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Susanne Friederike Schmehl

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*Glücklich ist wer nie verlor,
im Ernst des Lebens
den Humor.*

altes deutsches Sprichwort

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1 INTRODUCTION

Laughter seems to be a social signal. People laugh because they experience pleasure, they laugh to cement friendships, they laugh to defuse a situation or to motivate a humorist to keep on being funny. But not everyone laughs for the same reasons. Some find certain jokes funny and some do not. There are individual differences as well as sex differences in the perception and the production of humor. This study will focus on sex differences in humor appreciation.

1.1 EVOLUTIONARY CONSTRAINTS LEADING TO SEX DIFFERENCES

Evolutionary Psychology is settled within the framework of evolutionary theory. Especially sexual selection is a means to explain given sex differences. In sexually reproducing species, any heritable traits that help with competing for sexual mates will tend to spread through a species, even if it is somehow a compromise to survival. In response to given mate preferences sex differences occur in human behavior as well as in human cognition. As humor appreciation is connected to both, cognition and behavior, the purpose of this study is to examine sex differences in humor appreciation. Evolutionary concepts that could elucidate sex differences in humor appreciation are explained in the section below.

1.1.1 Asymmetric Parental Investment and Mate Selection

Taking a look at sexual reproduction, the theory of asymmetric parental investment (Trivers 1972) and its consequences, will arise as a main topic. Investment are any substantial and energetic costs a parent has to pay to increase the offspring's chance of surviving and therefore its own reproductive success. Parental investment includes not only the metabolic investment in the gametes, but any other investment that benefits the young individual (such as feeding or child guarding). Among almost all sexually reproducing species, females invest more than males, since female gametes (eggs) are larger and more costly to produce than male gametes (sperm). In mammals, this situation is aggravated by internal fertilization and gestation and long-

term lactation leading to a significant difference between male and female parental investment. In 95% of mammals, females provide all the parental care (Clutton-Brock 1991). According to these facts, females should be very choosy, because misconduct would lead her to extremely high costs, even higher than they are anyway. The only way to reduce female costs is parental support. On the other hand, males compete more intensely amongst themselves for access to females, than vice versa. This competition increases the potential for sexual selection (Bateman 1948; Trivers 1972) and leads us to a male-display, female-choice mating system. Sexual competition can be seen as the behavioral outcome of mate choice by the other sex. Choice includes both conscious and unconscious, and both psychological and physiological processes. Mate choice operates by rejecting some potential mates and accepting others. Two theories of sexual selection are well established: The good genes hypothesis and the sexy sons hypothesis. Of course mate choice can favour other qualities such as parental abilities and resources (Clutton-Brock 1991), fertility (fecundity and sperm quality) (Baker and Bellis 1993), similarity in appearance, personality and behavior (Buss 1985). Sexually selected traits are typically found in males. Preferred traits are said to be cues of resource quality rather than good genes. Women select for status and height to provide sufficient resources to their offspring, while men tend to choose women who carry neotenous features, and are therefore attractive, to ensure reproductive success.

Male-male-competition

Evolutionary theories suggest that young men are prone to aggression, risk-taking and violence, because they dismiss their future in favour of the current reproductive competition. Compared to other social groups young men are more likely to be victims of homicides, assaults, robberies, and car accidents (Chisholm 1999; Daly and Wilson 2001; Fetchenhauer and Rhode 2002). Wilson and Daly (1985) labeled this phenomenon as young male syndrome. They observed that there is no sex difference in children up to ten years regarding the likelihood of becoming a victim of homicide. This risk increases during adolescence, culminating in the mid-twenties. At that age men are six times more likely to become a victim of homicidal attempts, than women. The curve declines rapidly after this peak, suggesting that men begin to

avoid physical danger and risky tactics. Young men constitute the demographic class upon which there was the highest selection for confrontational competitive competence among our ancestors (Daly and Wilson 1994). In order to compete successfully for mates, our young male ancestors had to display formidable physical prowess in hunting, tribal defense, tribal raids and the ability to defend his interests. Demonstrating bravery, furthermore, may have influenced the lifetime reputation of a man, and therefore his reproductive success. This assumption is supported by the finding that young males display bravery only in the presence of an audience. Competition is an inherent part of our biological status.

Female competition

There is also competition amongst females. Initial research on female competition (Goodwin 1980; Gilligan 1982) found that girls tend to avoid competition. They rather follow tactics preserving interpersonal harmony and diffusing conflict. This degradation of competition in favor of sustaining friendships reflects the socialization into cultural norms against the apparent expression of conflict among females (Miner and Longino 1987; Tracy 1991). Research has identified that female competition is mostly on appearance, popularity and preservation of a "good" sexual reputation (Merten 1997; Brown 1998; Simmons 2002; Tanenbaum 2002). These topics are tightly connected since popularity is associated with physical attractiveness to the opposite sex. Many women compete for things they think men value (Tanenbaum 2002). But women also care more about opinions on attractiveness of women than the opinions of men (Graziano, Jensen-Campbell et al. 1993).

1.1.2 Patrilocality and the Social Preoccupation of Women

Patrilocality is a characteristic social system of most traditional societies (Van den Berghe 1979) whereby women leave their natal group to live in their husband's natal community. Among humans the majority of societies are patrilocal, e.g. in hunter-gatherer societies 56-62% (Ember 1978) live patrilocal. This may be a consequence of the fact that in most of these cultures males are able to control resources, like land and hunting grounds that women need for successful reproduction. In economic-type societies 69% (Van den Berghe 1979) are patrilocal.

As one consequence of female exogamy women must seek integration into a foreign group in order to enhance their chances of survival and reproduction. They must adapt to the new surrounding, including social integration. So, if language evolved to facilitate the group-cohesion (Dunbar 1993) and patrilocality was the social system of our ancestors, women should be the ones who "invented" language and thus can be expected to have better verbal skills. Early studies (Moore 1922; Landis and Burt 1924) suggest that topics of conversations depend on the sex of the participants. They found that 50% of their male-male dyads focused on business, about 15% on sports/leisure and 12% on the behavior of other males. In contrast, all-female conversations primarily focused on men (22-44% of conversations), followed by clothes (about 20%) and other women (about 20%). Dunbar (1997) found that social information exchange appears to be the predominant use to which language is put. He (Dunbar 1993) also stated that in most primate species, females give coherence to and form the core of the group. Males are less constant in their social affiliations. Among modern humans women are said to have better verbal skills and to be more skillful in the social domain than men. Knight (1990) argued that language first evolved to allow females to band together and force the males to invest in them and their offspring, mainly by hunting for meat. Maybe language evolved through the need for a tool to form and maintain female alliances.

Cooperative breeding

Sherman et al. (1995) established the term of cooperative breeding. Humans seem to have evolved as cooperative breeders, which means that allomothers help - to varying degrees - the mothers to protect, to carry or to provision their infants. Allomothers are individuals that are not genetically related to the infants, but help their parents with rearing him or her. Especially the young and inexperienced females carry and rear the babies so that their mothers are freed to forage more efficiently. The inter-birth intervals become shorter and infant mortality is reduced. Studies on primates have shown that if mothers are able to delegate only a small portion of child-raising-costs to allomothers they are ready to breed again after shorter intervals than would mothers without assistance. Data from human hunter and gatherers indicate that allomaternal assistance contributes to larger family sizes (in foraging

societies). This might be due to the reduction of the energetic burden on the mother (Hewlett, Lamb et al. 2000). However, if the mother is not able to rear alone (due to slow-maturing or especially costly offspring), she has to gamble on having help. Therefore she has to be very skillful in the social domain as well.

In-group-out-group

Traditional societies are based on clans. Human societies were characterized by this type of organization throughout the evolution of humans. The family is the smallest unit of a group and consists of genetically related members. About 80% to 90% of the not-by-marriage-related persons are siblings, aunts and uncles (Eibl-Eibesfeldt 1998). Group members are born into their group and grow up there. A child evolves a relationship to the other group members, learns their language and how to interact with the others, their norms, their values and traditions and identifies himself then with his group. Unrelated members of an individualized group were then able to bond by means of additional cultural institutions and therefore act in concert in certain situations (e.g. war) (Eibl-Eibesfeldt 1998). On the other hand, group identification was crucial for males that stayed in their natal community in a patrilocal system, and were therefore able to recognize an out-group. One means to ensure group cohesion is to laugh at an out-group. Sharing jokes enhances in-group solidarity through mutual enjoyment and the achievement of consensus (Alexander 1986). Humor can increase self-reported cohesion in group-members. Humor seems to bind groups just as play does (Banning and Nelson 1987; Vinton 1989).

1.2. HUMOR AND LAUGHTER

Humor and laughter have always been a topic of interest and we all know what it feels like to experience humor. Depending on how amusing the stimulus appears to be, it might cause us to grin, to smile or to burst out in guffaws of laughter. Most of us experience humor several times a day and it makes us feel well and pleasurable. The steady presence of humor might let one think that we understood how humor works and that there is no need to do research on it. But humor is a very complex topic and there is still no general definition of it. As laughter is highly correlated with subjective ratings of funniness (Chapman 1983), one could define humor in terms of its

characteristic expression or emotional display (Weisfeld 1993), as long as this display is evoked by a stimulus that is perceived as funny. The more expressive this display, the more intense the emotion. In the following section I will focus on what humor is and how to measure it. Additionally, I will emphasize on the need of an ethological approach for measuring the amount of humor appreciation.

1.2.1 What is Humor?

Humor is a broad term that refers to anything that people do or say that is perceived as funny and tends to make others laugh, as well as the mental processes that include both perceiving and creating a humorous stimulus (Martin 2007). McGhee (1979) stated that humor, or humorous stimuli, are notoriously difficult to define or classify. There are several problems with the definitions of humor. Laughter or smile are not only connected to humor, but accompany also other emotional states, such as triumph and anxiety (Monroe 1951) and almost any pleasurable state, therefore it is not a specific indicator of humor anymore (LaFrance 1983). Due to these limitations of defining humor by its displays or cognitive properties empirical research on humor is scarce.

In the fauna, animals tend not to show any displays unless they gain a benefit. Displays are costly and they consume metabolic energy and attract the attention of predators. An animal only shows a costly display when a payoff, for example by influencing another animal, can be achieved.

So what is the benefit of laughing about a humorous event? First, laughter is taken as a compliment to our talking or our wit. This is not only specific to laughter, but also to other emotional expressions, such as smiling, which is also rewarding. The fact that laughter occurs even when there is no humor in a conversation (Provine and Fischer 1989) suggests that perhaps we learn that laughter keeps the interlocutor talking. Therefore laughter is a means for giving feedback and eliciting information. According to Weisfeld (1993) the functional explanation for humor is that it provides the recipients with stimulation or information that will subsequently enhance their fitness. Laughter can be seen as an evolved, rewarding emotional expression that has the effect of motivating the humorist to continue providing stimulation or information of humor to the recipient. Laughter in response to wit often carries a

connotation of appreciation or gratitude, i.e. an implied promise to reciprocate for a favour received.

The fact that humor arises mostly in the presence of others, shows that it is a social phenomenon (Jakobs, Manstead et al. 1999). Bergson (1911) stated that it is an eminently social activity. Humor and laughter are thought to originate in social play (Van Hoof 1972). Thus, the adaptive functions of humor are likely to be closely linked to the functions of play. Many theorists have suggested that the evolutionary benefits of play are related to facilitating the development of various adaptive skills (Panksepp 1998; Batson 2005). Some authors have suggested that play helps individuals to learn social skills, such as behaviors that facilitate social bonding and cooperation, but also competitive social skills, that promote social rank, leadership and communication. Other authors argued that play serves as a function increasing physical fitness, cognitive abilities, and creativity (Smith 1982).

1.2.2 Various Types of Humor

Incongruity and Resolution Theory

Incongruity theories of humor focus specifically on cognition and give but little attention to the social and emotional aspect of humor. These theories suggest that incongruity perception is the key determinant of something being funny or not. Things are funny, when they are incongruous, unusual, surprising, or simply different from what we expect. Therefore incongruity somehow provides a basis for humor.

Incongruity is usually defined as a conflict between what is expected and what actually happens in a joke. This concept accounts well for the structural feature of most jokes - the punchline is very surprising. However, some theorists have argued that incongruity alone is not sufficient to represent the structure of humor. They suggest that there is a second, more subtle aspect of jokes which makes incongruity meaningful or appropriate by resolving or explaining it (Shultz 1972; Suls 1972).

Nerhardt (1970) as well as Deckers and Kizer (1974) found that subjects laughed or smiled more frequently when the discrepancy between an expected weight of an object to be lifted by the subject and its actual weight increased.

Incongruity seems to be a feature in humor around the world. Shultz (1972) found that incongruity characterized the vast majority of humorous tales, riddles and jokes in every culture.

Schadenfreude for misfortune and Schadenfreude for dangerous or hurtful actions

Schadenfreude roughly is the pleasure attained from the misfortune of others. Many studies on schadenfreude are based on social comparison theory (Festinger 1954), based on the notion that when people around us have bad luck, we appear better to ourselves. Superiority theory of humor itself traces even farther back to Thomas Hobbes (cited in La Fave, Haddad et al. 1996), explaining that an individual laughs about misfortune of others, because he or she feels a joy being superior to them. Greenland Eskimos used to resolve disputes by engaging in a public contest of ridiculing each other (Levine 1977). Chapman (1984) proposed that a group's rank order may be observable in its pattern of who ridicules who and who laughs at who, just as evaluative comments were observed to flow down the hierarchy during a volleyball game (Weisfeld and Weisfeld 1984).

To find appropriate humor categories adequate to evolutionary principles, we created two sublevels of the category schadenfreude: First, schadenfreude for misfortune, which is for example if someone stumbles across his/her own shoelaces, but doesn't get hurt seriously. And second, Schadenfreude for dangerous or hurtful actions, which is the more aggressive subcategory, implying that something really dangerous or even life-threatening happens.

Violation of social norms

The violation of social norms means showing inappropriate behavior such as nose picking, being loud in public or running around naked. This humor category has a component of incongruity - because there is a discrepancy between what is expected and what actually happens - as well as superiority - 'I can behave much better than you' - in it.

Wordplay

A phonological ambiguity occurs when a given sound sequence can receive more than one interpretation. There are many examples of jokes or wit that involve

wordplay. During humor development it is characteristic for preschoolers that they find it funny to play with sounds. At about the age of seven, when they have acquired a certain capacity for understanding linguistic ambiguity, they find puns and other double-meaning jokes much funnier (McGhee 1983). Throughout life we continue to improve our mastery of language and therefore word plays should be amusing even in adulthood (Weissfeld 1993).

Misunderstanding

A misunderstanding is a failure to understand or interpret correctly. This category also contains wordplay and incongruity. It is mainly on communication failures.

Sexism

Sexism is the unfair treatment of people, especially women, because of their sex (Hornby 2005). The term was coined in the late 20th century. It refers to the belief or attitude that one gender or sex is inferior to or less valuable than the other. It can also refer to hatred of, or prejudice towards, either sex as a whole, or the application of stereotypes of masculinity in relation to men, or of femininity in relation to women (Brittan 1984). It is also called male and female chauvinism. Historically and across many cultures, sexism has resulted in the subjugation of women to men. Many men and women espousing feminism, masculinism and other ideologies have worked toward dispelling sexist beliefs. Since the graveness of the topic has been lowered a bit, one might find sexist jokes funny, because of its inappropriateness. It is a violation of social norms as well.

It is extremely difficult to distinguish between above humor categories. From a psychological point of view, all of the humor categories mentioned above merge into supercategories, namely incongruity-and-resolution and superiority. The single humor categories are kind of carriers to convey the content relevant to evolutionary principles. Nevertheless, incongruity and schadenfreude are separate humor categories in the present study because evolutionary theory suggests that there are gender differences in those categories. Incongruity is closely linked to verbal skills

and the violation of social norms and superiority plays a role in male-male competition.

1.2.3 How to Measure Humor?

A thing we can observe in our everyday life is that people laugh and smile when they find something funny. Humor and laughter seem to have an evolved basis and are therefore universals in humans (Darwin 1872), occurring in all cultures and virtually all individuals throughout the world (Apte 1985; Lefcourt 2001). All universal emotions are expressed under somewhat different circumstances in different cultures. This does not contradict the universality of facial expressions and therefore its evolved basis (Ekman 1973). In early development, laughter is one of the earliest social vocalizations emitted by human infants (McGhee 1979).

Humor corresponds to no characteristic overt behavior except for its display, smiling and laughter. Weisfeld (1993) suggests that laughter is a useful measure of the amount of humor appreciation occurring in a research setting, but the affect is primary (Zajonc 1984). Prior studies mainly examined humor appreciation as well as humor creation with questionnaires - so called self-report inventories (e.g. SHRQ (Martin and Lefcourt 1984); MSHS (Thorson and Powell 1993)). Despite that, there are some attempts to examine humor with behavioral measures (Ruch 1992) as well, but still they are based on questionnaires and not on direct behavior observation. Köhler and Ruch (1996) studied several measurement methods of humor appreciation and production and came to the conclusion that the assessment of the sense of humor and its components appear to be far from being satisfactory. This might be due to reasons of self-report questionnaires and therefore of a quite subjective measurement of the sense of humor in general. Due to scientific guidelines, I think it is very important to emphasize on an unbiased quantification of behaviors and hence, an objective measurement needs to be established.

As mentioned before, Anthony Chapman (1983) found that smiling and laughter are highly correlated with subjective ratings of funniness. Therefore, I will focus on direct observation of videotaped behavior to measure the grade of humor appreciation.

1.2.4 Sex Differences in Humor?

A number of studies were conducted over the past decades to investigate sex differences in humor appreciation. Much of the research suggested that men are more likely to produce humor, whereas women are more likely to act as an appreciative audience than to produce humor themselves (Lampert and Ervin-Tripp 1998). According to Miller (1998) this is because sexual selection makes males better display-producers and females better display-discriminators. Studies of humor appreciation generally indicate that men are more likely than women to enjoy humor containing aggressive and sexual themes, whereas women are more likely to enjoy so called "nonsense" humor (Groch 1974; Terry and Ertel 1974; Wilson 1975). Nowadays this might be different. Men were always allowed to make fun of sexual topics or at least were allowed to laugh about it. In contrast, society would have condemned women for doing so. According to Tannen (1986; 1990) men and women have different goals in conversations: for women, the primary goal of friendly conversation is intimacy, whereas for men the goal is positive self-presentation. These goals are also reflected in the ways men and women use humor. Women more often use humor to enhance group solidarity, whereas men more often use humor for the purpose of impressing others.

Based on this theoretical background I will test the following hypotheses:

H1: By reason of ancestral patrilocality and resulting superior female verbal skills, women should respond stronger to humor associated with communication.

H2: As men have been subject to strong intrasexual competition, they should respond stronger to aggressive humor.

H3: Women and men should respond equally to sex-related humor, because there are no evolutionary reasons for differences.

2 METHODS AND MATERIAL

2.1 PRE-STUDY: CHOICE OF STIMULI

To establish appropriate humor categories three men (mean age=29.33, SD=5.50, range=23-33) and three women (mean age=26.66, SD=4.61, range=24-32) were asked to watch 56 funny commercials and rate them on a questionnaire for their reasons of funniness. These causative items were cognitive incongruity (unexpected twists and turns), violation of social norms, word play, schadenfreude for misfortune, schadenfreude for dangerous/hurtful actions, misunderstanding and sexism. The data was aggregated by means. Next a Principal-Component-Analysis was conducted. (The rotation method was Varimax and the scores were saved as variables for each of the 56 movies.) Three factors resulted, explaining 59,15 % of the variance. We named the factors that arose from the PCA *Unconventional*, *Communication* and *Schadenfreude* (Fig. 1, Tab. 1). For the presentation to the subjects, we decided to choose the three commercials that had the highest factor loadings as well as the three commercials with the lowest factor loadings in each of the three factors. This resulted in 18 movies in total.

2.1.1 Content of Chosen Commercials

The following section gives a short description of the content of the chosen commercials.

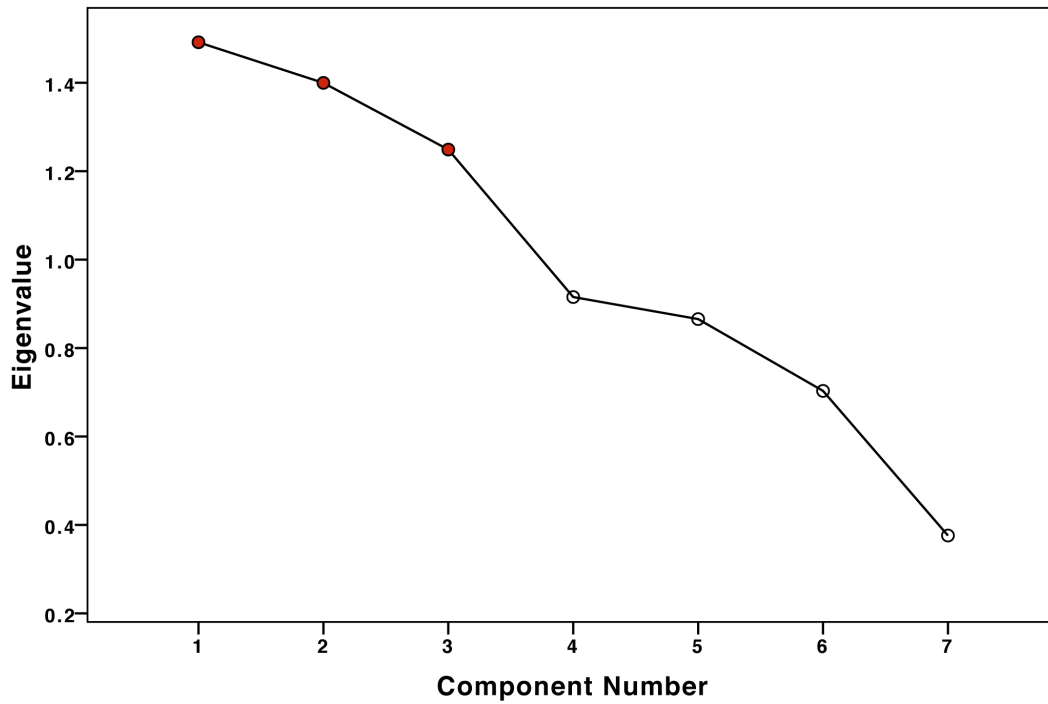


Figure 1: Screeplot of Factors. Component 1 was named *Unconventional*, Component 2 was named *Communication* and Component 3 was named *Schadenfreude*

Table 1: Factor loadings of humor categories
 Extraction Method: Principal Component Analysis, Rotation Method: Varimax with Kaisers
 Normalization; 59.15 % explained variance

	Unconventional	Communication	Schadenfreude
Violation of social norms	0.751	-0.096	-0.191
Sexism	0.570	-0.098	-0.051
Misunderstanding	-0.041	0.832	-0.097
Wordplay	-0.087	0.774	0.002
Schadenfreude for Dangerous Actions	-0.132	-0.093	0.757
Incongruity	-0.609	-0.210	-0.650
Schadenfreude for Misfortune	-0.399	-0.106	0.524

Table 2: Factor loadings of humor categories of the chosen commercials

	Factorloadings		
	Unconventional	Communication	Schadenfreude
Commercial No. 1			
The German Coast Guard	-0.76730	4.57580	0.40030
Commercial No. 2			
Kein Ostdeutsch	0.61728	2.88253	-0.01397
Commercial No. 3			
The Off-Road Vehicle	-1.11545	-0.72625	-0.97488
Commercial No. 4			
Don't Have Kids	1.98552	-0.41335	0.36020
Commercial No. 5			
Do You Know Who I Am?	0.67699	-0.09486	-1.35401
Commercial No. 6			
Blow Up Your Favourite Holiday Picture	3.03870	-0.38738	-0.30617
Commercial No. 7			
Winter Comes Quickly	-1.34253	-0.75539	0.13834
Commercial No. 8			
Sporty Cows	-1.05445	-0.67486	-1.54624
Commercial No. 9			
Bad Entertainment	0.64064	-0.38768	2.17264
Commercial No. 10			
Unfortunate Nixon	-1.09058	2.31531	0.20065
Commercial No. 11			
Hungry Stone Age Family	0.04921	-0.31541	2.6384
Commercial No. 12			
Smart Fishing	-1.05445	-0.67486	-1.54624
Commercial No. 13			
Swine Virus?	-1.15710	-0.33546	-0.65511
Commercial No. 14			
Fast Camera Car	-1.05445	-0.67486	-1.54624

	Factorloadings		
	Unconventional	Communication	Schadenfreude
Commercial No. 15 Live Insurance Comes With Motorcycle Insurance	-0.8389	-0.57153	2.69078
Commercial No. 16 Hands Free Phones	0.09071	1.77592	-0.35585
Commercial No. 17 Telling The Truth	2.6584	-0.16561	0.06417
Commercial No. 18 Too Good To Be True	-0.13229	-0.74279	-0.05901

Commercial No. 1 - The German Coast Guard A new staff member of the German coast guard gets a short introduction about his new working place by an older colleague. While sitting at work a mayday-call comes in: 'Mayday, Mayday! We are sinking! We are sinking!' The German coast guard asks: 'What are you thinking about?' It is a commercial for a language-institute. The commercial scored high in the *Communication* humor category.



Figure 2: Screenshot of Commercial No. 1

Commercial No. 2 - Kein Ostdeutsch The boss of a garage comes in and shouts at

his assistant in an Eastern-German dialect. The assistant is from Western-Germany and thus does not understand too much of what his boss is telling him. Then the other assistant comes in and explains to the boss that his colleague is from Western-Germany and thus does not speak Eastern-German dialect. The boss is quite startled and signals that he is sorry, because he did



Figure 3: Screenshot of Commercial No. 2

not know. Then a writing fades in saying that there are lots of people not knowing how to speak Eastern-German dialect and that one should help. The spot is a persiflage on another similar commercial concerning illiteracy. The commercial scored high in the *Communication* humor category.

Commercial No. 3 - The Off-Road Vehicle An alligator is lying in the sun at the

water. A bird hops into the open mouth of the alligator. The alligator shuts its mouth and the bird is captured. It frees itself by striking at all of the alligators teeth until they fall out. The little bird hops out of the mouth again. The power of the bird is compared to the power of an off-road vehicle that saves you out of every hole. This is a car-commercial.



Figure 4: Screenshot of Commercial No. 3

The commercial scored low in the *Unconventional* and *Communication* humor category.

Commercial No. 4 - Don't Have Kids An about five year old child takes some sweets out of the storage rack in a supermarket and puts it into a trolley. His father puts it back and the son moves it again into the trolley. They play this game for a while and then the kid starts to cry and scream, puts things out of the racks and throws them on the floor. All the other shoppers are looking quite shocked at the father, who feels therefore very uncomfortable. Then a writing fades in saying: 'Use condoms'. It's a commercial for condoms. The commercial scored high in the *Unconventional* humor category.

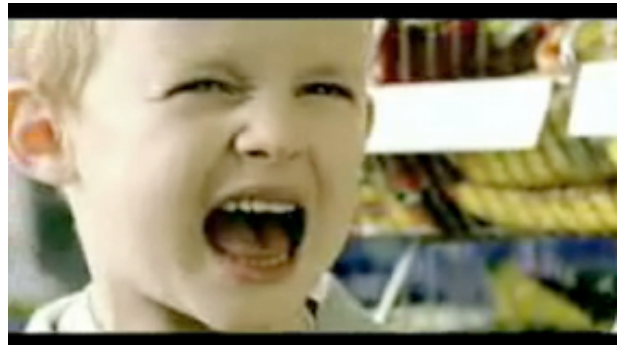


Figure 5: Screenshot of Commercial No. 4

Commercial No. 5 - Do You Know Who I Am? A class is writing an exam. There is this one guy who has already finished writing and is having a look at his lottery-ticket. The teacher closes the exam and all students bring their exams to the teacher's desk except the one guy, who is still looking at his ticket. When he realizes that everyone has already left the room, he wants to hand in his exam too. But the teacher says 'No' and that he is too late. Thereupon the student asks the teacher, if he knows who he is and the teacher says quite dastard 'No'. The student puts his exam between the other exams, takes an apple that lies in front of the teacher and goes off. It is a commercial for a lottery. The commercial scored low in the *Schadenfreude* humor category.



Figure 6: Screenshot of Commercial No. 5

Commercial No. 6 - Blow Up Your Favourite Holiday Picture Two men are coming along and see two elderly women lying in the sun and sleeping. They grab the women's camera. One makes a picture of the other guy, who just dropped his trousers. Next, they put back the camera. This is a commercial of a photo-developer. The commercial scored high in the *Unconventional* humor category.



Figure 7: Screenshot of Commercial No. 6

Commercial No. 7 - Winter Comes Quickly A guy is jumping down from a diving-board. The water is splashing. Another one is jumping and the same happens. A third guy is jumping and one can not hear any water splashing, but something heavy falling on the ground. Then a Swiss voice says that winter comes quicker than one would expect. It is a commercial for a tire specialist. The commercial scored low in the *Unconventional* and *Communication* humor category.



Figure 8: Screenshot of Commercial No. 7

Commercial No. 8 - Sporty Cows One can see several cows while they are doing gymnastics. They are swimming and jogging, trying to burn fat. Then the narrator says that they are doing everything to provide all the taste of regular milk, but with 70% less fat. It is a commercial on low-fat milk. The commercial scored low in the *Schadenfreude* humor category.



Figure 9: Screenshot of Commercial No. 8

Commercial No. 9 - Bad Entertainment A quite bad dancer appears on the stage of a night club. A bunch of nasty guys are playing pool billiard and next an even bigger guy appears holding a baseball bat in his hands. The narrator says: 'Bad entertainment'. Then another strange guy appears on the stage and again the narrator says: 'Bad entertainment'. It is an advertisement for a shopping center. The commercial scored high in the *Schadenfreude* humor category.

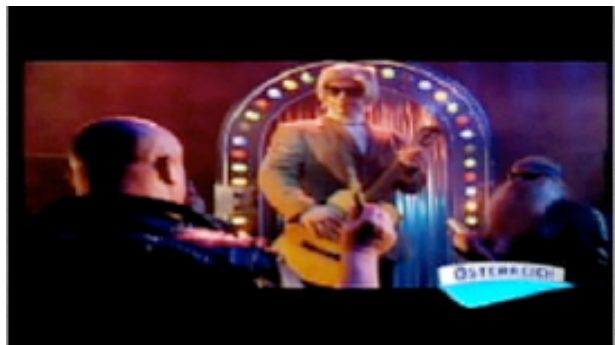


Figure 10: Screenshot of Commercial No. 9

Commercial No. 10 - Unfortunate Nixon A man is in a quiz show where he is challenging the final round. He has got a pager and his family, who are sitting in front of their TV at home, sending him the right answers via a pager. The quiz master is waiting for the right answer - 'NIXON'. But the answer of the man is 'NOXIN'. He is holding the pager inverted. It is a commercial for a pager. The commercial scored high in the *Communication* humor category.



Figure 11: Screenshot of Commercial No. 10

Commercial No. 11 - Hungry Stone Age Family A Stone Age family is sitting around a table being hungry. Suddenly a noise makes the mother send her husband to hunt for food. The husband tries to attack a mammoth. The mammoth stomps on the Stone Age guy. The narrator says: 'Hungry? - Cup Noodles'. It's a commercial on instant noodles. The commercial scored high in the *Schadenfreude* humor category.



Figure 12: Screenshot of Commercial No. 11

Commercial No. 12 - Smart Fishing An elderly man is fishing, being patient and calm. Suddenly another man enters the scene. He is very noisy, he takes a stick and puts some instant adhesive on it and holds it below the water surface. Within seconds the man has caught some fish and the elderly man still has no catch. This is a commercial on instant adhesives. The commercial scored low in the *Schadenfreude* humor category.



Figure 13: Screenshot of Commercial No. 12

Commercial No. 13 - Swine Virus? A pig was kidnapped and now the holder is being blackmailed. The blackmailer calls and demands for money. But the owner has a display for call-in numbers and calls the blackmailer back, pretending he is a veterinarian. He tells him that the swine virus has reached the region and that it was the best to stay inside the house. Next the blackmailer leaves the pig. It is an advertisement for a telecommunication company. The commercial scored low in the *Unconventional* humor category.



Figure 14: Screenshot of Commercial No. 13

Commercial No. 14 - Fast Camera Car One can see a high-speed car trying to break a high-speed record by driving through the desert. In the end of the spot, the car that filmed the high-speed car comes into view and it is a normal passenger car. It is a commercial for a new automobile. The commercial scored low in the *Communication* and the *Schadenfreude* humor category.



Figure 15: Screenshot of Commercial No. 14

Commercial No. 15 - Live Insurance Comes With Motorcycle Insurance A pseudo-biker is driving along a street flirting with the women and pretending to be a really tough guy. Then he jostles another motorcycle, which is standing in a row with plenty other motor-cycles. They all fall down and the owners of the motorcycles are turning around. They look like a threatening biker gang. The narrator says that they think, that a live insurance should come with a motorcycle insurance. This is a commercial of a insurance company. The commercial scored high in the *Schadenfreude* humor category.



Figure 16: Screenshot of Commercial No. 15

Commercial No. 16 - Hands Free Phones Two men are sitting in a car and one is confessing his love. The other one says nothing. In the end of the spot it turns out that the guy was talking through a hands free phone and it is a commercial for hands free phones in cars. The commercial scored high in the *Communication* humor category.



Figure 17: Screenshot of Commercial No. 16

Commercial No. 17 - Telling The Truth A man is picking up his girlfriend at her home and he tells her father that they are going to have sex and that he has already bought some condoms. The father is shocked. Then the narrator says that some people can only tell the truth and therefore there is only one job for those persons - they should work for a certain newspaper. The commercial scored high in the *Unconventional* humor category.



Figure 18: Screenshot of Commercial 17

Commercial No. 18 - Too Good To Be True In a swimming pool scene a man jumps down from a diving board like an Acapulco-diver. He is watched by several women. When he wants to step out of the swimming pool he loses his swimming trunks. Next he wants to dry his hair with a hair dryer and his toupee is blown away. It is a commercial for a shopping center. The commercial scored low in the *Communication* humor category.



Figure 19: Screenshot of Commercial No. 18

2.2 SAMPLE COMPOSITION

A total number of 84 men (mean age=23.50, SD=4.12, range=18-37) and 83 women (mean age=23.36, SD=5.78, range=18-51) took part in the study. All 167 participants were students of the University of Vienna. To make sure participants were not aware of the actual aim of the study in advance, they were asked to participate in a study on the effectiveness of commercials. They were recruited at the aisle of the Biozentrum in Vienna on a voluntary basis and received no financial compensation.

2.3 PROCEDURE AND EXPERIMENTAL SETUP

Participants were seated in the experimental room in pairs. The participants did not see each other until the experiment was over in order to prevent subjects from influencing each others' responses to the commercials. In between the advertisements, they filled out a questionnaire (see 2.4) on each commercial. Subjects watched all 18 movies in a randomized order. The experimenter was sitting in the same room behind the participants, presenting the commercials.

During the whole experiment participants were videotaped. They were informed about the recording afterwards. In case they did not sign a declaration of consent, the tapes were deleted immediately. The duration of the whole experiment varied between 30 and 60 minutes.

The room in which the experiment took place, was divided by a portable folding screen in two parts. On one side subject A was placed and on the other side subject B. In between we had a projector, casting the commercials on a screen. In the back of the room the experimenter was sitting behind a paravant controlling the start of the commercials and the small cameras, which were recording the subjects faces (Fig. 20). The room was darkened, except of a little lamp placed next to each subject to illuminate their faces. For a detailed plan of the experimental setup see Fig. 21.

2.4 QUESTIONNAIRES

Before the experiment started, subjects had to fill out three questionnaires.

2.4.1 Questionnaire on General Demographic Information

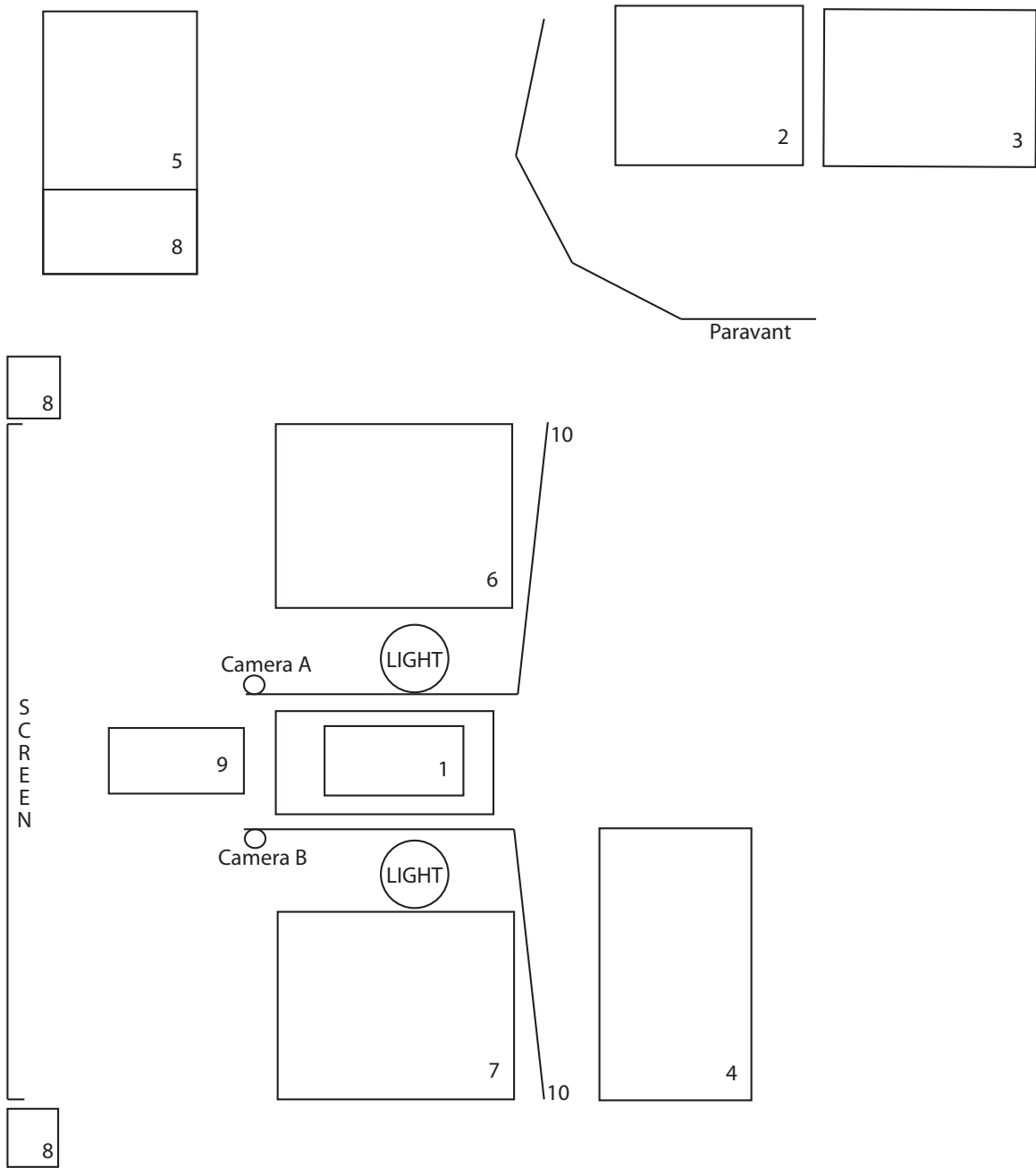
We asked for sex, age, nationality, profession, focus of study and how long the subject has been studying. (Appendix A)

2.4.2 Eigenschaftswörterliste 60 S

The *Eigenschaftswörterliste 60 S* (Janke and Debus 1978) is a self-rating-scale for the description of the momentary condition of the subject. It gives information about the momentary grade of activity, well-being, tiredness, huffiness and anxiety of the participant and consists of 123 items. (Appendix B)

2.4.3 Questionnaire on Commercials

To control for the perceived funniness and prior knowledge of the advertisement, we used a special questionnaire. We added some extra questions on the perception of the commercials, to support the effectiveness-of-commercials-story. We asked on a 7-Point Likert scale whether the participants found the advertisement informative or



- 1 Projector
- 2 Screening computer
- 3 Controlling computer
- 4 + 5 Recording computers
- 6 + 7 Subject's seats
- 8 Speakers and Tuner
- 9 Additional camouflage
- 10 Folding Screen

Figure 21: Experimental setup

absurd, realistic or more implausible, whether they found it funny or rather not funny, boring or exciting. We asked for funniness to control for subjective perception in



Figure 20: Screenshot of recorded subject

relation to objective quantification of perceived funniness. Additionally, we asked for prior knowledge of the commercial and the name of the product and if the subject would buy the advertised product or service (Appendix C).

2.5 CODING OF BEHAVIORS

Recorded behavior of the subjects was coded through continuous recording in *Noldus Observer XT*. We compiled a repertoire of behaviors relevant to humor. We also coded some other behaviors that are not directly related to humor, but may serve in further studies.

2.5.1 Mouth

In the mouth area we focused on the behaviors smile, open-smile, grin, disgust and pout.

Smile

Smile is a "blanket" term used to cover a wide range of behaviors including slight raising of the mouth corners, with lips closed or a wide-open mouth, with mouth corners retracted horizontally and both rows of teeth visible (McGrew's grin face) or a wide opened mouth, with mouth corners up, and teeth covered by lips or only partly visible (McGrew's and Blurton Jones' play face). With this expression particularly, there are considerable individual differences in e.g. characteristic width of smile (Leach 1972). We agreed on the following definition: The lips are closed but not compressed, and the mouth is drawn up and out at the corners. Smiling is a characteristic expression or display of humor (Chapman 1983).

Open smile

In the literature one finds something like a broad smile, which is the drawing up and out of the mouth corners and the lips parting to reveal some of the upper and the lower teeth. The vocalisation of laughter is often associated with this kind of smile, but can also occur in most other forms of smiling (Brannigan and Humphries 1972). For the sounds of laughter we established a separate category. In the case of open smile we formulated the following: The mouth is open and drawn up and out at the corners and both rows of teeth are visible or teeth covered only partly. Open smile is an expression or display of humor (Chapman 1983).

Grin

Grin is usually described as closed lips, but not compressed lips, drawn up and out at the corners, but with only one side of the mouth involved (Brannigan and Humphries 1972). We adapted this definition by adding a modifier *left* for raising the left mouth corner more than the other and a modifier *right* for raising the right mouth corner slightly higher. Grin is a characteristic expression or display of humor (Chapman 1983).

Disgust

According to Ekman and Friesen (1978) Action Unit 10 (AU10) - the upper lip raiser is specified as follows: AU10 raises the upper lip, whereby the center of the upper lip is drawn straight up. The outer portions of the upper lip are drawn up but not as high as the center. The intraorbital triangle is pushed up and the infraorbital furrow is caused to wrinkle. Additionally, the alae of the nose are widened and raised and the lips may be parted. We set out that in a disgust-mouth the skin above the upper lip is pulled upwards and towards the cheek, pulling the upper lip up. The upper row of teeth is not shown necessarily and the lower lip stays relaxed. The nose is slightly wrinkled and the nasolabial fold is deepened. The behavior is an expression of disgust and may be displayed when something is distasteful and repellent.

Pout

Due to the vast majority of definitions a pout is displayed when the lower lip or both lips, are pushed forward while the lower lip is curling down. The mouth is slightly open or closed and the mouth corners are pulled down (Leach 1972). We adapted this explanation so that the mouth corners do not need to be pulled down. A pout has no direct link to humor, but may display uncertainty.

2.5.2 Sounds

We focused on the sounds produced while laughing. The sound itself is variable, but is produced by a series of short, single or repeated exhalations (bouts) and a long inhalation of breath, accompanied by some characteristic movement of the chest and some characteristic noise like hee, hee. The abdominal muscle contracts concurrently to the exhalations. The mouth is usually wide open, but might also be shut (Leach 1972). There is also a characteristic nodding and jerking of the head. Every type of laughter in our study is supposed to look the same and is differentiated by the accompanying sound only. Laughter is a characteristic expression or display of humor (Chapman 1983).

Silent laughter

There is no detectable vocalization while laughing. We were not able to discriminate whether no sound was produced or the sound was drowned in another sound e.g., noise of the commercials.

Vocalized laughter

The laughter is accompanied by some characteristic noise (e.g. hee, hee).

Nose laughter

This type of laughter is accompanied by one or several expirations through the nose.

2.5.3 Forehead and Eyes

In the forehead and eyes area we focused on the behaviors frown, nose wrinkle-frown and eyebrow raise. These are not necessarily categories we will need for this particular study, but may be auxiliary for future research.

Frown

Blurton Jones (1971) described frown in the way that the inner eyebrows are drawn down creating vertical creases in the forehead. The eyes are usually well open. There is a range of frowns described - e.g. weak frown and strong frown, low frown - which we did not differentiate further (Leach 1972). We held with the general definition.

Nose wrinkle frown

The nose wrinkler (AU9) is defined as follows: The skin along the sides of the nose is pulled towards the root of the nose causing wrinkles to appear along the sides of the nose and across the root of the nose. The infraorbital triangle is pulled upwards, causing the infraorbital furrow to wrinkle, and bunching or bagging of the skin around the lower eyelid. The medial portion of the eyebrows is lowered. The eye aperture is narrowed and the center of the upper lip is pulled upwards. The alae of the nose are widened and raised and the nasolabial furrow is deepened. (Ekman and Friesen

1978). We stayed with a less complex definition and decided that nose wrinkling occurs if the skin on the nose and the forehead is wrinkled vertically and the eyebrows are drawn downwards concurrently.

Eyebrow raise

According to the literature the brows are raised, usually looking rather arched, and the forehead is wrinkled horizontally. The eyelids are usually separated widely (Leach 1972). We elaborated to a more complex definition: One or both eyebrows are raised and held, at least briefly, in the raised position. They are not drawn towards the mid-line and are not tilted. In this case the category includes also the category eyebrow ash, which is a swift raising of the eyebrows which is not held; the brows returning immediately to the neutral position.

2.5.4 Head

In the head area we focused on the behaviors head-shake, head-nod and head-jerk. These are also categories we do not necessarily need for this particular study, but may be auxiliary for further research. For each behavior of this area we had modifiers for single or repeated head movements (Schmehl, Holzleitner et al. 2008).

Shake

A head shake is displayed if the head is rotated from side to side, at least once up to several times. The movements can vary from very slight to extended swings (Leach 1972). We defined head shake as a horizontal rotation of the head from an initial position to one side to the opposite and back to the initial position.

Nod

In a head nod, the head is moved first down and then up, once or several times, fast or slowly and the movement ranges from a barely perceptible single inclination of the head to vigorous action (Leach 1972). Usually it is an affirmative gesture. One could

also say it is a repetitive, rhythmic, dorso-ventral tilting of the head (Brannigan and Humphries 1972). We remained with the first definition.

Jerk

According to Brannigan and Humphries (1972) the head abruptly jerks up and to one side and may move the hair. We defined jerk as the head moving first up and then down, once or several times, fast or slowly.

For technical reasons of continuous recording, each behavior group was complemented by non-behaviors and not-visible-behaviors for behaviors that can not be seen. When we started with the coding, we realized that it was nearly impossible to distinguish between grin and smile. Sometimes only one half of the face was visible, due to reasons of illumination or perspective. So we decided to lump these two categories. Frown and nose wrinkle-frown were also difficult to discriminate and were lumped too in one category.

2.5.5 Reliability Analysis

Due to the huge amount of coding-work, two persons coded the behavior. To check the quality of Christine Buchegggers and my measurements, a reliability analysis was conducted. A third person randomly selected three of the taped movies. First, reliability-movie number one was coded, then movie number two and again movie number one, the third movie and then again movie number one. Now we had the possibility to check for intra-observer reliability as well as for inter-observer reliability. The statistical parameter (correlation coefficient) for the reliability analysis was Cohen's Kappa (Cohen 1960) which should be at least 0.7. In the first interobserver-reliability-coding (between Christine Buchegger and me) Cohen's Kappa reached only 0.53. To enhance the level of reliability between Christine Buchegger and me, we had to train. So we went through the reliability-movies to check where we did not agree, talked about it and refined the definitions of the behaviors (see 1.5). In the second run we reached an inter-observer agreement as measured by Cohen's Kappa of 0.78 ($p < 0.001$), which is an acceptable value. In the intra-observer agreement

Cohen's Kappa was 0.98 ($p < 0.001$) right away. The reliability analysis was done in Noldus Observer XT.

2.6 STATISTICAL ANALYSIS

For further calculation the data was imported to SPSS 16. I created one data sheet displaying the total durations of the single behaviors, and another data sheet, which consists of the total number of occurred behaviors. Calculations were conducted separately for each data sheet. One-sample Kolmogorov-Smirnov-tests were conducted to check for the distribution of the variables. None of the variables was normally distributed, therefore only non-parametric tests were calculated. For mean sex differences in the frequency, respectively the total duration of behaviors, two-sample Mann-Whitney-U-tests were calculated.

2.6.1 Total Behavioral Response (TBR)

I computed the total behavioral response (TBR) to the humorous events by adding up the frequencies and the durations of behaviors with a positive connotation to humor (Tab. 2). TBR consists of smile, open-smile, silent laughter, vocalized laughter and nose laughter. To test whether TBR is an objective measure of the perceived funniness, I did a partial correlation for TBR with the perceived funniness of the movies, controlling for confounding EWL-factors.

Table 3: List of behaviors with positive, negative or neutral connotation relevant for total behavioral response to humorous events.

Behavior	Connotation	TBR
smile	+	TBR
opensmile	+	TBR
grin	+	TBR
disgust	-	
pout	neutral	
silent laughter	+	TBR
vocalized laughter	+	TBR
nose laughter	+	TBR
frown	-	
nose-wrinkle frown	-	
eyebrow-raise	neutral	
wide-eyed	neutral	
headshake	neutral	
headnod	neutral	
headjerk	neutral	

2.6.2 Confounding Variables

Each of the 167 subject watched 18 movies summing to a total of 3006 watched commercials. There were 161 cases of prior known commercials and 99 commercials, of which I did not know about prior knowledge. I decided to exclude those 260 cases from further calculations. This resulted in a new total of 2746 cases. A case is one commercial watched by one subject.

Additionally, I controlled for the momentary condition of the subject within each of the sexes. The items of the questionnaire were merged into groups resulting in a total

score for each of the five EWL-factors (*activity, well-being, tiredness, huffiness, anxiety*) for each person. The five subjects who missed to fill out the EWL-questionnaire properly were excluded from the analysis. Next the file was aggregated by the means of the EWL-factors and the sum of TBR, for all movies. A bivariate correlation was conducted, for both sexes separately, between TBR and the EWL-factors, to see whether they correspond to each other. Subsequently, I tested with a Mann-Whitney-U-test whether the TBR-correlating EWL-factors differ in their mean between the sexes.

2.6.3 Sex Differences

Partial correlation was conducted for TBR and the self-rated item on how funny the commercial was. To see whether there is a relation between TBR and the single humor-factors, I did one-tailed partial correlations for both sexes separately, controlling for the relevant EWL-factors. I tested for sex differences in number and duration of TBR with Mann-Whitney-U-tests.

3 RESULTS

There is neither a difference in the duration nor in the total number of the single behaviors between men and women. They show about the same amount of behaviors (Tab. 4). Therefore, it is possible to compare between the sexes regarding the ultimate hypotheses.

Table 4: Frequencies of humor related behaviors.

	N	smile	open-smile	laughter all	nose laughter	silent laughter	vocalized laughter
female	1144	848	267	334	106	153	75
male	1105	791	256	363	121	153	89

The perceived funniness correlates positively with TBR (smile, open-smile, laughter all, nose laughter, silent laughter, vocalized laughter) (Tab. 5).

Table 5: One-tailed partial correlation between the perceived funniness and TBR.

		N	Correlation Coefficient	p
number	female	1144	0.284	<0.001
	male	1105	0.311	<0.001
duration	female	1144	0.377	<0.001
	male	1105	0.403	<0.001

3.1 CONFOUNDING VARIABLES

In bivariate Spearman's correlation of TBR and the five EWL-dimensions only *activity* showed a significant effect (men $\rho=0.253$, $p=0.047$, $N=1416$ and women $\rho=0.255$, $p=0.042$, $N=1424$). There is even a sex difference on this dimension ($N=2840$, $U=819337$, $p=0.038$), meaning that the EWL-factor *activity* has an influence on the behavioral response and therefore needs to be controlled.

3.2 SEX DIFFERENCES

Partial correlations between TBR and the factor loadings of the humor categories showed that TBR is connected to *Unconventional* humor and *Communication* humor, but not to *Schadenfreude* humor (Tab. 6 and Tab. 7).

Table 6: One-tailed partial correlation between the humor-factors and TBR, controlling for EWL-item activity; total number.

		TBR	
		male	female
	N	1105	1144
Unconventional	r	0.113	0.127
	p	<0.001	<0.001
Communication	r	0.261	0.177
	p	<0.001	<0.001
Schadenfreude	r	-0.016	-0.019
	p	0.299	0.259

Table 7: One-tailed partial correlation between the humor-factors and TBR, controlling for EWL-item activity; total duration.

		TBR	
		male	female
	N	1105	1144
Unconventional	r	0.149	0.160
	p	<0.001	<0.001
Communication	r	0.239	0.109
	p	<0.001	<0.001
Schadenfreude	r	<i>-0.018</i>	<i>-0.036</i>
	p	0.280	0.114

In the movies eight and fourteen there is a sex difference in the frequency of TBR. In the movies two, eight and fourteen I also found sex differences in the total duration of TBR (Tab. 8, Fig. 22 and Fig. 23).

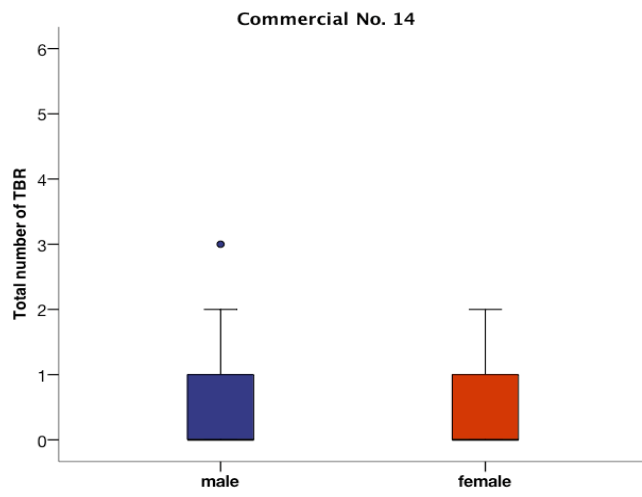
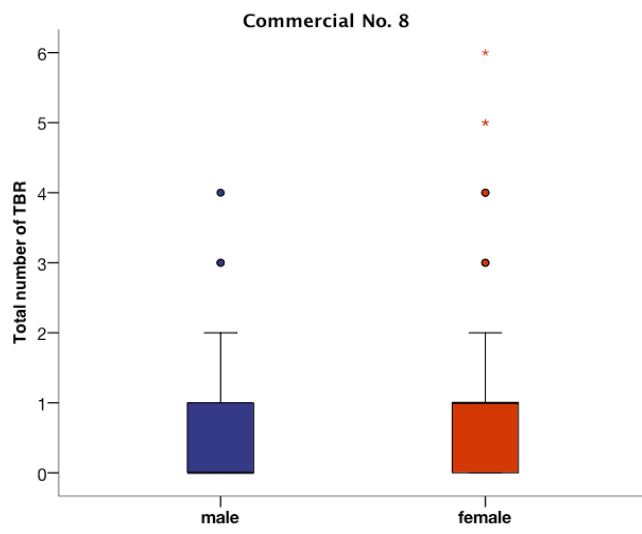


Figure 22: Box-plot of frequency of TBR in commercial No. 8 and No. 14.

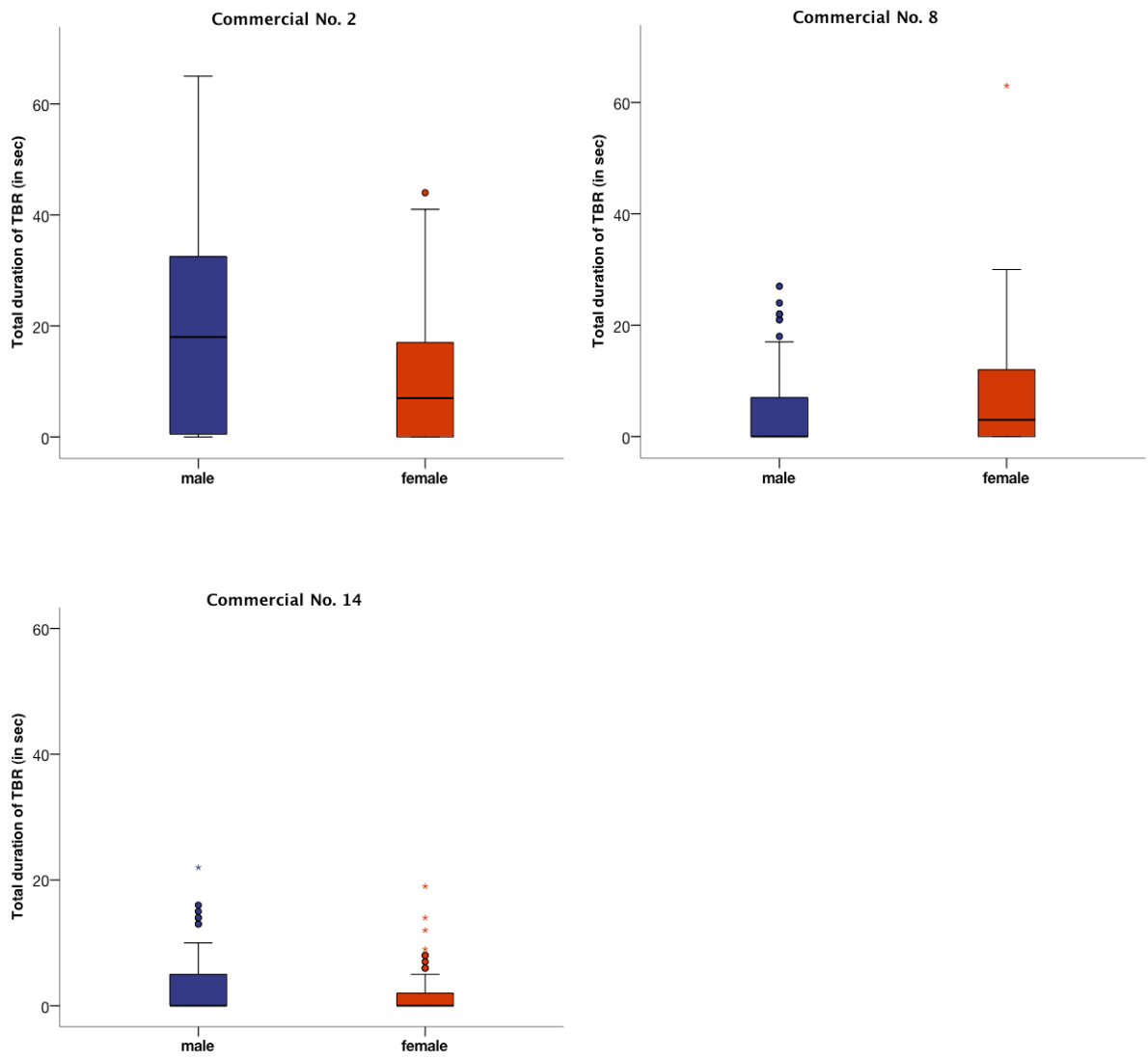


Figure 23: Box-plots of total duration of commercial No. 2, No. 8 and No.14

Table 8: Two-tailed Mann-Whitney U-test of TBR-behaviors between men and women. Only the commercials containing sex differences are shown.

Commercial	Sex	N	TBR		smile		laughter all		nose laughter		silent laughter	
			Mean Rank	p	Mean Rank	p	Mean Rank	p	Mean Rank	p	Mean Rank	p
2	male	63	6.973	0.108	6.701	0.425	6.926	0.082	6.102	0.046	7.090	0.002
	female	65	5.943		6.207		5.988		6.787		5.830	
7	male	60	6.638	0.280	6.518	0.466	6.585	0.209	6.633	0.035	6.212	0.541
	female	65	5.988		6.099		6.037		5.992		6.381	
8	male	62	5.451	0.006	5.554	0.014	5.903	0.029	6.050	0.043	6.152	0.323
	female	62	7.049		6.946		6.597		6.450		6.348	
14	male	62	6.944	0.020	6.800	0.062	6.657	0.026	6.606	0.027	6.402	0.152
	female	63	5.666		5.808		5.948		5.999		6.200	
2	male	63	7.385	0.004	7.084	0.051	6.952	0.067	6.103	0.047	7.044	0.004
	female	65	5.544		5.835		5.964		6.786		5.874	
7	male	60	66.92	0.217	6.583	0.361	6.569	0.237	6.625	0.040	6.212	0.541
	female	65	5.938		6.038		6.052		6.000		6.381	
8	male	62	5.615	0.031	5.711	0.064	5.901	0.028	6.050	0.043	6.151	0.315
	female	62	6.885		6.789		6.599		6.450		6.349	
14	male	62	6.904	0.031	6.838	0.050	6.656	0.027	6.607	0.027	6.402	0.152
	female	63	5.706		5.771		5.950		5.998		6.200	

4 DISCUSSION

4.1 INTERPRETATION OF RESULTS

The aim of this study was to show that there are sex differences in humor appreciation due to evolutionary adaptations. The three hypotheses could not be supported.

Aside from that, a new measurement of humor appreciation was designed.

4.1.1 EWL-dimensions

Only one of the five EWL-dimensions has an effect on the behavior of the subjects. Subjects that showed more behavior in general reached a higher *activity*-score. This suggests that people who feel more active show more behavior. The other four EWL-dimensions *well-being*, *tiredness*, *huffiness* and *anxiety* do not have any effect on the examined behaviors.

4.1.2 Sex differences

There are no sex differences in the frequency and the total duration of the single behaviors, which makes it possible to compare between men and women regarding the ultimate hypotheses.

As mentioned above the three hypotheses could not be proved. I could not find any sex differences in the examined behaviors concerning the humor categories (*Unconventional*, *Communication* and *Schadenfreude*).

There are several possible reasons why the hypotheses could not be supported. A funny commercial usually includes more than one humor category. Most of the commercials include two of the three humor categories. Therefore it is difficult to assign each commercial to a definite humor category.

Moreover, sex differences are not directly linked to the type of humor, but rather to the content of a humorous stimulus.

Additionally, commercials aim mostly at both sexes. Most of the advertised products are directed at both men and women. Exceptions show sex differences, when one

sex is the target group only. Taking a closer look at the single commercials, their content and their topics will reveal predictable sex differences.

Commercials that show sex-differences

Commercial No. 2 (Kein Ostdeutsch)

Men showed longer TBR and longer silent laughter than women, and women showed more and longer nose laughter in commercial No. 2. The commercial scored high in the *Communication* humor category. But since the fun in the commercial is on Eastern German dialect and the sample consists mainly of Austrians (82.97%), there might be an in-group-out-group (Eibl-Eibesfeldt 1998) effect. Men might find it funnier to laugh about out-groups, than women to laugh about foreign dialects.

Commercial No. 7 (Winter Comes Quickly):

In commercial Nr. 7 men showed more and longer nose laughter than women. The commercial scored low in the *Unconventional* humor as well as in the *Communication* humor. The commercial is not accurately attributable to just one humor category. A reason for men showing more and longer nose laughter while watching this commercial may be caused by consequences of the 'young male syndrome' (Wilson and Daly 1985). The guy in the commercial jumps from a certain height into water - which is risky - and he hurts himself by doing so. Feeling humorously stimulated by this might come down to *schadenfreude* and therefore a superiority kind of humor. As the majority of the participants was Austrian, there might also be an in-group-out-group (Eibl-Eibesfeldt 1998) effect that makes men find the commercial funnier than women.

Commercial No. 8 (Sporty Cows)

In commercial Nr. 8 women showed more and longer TBR, overall laughter, nose laughter and more smiles than men. The commercial is negative in the humor category *Schadenfreude*. But the reason that women show more TBR related behaviors might be due to the principle of female competition. As appearance is one of the most important topics women compete on, they might somehow feel understood by this commercial. The cows in the movie do a lot of training to reduce

the fat (in the milk), as women would do to look more attractive. Maybe women find it funnier than men, because they feel a certain similarity (Tanenbaum 2002).

Commercial No. 14 (Fast Camera Car)

Men show more and longer TBR, overall laughter and nose-laughter as well as longer smiles. Again, the commercial can be found in two humor categories. It falls negatively into the categories *Communication* and *Schadenfreude*. The commercial is funny mainly because of the surprising punchline. Maybe men find it especially funny because there is also kind of male-male competition (Wilson and Daly 1985) in it. There is the one car that is really fast, trying to break a speed record and then there is the other car that filmed the record attempt and is therefore faster and better. Driving so fast with cars accompanies also a certain risk and risk taking can be easily linked to the 'young male syndrome'.

Difficulties in distinguishing between the three humor categories occurred. Several types of humor can be found in any of the commercials. Paul McGhee (1979) stated that humor, or humorous stimuli, are notoriously difficult to define or classify. Therefore, I would propose to do a content analysis of the commercials, first, taking a closer look to the evolutionary principles that occur in a commercial.

Single behaviors

In the movies two, seven, eight and fourteen men and women showed constantly sex differences in nose laughter. There is no explanation for this phenomenon. Maybe the amount of shown nose laughter is related to some personality traits, so that more introverted people show more nose laughter. There is no literature on this, but I think it is worth to take a closer look at this behavior.

4.1.3 TBR

Partial correlations between TBR and the factor loadings of the humor categories showed that TBR is connected to *Unconventional* humor and *Communication* humor, but not to *Schadenfreude* humor. *Schadenfreude* humor is not correlating with any of

the analyzed behaviors, neither in men, nor in women. This suggests that facial expressions of schadenfreude are more ambiguous and thus need to be further investigated.

The self-reported funniness correlates positively with TBR in men and women, which indicates that TBR is a fairly good measurement for the objective evaluation of the (subjective) perceived funniness. Hence, I could underline the findings of Chapman (1983) that smiles and laughter are appropriate measures for the appreciation of humor as well as Glenn Weisfeld's (1993) proposal that laughter could serve as a useful measure of the amount of humor appreciation. Thus, it was possible to create a new, more objective measurement of humor appreciation (TBR). TBR is able to be a measure for aggressive and sexual humor as well as for language respectively communication related humor. Nevertheless, TBR failed to count for schadenfreude humor. So maybe we should strive to create different ethological measures for the appreciation of different kinds of humor.

4.1.4 Methodological shortcomings

We are aware of the influence of the two female investigators on the behavior of the subjects and therefore on the results. To eliminate effects of social facilitation or social desirability on humor appreciation (Chapman, Smith et al. 1980) the subjects should rather be among each other, without an experimenter in the room.

To create a more exact measurement of humor appreciation it would be utile to examine the intensity of shown behavior, namely onset, apex and offset. The coding of facial action units (FACS; (Ekman and Friesen 1978)) could also serve to measure the perception of different kinds of humor.

4.1.5 Summary and Prospects

The findings underline that the expressions of smiles and laughter are not limited to humor perception, but will only occur if the emotional state provides some basic readiness for humor appreciation. Furthermore, Chapman's findings (Chapman

1983) that smiles and laughter are appropriate measures for the appreciation of humor could be reconfirmed and confined. Therefore the study contributes to a new method of humor measurement by behavioral observation, and could thus serve to measure humor more objectively.

The study also provides additional empirical evidence that facial expressions are ambiguous signals, whose meanings are modulated by other communicative signals.

As male and female behaviors differ in the commercials two, seven, eight and fourteen, one could locate the onset of the affected behaviors (smile, nose laughter, silent laughter and overall laughter; frequency and duration), in order to link them to the story-line of the commercial.

A further investigation should take a closer look at nose laughter and its relation to humor, since nose laughter is a conspicuous behavior in the present study. This behavior shows sex differences in all of the four commercials that show sex differences.

In another follow-up study one could further investigate which facial expression or which combination of expressive behavior might be a good measure for the appreciation of schadenfreude humor. One could also scrutinize, whether there are sex differences in this facial behavior. I suggest an explorative approach, showing little comics, funny pictures or other humorous stimuli conveying schadenfreude to the subjects and see which facial behavior they show. Other researchers suggest that people with low self-esteem are more likely to feel schadenfreude than are people who have high self-esteem (Portman 2000). Accordingly, controlling for self-esteem might be relevant for the examination of schadenfreude.

Furthermore, one should delve into the additionally coded behaviors to see whether sex differences in the appreciation of certain types of humor occur, concerning the onset of laughter and smiles, TBR and moreover concerning the onset, the duration and the total number of frowns, disgust face, single and repeated head movements (shake, nod, jerk), pout or eyebrow raises. This could contribute to a new method of measuring different types of humor by behavioral observation, and therefore serve as an objective humor measurement.

I would like to emphasize once more the need for an objective measurement of certain humor categories, since questionnaire data provide only partial insight into the topic.

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APPENDIX

APPENDIX A

Code Nr. _____

Proband Nr. _____

Datum _____

Uhrzeit _____

weiblich männlich

Alter _____

Nationalität _____

Beruf bzw. Studienrichtung _____

Semester _____

Haben Sie in den letzten 24 Stunden Alkohol oder andere Drogen konsumiert?

Ja Nein

Wenn weiblich:

Wie lange dauert Ihr durchschnittlicher Zyklus?

Weniger –20–21–22–23–24–25–26–27–28–29–30–31–32–33–34–35– mehr Tage

Wann hat Ihre letzte Menstruation begonnen (Datum)? _____

Nehmen Sie hormonelle Verhütungsmittel (Pille)?

Ja Nein

Oder andere Hormonpräparate?

Ja Nein

APPENDIX B

Proband Nr. _____

Code Nr. _____

Datum _____

Uhrzeit _____

Eigenschaftswörterliste (EWL-K)

Dies ist eine Liste von Wörtern, mit denen man beschreiben kann, wie man sich **augenblicklich** fühlt.

Gehen Sie alle Wörter der Liste nacheinander durch, und entscheiden Sie sofort bei jedem Wort, ob es für Ihr augenblickliches Befinden zutrifft oder nicht.

Trifft das Wort für Ihr augenblickliches Befinden zu, so machen Sie bitte ein Kreuz in den Kreis hinter "trifft zu".

Trifft das Wort für Ihr augenblickliches Befinden nicht zu, so machen Sie bitte ein Kreuz in den Kreis hinter "trifft nicht zu".

Es ist wichtig, dass Sie folgende Punkte beachten:

1. Beurteilen Sie nur, wie Sie sich **augenblicklich** fühlen. Es kommt nicht darauf an, wie Sie sich allgemein oder gelegentlich fühlen, sondern ob das Wort für Sie **augenblicklich** zutrifft oder nicht.
2. Überlegen Sie bitte nicht, welche Antwort den besten Eindruck machen könnte. Antworten Sie so, wie Ihr Befinden **augenblicklich** ist.
3. Denken Sie nicht lange über ein Wort nach, sondern geben Sie bitte die Antwort, die Ihnen unmittelbar in den Sinn kommt.
4. Sollte Ihnen die Antwort einmal schwer fallen, so entscheiden Sie sich für die Antwortmöglichkeit, die am **ehesten** zutreffen könnte.
5. Bitte lassen Sie kein Wort aus. Entscheiden Sie sich immer sofort.



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Bitte blättern Sie um!



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| 49 | lasch | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 50 | unglücklich | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 51 | erschöpft | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 52 | arbeitslustig | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
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| 54 | kraftlos | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
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| 58 | angsterfüllt | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
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| 65 | unberechenbar | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 66 | verwundbar | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 67 | offen | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 68 | trübsinnig | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |





- | | | | | | |
|-----|----------------------------|-----------|-----------------------|-----------------|-----------------------|
| 69 | arbeitsam | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 70 | einschläfernd | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 71 | rastlos | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
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| 75 | berauscht | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 76 | gereizt | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 77 | menschenscheu | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 78 | heiter | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 79 | müde | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 80 | gedankenverloren | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 81 | beschwingt | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
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| 85 | frohgemut | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 86 | verstört | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 87 | lustig | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 88 | empfindlich | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 89 | besinnlich | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 90 | schreckhaft | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 91 | düster | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 92 | unstetig | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 93 | denkfaul | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 94 | menschenfreundlich | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 95 | bedauernswert | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 96 | unbesorgt | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 97 | angesäuselt | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 98 | trüb | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 99 | tüchtig | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 100 | schwerfällig | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 101 | furchtsam | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |
| 102 | zutraulich | trifft zu | <input type="radio"/> | trifft nicht zu | <input type="radio"/> |



Bitte blättern Sie um!

APPENDIX C

Probanden Nr. _____

Code Nr. _____

Filmnummer: _____

Wie fanden Sie den eben gezeigten Werbefilm?

lehrreich	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	unsinnig
realistisch	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	unglaublich
lustig	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	gar nicht lustig
langweilig	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	aufregend

Kannten Sie diesen Werbefilm?

Ja Nein

Für welches Produkt hat dieser Spot geworben?

Würden Sie das angepriesene Produkt kaufen bzw. die Dienstleistung in Anspruch nehmen?

Ja Nein

Wenn Ja:

- Das Produkt habe ich bereits gekauft/ die Dienstleistung habe ich schon in Anspruch genommen.
- Die Werbung hat mich überzeugt.

SUMMARY

Whilst humor has always captured scientific interest, few researchers have investigated humor through observational studies so far. Empirical works employing questionnaire instruments only, are most vulnerable to generate results based on social desirability. Therefore I carried out a study on humor appreciation based on behavior observation. According to Weisfeld (1993) laughter could serve as a useful measure of the amount of humor appreciation.

Possible reasons for sex differences in humor appreciation could be sought in different selection pressures for our male and female ancestors. Asymmetric investment leads to female choice and male competition. One consequence of intrasexual competition is the so-called young male syndrome, i.e. men tend to seek risky situations to a higher extent than women, thus creating a setting in which they can prove that they are the better choice. Due to patrilocality women must seek for social integration into a foreign group. The most important tool to pursue this goal is communication. Therefore women have developed more sophisticated verbal skills. Consequently, men and women should appreciate humor that touches the evolutionary relevant topics.

Studies of humor appreciation generally indicate that men are more likely to enjoy humor based on aggressive and sexual themes, whereas women are more likely to enjoy nontendentious humor. The purpose of this study was to investigate whether women respond more to humor associated with communication, and men respond more strongly to aggressive humor, and whether this can be observed in their expressive behavior.

In a pre-study we determined three basic dimensions of humor: Schadenfreude (schadenfreude for misfortune, schadenfreude for hurtful actions), Unconventional (violation of social norms, sexism) and Communication (incongruity, wordplay, misunderstandings). Subjects (84 male and 83 female students) were videotaped while watching 18 more or less funny commercials in pairs, but without visual contact. The stimulus movies were selected based on the humor factors (the three top and lowest ranked for each dimension). I expected men to laugh more about movies conveying schadenfreude, women should laugh more about communication

related humor. I did not expect any sex difference concerning the Unconventional humor factor. Subjects filled out questionnaires controlling for emotional state as well as other intervening variables, and indicated how humorous they found the respective movie. Video recordings were used for behavior coding, such as smiles and laughter.

There was no significant sex difference in the total amount of behavioural correspondents (i.e. facial expressions) of humor. Our results suggest that current emotional state strongly affects expressive behavior. Additionally, the study contributes to a new method of humor measurement by behavioral observation, and could therefore serve for measuring humor more objectively.

These findings underline that the expression of smiles and laughter is not limited to humor perception, but will only occur if the emotional state provides some basic readiness for humor appreciation. With this study we provide additional empirical evidence that facial expressions are ambiguous signals, whose meaning is modulated by other communication channels.

ZUSAMMENFASSUNG

Obwohl Humor immer im Zentrum wissenschaftlichen Interesses stand, haben bisher nur wenige Forscher Humor mittels Verhaltensbeobachtung untersucht. Empirische Arbeiten, die Fragebögen als einziges Untersuchungswerkzeug verwenden, sind äußerst anfällig dafür, Ergebnisse zu generieren, die einer gewissen sozialen Erwünschtheit entspringen. Daher führte ich eine Studie über den Sinn für Humor durch, die gänzlich auf Verhaltensbeobachtungen beruht. Laut Weisfeld (1993) kann Lachen als Maß für den Grad an gefühltem Humor dienen.

Unsere männlichen und weiblichen Vorfahren unterlagen unterschiedlichen Selektionsdrücken, die mögliche Erklärungen für Geschlechtsunterschiede im Sinn für Humor darstellen. So führt uns das asymmetrische elterliche Investment zu einer Gesellschaft geprägt von weiblicher Wahl und männlicher Konkurrenz. Eine Konsequenz des intrasexuellen Konkurrenzkampfes unter Männern ist das so genannte "young male syndrome", das besagt, dass junge Männer im Vergleich zu Frauen eher dazu tendieren Risiken einzugehen, also Szenarien provozieren, in denen sie beweisen können, dass sie auf dem Partnermarkt die bessere Wahl sind. Aufgrund der patrilokalen Lebensweise unserer Vorfahren war es für Frauen notwendig, sich in einer fremden Gruppe sozial zu integrieren. Das beste Werkzeug dazu ist Kommunikation. Daher haben Frauen im Vergleich zu Männern ausgeprägtere verbale Fähigkeiten entwickelt. Dies lässt darauf schließen, dass Männer bzw. Frauen verstärkt über Humor lachen, der geschlechtsspezifisch evolutionär relevante Themen einschließt.

Frühere Studien über den Sinn für Humor ergaben, dass Männer dazu tendieren über aggressive oder anzügliche Themen zu lachen, wohingegen sich Frauen bevorzugt über nicht-tendenziösen Humor amüsieren. Zweck dieser Studie war es herauszufinden, ob Frauen eher auf Kommunikations-bezogenen Humor reagieren und Männer eher auf aggressiven Humor und ob dieses in deren expressivem Verhalten beobachtet werden kann.

In einer Vorstudie konnten mittels Hauptkomponentenanalyse drei basale Humorfaktoren erarbeitet werden: Schadenfreude (Schadenfreude bei einem Missgeschick, Schadenfreude bei Gefahr), Unkonventionell (Normverletzung sozialer

Regeln, Sexismus) und Kommunikation (Kognitive Inkongruenz, Wortspiel, Missverständnis). 84 männliche und 83 weibliche Versuchspersonen wurden mittels Kamera aufgenommen, während sie sich 18 mehr oder weniger lustige Werbefilme ansahen. Die Probanden sahen die Werbefilme jeweils in Paaren, jedoch ohne sich vorher oder während der Vorführung zu sehen. Diese Stimulus-Filme wurden auf der Basis der drei definierten Humorfaktoren ausgewählt (jeweils die drei Werbefilme, die am höchsten bzw. am niedrigsten auf den drei Humor-Dimensionen laden). Es war zu erwarten, dass Männer eher bei Werbefilmen lachen, die ein hohes Mass an Schadenfreude beinhalten, während Frauen eher auf Werbefilme ansprechen, die einen hohen Kommunikationsanteil aufweisen. Beide Geschlechter sollten laut Hypothese gleichermassen über unkonventionellen Humor lachen. Die Probanden füllten ausserdem Fragebögen zur Kontrolle der momentanen Befindlichkeit, sowie für andere Störvariablen aus. Ausserdem mussten sie zu jedem Film angeben, wie lustig sie diesen empfunden haben. Die Videoaufnahmen von den Probanden wurden anschliessend verwendet, um das gezeigte Verhalten zu kodieren.

Es konnten keine Geschlechterunterschiede bezüglich des Humor-korrespondierenden Verhaltens (z.B. lachen und lächeln) gefunden werden. Es wurden auch keine Geschlechtsunterschiede bezüglich der Humorkomponenten gefunden. Die Ergebnisse zeigen, dass der momentane Gefühlszustand expressives Verhalten in hohem Maße beeinflusst. Ausserdem, trägt diese Studie dazu bei, eine neue Methode zur Messung vom Ausmass an gefühltem Humor über Verhaltensbeobachtung zu entwickeln. Eine ethologische Herangehensweise macht das Messen von Humor sehr viel objektiver.

Mit dieser Studie konnten zusätzliche empirische Hinweise dargelegt werden, dass Gesichtsausdrücke ambivalente Signale sind, deren Bedeutung durch andere Kommunikations-Kanäle moduliert werden kann.

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During this project I experienced that humor is not always fun. In the following I want to say thank you to some people who helped me in keeping my humor.

I want to thank my supervisor Prof. Dr. Karl Gammer, for his guidance, his advice and for teaching me not only human ethology, but also how to behave in the “crazy” world of science.

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And to Charles Darwin, who made all things possible.

CURRICULUM VITAE

CONTACT

Office Address: Ludwig-Boltzmann-Institute for Urban Ethology
Dept. of Anthropology
University of Vienna
Althanstrasse 14
1090 Vienna
Austria

e-mail: susanne.schmehl@univie.ac.at
web: www.urbanethology.at
phone: +43-1-4277-54769
fax: +43-1-4277-9547

EDUCATION

Since 2006 Master Thesis at the Department of Anthropology, University of Vienna, Austria

Since 2006 administrative assistant at the Ludwig-Boltzmann-Institute for Urban Ethology

Since 2004 studies in Anthropology (focusing on Human Ethology); University of Vienna, Austria

Since 2004 additional courses in Nutritional Sciences; University Vienna; Austria

2004 degree in General Biology; University of Vienna, Austria

2001 - 2004 basic courses in General Biology; University of Vienna, Austria

2000 - 2001 basic courses in Psychology; University of Vienna, Austria

2000 Matura (A-levels); High School (focusing on natural sciences) at the BORG Feldkirch, Austria

1998 - 2000 High School (focusing on natural sciences) at the BORG Feldkirch, Austria

1991 - 1998 High School at the BG Feldkirch, Austria

05.09.1980 born in Heidelberg, Germany

LIST OF POSITIONS

2006 – present research assistant at the LBI for Urban Ethology

2006 – 2007 scientific assistant in the FWF-Forschungsprojekt (P17761-G6, 2005) *'Rudolf Pösch – Anthropologe, Forschungsreisender, Medienpionier'*

RESEARCH

- 2006 – present Sex Differences in Humor Appreciation
2006 – present Nonverbal Communication and Emotions
2006 – present Simulation of Human Behavior

TEACHING

at the University of Vienna

- 2007 - present Tutorial in practical course: Human Ethology
2007 - present Tutorial in practical course: Behaviour Observation II
2007 – 2008 Tutorial in practical course: Behaviour Observation III

MEMBERSHIP

- International Society for Human Ethology (ISHE)
European Human Behaviour & Evolution Association (EHBEA)

OTHER ACTIVITIES

Summer School in Human Behavior Research 2008 “Courtship Behavior”, in collaboration with Karl Grammer, Elisabeth Oberzaucher and Iris Holzleitner (2008).

Summer School in Human Behavior Research 2007 “Nonverbal Communication”, in collaboration with Karl Grammer, Elisabeth Oberzaucher and Iris Holzleitner (2007).

Participation in the Science-contest “Dance your PhD”, at the Research Institute for Molecular Biology (2007).

PUBLICATIONS

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SZUGFIL, L., ARENDT, F., FENK, L., FILIADIS, CH., FUCHSBAUER, A., KEBER, A.M., KOESSNER, I., MAYER, CH., REISINGER, M., RICHL, E., SCHÜTZE, H.C., SPEISER, N., STOCKINGER, E., GRAMMER, K., OBERZAUCHER, E., **SCHMEHL, S.**, HOLZLEITNER, I. (2008). *Gender Differences in Hand Gestures*. Poster presented at the 2nd MEi:CogSci Student Conference in Bratislava, Slovakia.

SCHMEHL, S., HOLZLEITNER, I., OBERZAUCHER, E., GRAMMER, K., ALSCHER, W., PFLÜGER, L., STEINKOPF, L., ALTEHELD, L. (2008). *The signal quality of head movements*. Poster presented at the IK (Interdisziplinäres Kolleg) 2008 Kooperation at Günne, Germany.

HOLZLEITNER, I., **SCHMEHL, S.**, OBERZAUCHER, E., GRAMMER, K., (2008). *The dynamics of smiles and brow movements*. Poster presented at the IK (Interdisziplinäres Kolleg) 2008 Kooperation at Günne, Germany.