensch simuliert hier eine Situation, bei der der Roboter einer körperlich eingeschränkten Person beim Aufstehen helfen soll.

Third coding:

Dieses Bild zeigt eine Person, die einen frisch entwickelten Roboter testet. Dieser Roboter soll bei vielen alltäglichen Situationen Hilfestellung leisten können. Der Mensch simuliert hier eine Situation, bei der der Roboter einer körperlich eingeschränkten Person beim Aufstehen helfen soll.

Image 5:

Referential coding:

Dieses Bild zeigt wie eine Person mit einem neu entwickelten Roboter Schach spielt. Die Person lebt in einem Altenheim und findet hier ansonsten keine andere Person, die fähig ist Schach zu spielen.

Second coding:

Dieses Bild zeigt wie eine Person mit einem neu entwickelten Roboter Schach spielt. Die Person lebt in einem Altenheim und findet hier ansonsten keine andere Person, die fähig ist Schach zu spielen.

Third coding:

Dieses Bild zeigt wie eine Person mit einem neu entwickelten Roboter Schach spielt. Die Person lebt in einem Altenheim und findet hier ansonsten keine andere Person, die fähig ist Schach zu spielen .

Image 6:

Referential coding:

Die Person auf dem Bild ist Student und arbeitet an einer Aufgabe für den Informatik-Kurs. Eigentlich ist programmieren nicht ihr Fachgebiet, aber da kommt sie im Mathestudium nicht herum . Da sie für dieses Fach jedoch viele Credits bekommt, ist sie motiviert und gibt sich Mühe.

Second coding:

Die Person auf dem Bild ist Student und arbeitet an einer Aufgabe für den Informatik-Kurs . Eigentlich ist programmieren nicht ihr Fachgebiet, aber da kommt sie im Mathestudium nicht herum. Da sie für dieses Fach jedoch viele Credits bekommt, ist sie motiviert und gibt sich Mühe .

Third coding:

Die Person auf dem Bild ist Student und arbeitet an einer Aufgabe für den Informatik-Kurs. Eigentlich ist programmieren nicht ihr Fachgebiet , aber da kommt sie im Mathestudium nicht herum. Da sie für dieses Fach jedoch viele Credits bekommt , ist sie motiviert und gibt sich Mühe .

Image 7:

Referential coding:

Die Person auf dem Bild ist normalerweise nicht sehr vertraut mit dem Innenleben eines Computers , da jedoch kein Fachgeschäft mehr offen hat, sucht sie selber nach der Ursache für den Defekt des Computers. Ein wenig Stress hat die Person schon, da sie große Angst hat, etwas an dem Computer zu beschädigen.

Second coding:

Die Person auf dem Bild ist normalerweise nicht sehr vertraut mit dem Innenleben eines Computers, da jedoch kein Fachgeschäft mehr offen hat, sucht sie selber nach der Ursache für den Defekt des Computers. Ein wenig Stress hat die Person schon, da sie große Angst hat, etwas an dem Computer zu beschädigen.

Third coding:

missing

Appendix 8.1 - Inter-rater agreement table

		Referential rater		
		True	False	Total
Second and third rater	True	21	4	25
	False	13	146 / 5.34 = 27.3 ≈ 27	40
Total		34	31	65

Appendix 8.2 - Inter-rater agreement table (just for BT-G)

		Referential rater		
		True	False	Total
Second and third rater	True	0	4	4
	False	1	566 / 5.34 = 106	107
Total		1	110	111

Appendix 9 - Table 13 - Generalized linear model parameter estimates

Parameter	B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	637,090	20,9853	595,959	678,220	921,657	1	,000
[geek word] * [control picture] * BT-G	-20,194	22,3545	-64,008	23,620	,816	1	,366
[geek word] * [geek picture] * BT-G	-6,883	19,5234	-45,148	31,382	,124	1	,724
[geek word] * [neutral picture] * BT-G	5,269	24,9396	-43,612	54,149	,045	1	,833
[hedonist word] * [control picture] * BT-G	-28,749	32,3161	-92,087	34,589	,791	1	,374
[hedonist word] * [geek picture] * BT-G	-9,216	25,9576	-60,093	41,660	,126	1	,723
[hedonist word] * [neutral picture] * BT-G	-15,596	23,3691	-61,399	30,207	,445	1	,505
[utilitarian word] * [control picture] * BT-G	-12,795	26,3341	-64,409	38,819	,236	1	,627
[utilitarian word] * [geek picture] * BT-G	14,453	22,5727	-29,788	58,695	,410	1	,522
[utilitarian word] * [neutral picture] * BT-G	-8,467	24,5081	-56,502	39,568	,119	1	,730
(Scale)	50311,759						

Dependent Variable: Response time

Model: (Intercept), Stroop word prime * Stroop picture prime * BT-G

Appendix 10 - SPSS syntax

```
* Chart Builder.
GGRAPH
  /GRAPHDATASET NAME="graphdataset" VARIABLES=Age MISSING=LISTWISE
REPORTMISSING=NO
  /GRAPHSPEC SOURCE=INLINE.
BEGIN GPL
  SOURCE: s=userSource(id("graphdataset"))
  DATA: Age=col(source(s), name("Age"))
  GUIDE: axis(dim(1), label("Age"))
  GUIDE: axis(dim(2), label("Frequency"))
  ELEMENT: area(position(summary.count(bin.rect(Age, binCount(48)))),
missing.wings())
END GPL.

CTABLES
  /VLABELS VARIABLES=Gender geekField total_words DISPLAY=LABEL
  /TABLE Gender [C] + geekField [C] BY total_words [S][MEAN, MAXIMUM,
MINIMUM, STDDEV]
  /CATEGORIES VARIABLES=Gender ORDER=A KEY=VALUE EMPTY=INCLUDE
  /CATEGORIES VARIABLES=geekField ORDER=A KEY=VALUE EMPTY=EXCLUDE.

T-TEST GROUPS=Gender(1 2)
  /MISSING=ANALYSIS
  /VARIABLES=total_words
  /CRITERIA=CI(.95).

T-TEST GROUPS=geekField(0 1)
  /MISSING=ANALYSIS
  /VARIABLES=total_words
  /CRITERIA=CI(.95).

CORRELATIONS
  /VARIABLES=zHimpl zUimpl zGimpl
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.

REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT zGimpl
  /METHOD=ENTER zUimpl.

* Chart Builder.
GGRAPH
  /GRAPHDATASET NAME="graphdataset" VARIABLES=Uimpl Gimpl MISSING=LISTWISE
REPORTMISSING=NO
  /GRAPHSPEC SOURCE=INLINE.
BEGIN GPL
  SOURCE: s=userSource(id("graphdataset"))
  DATA: Uimpl=col(source(s), name("Uimpl"))
  DATA: Gimpl=col(source(s), name("Gimpl"))
  GUIDE: axis(dim(1), label("Uimpl"))
  GUIDE: axis(dim(2), label("Gimpl"))
  ELEMENT: point(position(Uimpl*Gimpl))
END GPL.
```

```
CORRELATIONS
  /VARIABLES=zGimpl zGeekism zNCS zMPL zSelbstbestimmung
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.

REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT zGimpl
  /METHOD=ENTER zGeekism.

REGRESSION
  /MISSING LISTWISE
  /STATISTICS COEFF OUTS R ANOVA
  /CRITERIA=PIN(.05) POUT(.10)
  /NOORIGIN
  /DEPENDENT zGeekism
  /METHOD=ENTER zGimpl zMPL.

CORRELATIONS
  /VARIABLES=zUimpl zErfolg zNCS zCommitment
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.

CORRELATIONS
  /VARIABLES=zHimpl zHedonismus zPassion zIntimacy
  /PRINT=TWOTAIL NOSIG
  /MISSING=PAIRWISE.

* Generalized Estimating Equations.
GENLIN RT BY primeCat HUG (ORDER=ASCENDING) WITH zHimpl zUimpl zGimpl
  /MODEL HUG*zHimpl HUG*zUimpl HUG*zGimpl INTERCEPT=YES
 DISTRIBUTION=NORMAL LINK=IDENTITY
  /CRITERIA SCALE=MLE PCONVERGE=1E-006(ABSOLUTE) SINGULAR=1E-012
ANALYSISTYPE=3(WALD) CILEVEL=95 LIKELIHOOD=FULL
  /REPEATED SUBJECT=Subj SORT=YES CORRTYPE=EXCHANGEABLE ADJUSTCORR=YES
COVB=ROBUST MAXITERATIONS=100 PCONVERGE=1e-006(ABSOLUTE) UPDATECORR=1
  /MISSING CLASSMISSING=EXCLUDE
  /PRINT CPS DESCRIPTIVES MODELINFO FIT SUMMARY SOLUTION.

* Generalized Estimating Equations.
GENLIN RT BY HUG primeCat (ORDER=ASCENDING) WITH zGimpl Trial Age
  /MODEL HUG*primeCat*zGimpl INTERCEPT=YES
 DISTRIBUTION=NORMAL LINK=IDENTITY
  /CRITERIA SCALE=MLE PCONVERGE=1E-006(ABSOLUTE) SINGULAR=1E-012
ANALYSISTYPE=3(WALD) CILEVEL=95 LIKELIHOOD=FULL
  /REPEATED SUBJECT=Subj SORT=YES CORRTYPE=EXCHANGEABLE ADJUSTCORR=YES
COVB=ROBUST MAXITERATIONS=100 PCONVERGE=1e-006(ABSOLUTE) UPDATECORR=1
  /MISSING CLASSMISSING=EXCLUDE
  /PRINT CPS DESCRIPTIVES MODELINFO FIT SUMMARY SOLUTION.
```