What Is Beautiful in Cyberspace? Communication with Attractive Avatars

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Abstract. The face with its structural and nonverbal features is the most important cue in interpersonal face-to-face communication (e.g. Dion et al., 1972; Reis et al., 1990). The aim of the presented study is to examine whether physical attractiveness and nonverbal cues in virtual representations can elicit interpersonal effects comparable to those evoked in face-to-face contacts. In a 2 (observer's nationality) x 2 (smiling, non-smiling) x 3 (sender's attractiveness) x 2 (sender's gender) x 2 (observer's gender) experimental design 158 German and 128 Malaysian participants evaluated 18 faces (9 smiling, 9 non-smiling) concerning attractiveness, social competence and dominance. Analyses show several effects, e.g. indicating that the same facial features are attractive in virtual faces and human faces.

Keywords: Attractiveness, avatars, facial features, nonverbal behavior.

1 Theoretical Background

Research on the interaction with virtual figures (avatars or agents) is a field of growing relevance, investigating for instance, what characters gamers create [1] and how these characters influence other gamers/users perception (e.g. [2,3]). However, the impact of the outward appearance was not sufficiently explored so far, although findings in the human context revealed that the attractiveness of a person is decisive for building relationships. Since it was found [4] that the attribution processes induced by virtual figures are generally very similar to those evoked by humans we suggest that attractiveness will be influential in virtual contexts. Additionally, Mühlberger et al. [5] revealed that the neural responses towards virtuals and humans are very much the same.

People derive a lot of information about their interaction partner by looking at his/her outward appearance. One of the most important cues is the face which conveys information on the attractiveness of a person, on someone's gender, cultural background and for instance similarity to oneself or friends.

Especially the facial attractiveness of a person is an important social cue for face-to-face interactions, because it influences interpersonal attraction and the likelihood for interaction. Attractive persons are for instance highly coveted on the dating market (e.g. 6) and the job market (e.g. 7) and receive a lot of beneficial attributions [8].

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In their seminal study Dion et al. suggested the existence of a "physical attractiveness stereotype"[8, p. 289]. They found their participants to associate attractiveness with several social desirable personality traits (e.g. sensitive, interesting, strong. friendly) and better life experiences (e.g. getting good jobs). Moreover, their participants reported to be even more willing to do life risking actions like donating a kidney for the attractive person and rescuing the person from drowning. These findings were replicated in several studies and confirmed in meta-analyses [9-11]. The attractiveness benefits were also demonstrated for the virtual context [12]. The authors found that attractiveness is associated with social competence, intellectual competence and social adjustment. In line with this Yee, Bailenson and Ducheneaut [2] found that attractive characters in World of Warcraft were rated as more successful, competent and powerful than less attractive characters. Additionally, van Vugt [3] revealed for the e-learning context that the attractiveness of an agent increases the willingness to use it another time under the condition that the agent is generally perceived as supportive.

To examine the triggers for attractiveness Weibel, Stricker, Wissmath, and Mast [13] conducted a study in which they varied virtual character's size of the pupils; blinking frequency and viewing perspective. Results revealed that a higher blinking frequency and bigger pupils enhance attractiveness and perceived sociality. Moreover, a bottom up perspective renders the avatars more social and self-confident than a frontal and top down perspective. This study gives evidence that single features can influence attributions. But it still remains unanswered which facial features in the virtual face are attractive, apart from the width of the pupils.

Ensuing from research on human attractiveness there might be several other attractive facial features in virtual faces. Cunningham [14, 15] detected various facial features which arouse attractiveness ratings. In order to do so, he measured single features' sizes like the length of the nose and correlated measurements with attractiveness ratings made by observers. For female faces he found positive correlations for the size of the eyes, the prominence of the cheekbones and a bright smile with attractiveness ratings, and a negative correlation for the length of the chin and the length of the nose. For male faces very similar results were found [15], indicating that larger eyes, more prominent cheekbones, a long chin, a smaller nose area and a bright smile are rated as attractive. Moreover, to figure out whether ratings on attractiveness are consistent across cultures, Cunningham, Roberts, Barbee, Druen, an Wu [16] conducted another study replicating the earlier study with a multi-cultural sample (US-Americans, Asians, and Hispanics). General attractiveness ratings were highly correlated between the subsamples. Additionally, all subsamples rated large eyes, prominent cheekbones and a short chin to be attractive. Also, high eyebrows and size of pupils were rated as attractive, while smiles' breadth was only attractive for the US-American sample and the Hispanics. Although the study has its weakness with regard to the unequally distributed subsample sizes and the unsystematically distributed facial features in the stimulus material, it indicates that there are on the one hand high consistencies in attractiveness rating, but on the other hand there are subtle differences. Hence we want to examine of whether cultural differences exist for virtual attractiveness.

Besides these static physiognomic features (cheekbones, eyes and chin) the smile is of special importance, because it is a nonverbal behavior, which is usually performed

and perceived in a dynamic way. The studies by Cunningham and many other research groups found smiles to be attractive on photographs (e.g. 17, 18). But most recently researcher state that the dynamics of a smile are of particular importance to let it appear authentic and increase attractiveness ratings. Quite slow starting smiles only lasting some milliseconds, for example, evoke high attractiveness ratings [19, 20].

Furthermore, the evaluation of a smile can depend on the sender's sex as well as on the cultural background of the perceiver. Deutsch, LeBaron, and Fryer [21] found non-smiling women to be negatively evaluated compared to non-smiling men, whose attractiveness ratings remain on the same level or even increase. The authors ascribe this difference to gender stereotypes, which suggest that smiling is a normative behavior for women and non-smiling is normative for men. Diekman and Goodfriend [22] even suggest that violating stereotypical norms can provoke penalization. With regard to culture most comparisons were conducted between US-American and Japanese subsamples (e.g. 23-25) followed by comparisons of US-American and Chinese samples (e.g. 26, 27). Less data is available on comparison of other Asian countries than Japan and China with American, European or even African subsamples. Matsumoto [28] states that smiling is an appropriate behavior in America, but not in Asia. However, Matsumoto and Kudoh [24] neither detected an attractiveness benefit for smiling stimuli compared to non-smiling stimuli for Japanese participants nor for Americans, like for instance Reis et al. [18] found it. Finally, Hess, Beaupré, and Cheung [27] suggest that there is no study which directly compares the smiling effect between at least two cultures.

To summarize, general findings suggest that attribution processes towards humans and virtual characters are very similar. Further, attractiveness is correlated with the attribution of beneficial personality characteristics like sociality in face-to-face interactions as well as in the virtual context. However, it remains mostly unanswered which facial features induce the attractiveness attribution. Based on research concerning human attractiveness we want to examine which manifestation of a physiognomic facial feature (cheekbones, eyes, chin) induces the highest attractiveness ratings in the virtual context and whether a dynamic smile can evoke attractiveness ratings. Thus we derive the research question (RQ1): Which manifestations of the cheekbones, the eyes and the chin will be attractive in virtual figures and how do they interact with figure's sex? Furthermore, first data on the different cross-cultural attribution of facial features is available what leads us to ask (RQ2), which facial features will interact with the participant's culture?

Besides the physiognomic facial features smiling is a dynamic nonverbal behavior which can increase attractiveness ratings and is often performed in applied virtual contexts. So we suggest that a smiling figure will be perceived as more attractive (H1). Additionally, research showed that smiling is a behavior which is expected to be performed more by woman than by men [21, 29] and that non-smiling is a correct/norm-conforming male behavior, while the same behavior evokes negative evaluation for women. Therefore, non-smiling female figures will receive lower attractiveness ratings than male figures (H2). Due to the fact that the perception of a dynamic smile is not yet cross-culturally validated we (RQ3) of whether the attractiveness ratings for a smile will interact with the participant's culture?

2 Method

The presented study is a part of a larger research project which was conducted to extensively investigate the influence of physiognomic and nonverbal facial features on attributions of attractiveness, social competence and dominance. Here, we will only report the variables and results which are important for the current research questions.

2.1 Study Design and Stimuli

To test the outlined research questions and hypotheses we conducted an online experiment with a 2 (virtual figures' sex) x 3 (physiognomic facial features) x 2 (nonverbal facial feature) x 2 (participants' sex) x 2 (participants' nationality) mixed-factorial design. While the physiognomic facial features (prominence of the cheekbone, size of the eyes, length of the chin) and nonverbal facial feature (smiling, non-smiling) were varied within subjects, virtual figures' sex, participants' sex and nationality (German, Malay) were varied between subjects.

We created synthetic female and male faces as stimulus material by using the Poser 6 software by Curious Labs. The software enables facial manipulation in a subtle manner (e.g. 19, 20, 30). By referring to Cunningham [14, 15] we decided to vary cheekbones, eyes, chin and smiling, because these features yielded the strongest correlations with attractiveness ratings. We manipulated the prominence of cheekbones in narrow, middle and prominent cheekbones, the size of eyes in small, middle and large and the length of chin in short, middle, long. The distance between the middle feature and the low feature was the same as the distance between the middle feature to the high feature. In pictures of 13x18 cm size the differences were as follows: in females' faces the width of narrow cheekbones were 11.2 cm, middle cheekbones 11.6 cm and prominent cheekbones were 12.0 cm. The size of eyes, measured from one corner of the eyes to the other, varied from 1.1 cm for small eyes, 1.2 cm for middle sized eyes and 1.3 cm for large eyes. The length of chin measured up from the lower lip ranged from 1.2 cm of the short chin, to 1.3 cm for the middle chin and 1.4 cm for the long chin. Males' facial characteristics were varied accordingly, so the width of cheekbones for narrow cheekbones was 12.4 cm, for middle cheekbones 12.8 cm and for prominent cheekbones 13.2 cm. The size of the eyes ranged from 1.4 cm for small eyes, 1.5 cm for middle eyes and 1.6 cm for large eyes. The length of chin ranged from 1.7 cm of the short chin, 1.9 cm for the middle chin and 2.1 cm of the long chin.

Smiling was varied according to [19, 30]. Thus, we produced short videos (each 3.5 sec) as stimulus material. Smiling was created with a long onset and short apex duration to evoke an authentic impression. In the smiling condition videos started with an eye blinking and then the virtual person started to smile. In the non-smiling condition the figure showed an eye blink and did not smile. For each facial manifestation we produced two different types of faces, which differed in their skin color, their eye color as well as in their hair color and style to avoid confusion on the

fact that participants rated the faces with the same physiognomic features twice, once smiling and once not smiling (Table 1, Table 2).

Moreover, to examine differences in the evaluation of the figures we captured participants' gender and nationality.

Fig. 1. Examples for two different types of faces with the same physiognomy

Fig. 2. Examples for a smiling and non-smiling face with the same physiognomy

2.2 Dependent Measures

To test which facial features evoke the highest ratings of attractiveness, we measured attractiveness with a 7-point semantic differential (1= attractive; 7 = unattractive).

2.3 Participants and Procedure

286 participants (*N* = 164 females) took part in the online experiment. German (*N* = 159) and Malay (*N*= 127) participants were acquired by several postings in forums, notices and announcements in foundation courses at the Universities in Western Germany and south Malaysia. Both samples were similar in age and educational background.

Participants were randomly assigned to one of the experimental conditions (i.e. gender of the virtual figure) by activating the survey link. At the first pages they were welcomed and instructed. Each page showed one of the stimulus videos on the top of the page. Below the video the impression was captured, followed by the questions concerning similarity and meeting preference. After evaluating either 16 male or female faces, the experience with virtual figures and demographic information on age, gender and education were captured. Finally, participants were thanked for their participation and were fully debriefed.

3 Results

We conducted ANOVAS with repeated measurement with the manifestations of the facial features (weak, moderate, strong) and figure's nonverbal behavior (smiling, non-smiling) as the within-subject factors and the, figure's sex, participant's culture and participant's sex as between-subject factors. To figure out which manifestations significantly differ we used the Bonferroni post-hoc test and simple contrasts.

RQ1: Which manifestations of the cheekbones, the eyes and the chin will be attractive in virtual figures and how do they interact with figure's sex?

For the comparison of the faces differing in their manifestations of the cheekbones (narrow, middle, prominent) a main effect was found ($F(1.8, 139.85) = 71.55$, $p < .001$, $\eta 2p = .475$). The post-hoc test revealed that the middle cheekbones ($M= 3.65$, $SE= .07$, $p < .001$, $SE= .08$) are more attractive than the narrow cheekbones ($M= 4.04$, $SE= .07$) and the prominent cheekbones ($M= 3.94$, $SE= .09$, $p < .005$, $SE= .09$). No difference was found between the narrow and the prominent cheekbones.

For the comparison of the size of the eyes analyses showed a significant effect ($F(1.92, 534.81) = 44.78$, $p < .001$, $\eta 2p = .139$). The post-hoc test revealed that the middle eyes were more attractive ($M= 3.65$, $SE= .07$, $p < .001$, $SE= .08$) than the small eyes ($M= 4.30$, $SE= .07$), and the large eyes ($M= 4.26$, $SE= .08$, $p < .001$, $SE= .08$). There is no difference between the small and the large eyes.

The analysis of the length of the chin detected a main effect ($F(2, 556) = 26.01$, $p < .001$, $\eta 2p = .086$). The post-hoc test showed that the short chin was perceived as less attractive ($M= 4.19$, $SE= .07$, $p < .001$, $SE= .07$) than the middle chin ($M= 3.65$, $SE= .07$) and the long chin ($M= 3.82$, $SE= .07$)

Furthermore, we found three interaction effects for the facial features and the figure's sex. The evaluation of the cheekbones depends on the figure's sex ($F(2, 556) = 14.47$, $p < .001$, $\eta 2p = .049$). Simple contrasts showed a difference for the narrow and the prominent cheekbones ($F(2, 556) = 14.47$, $p < .001$, $\eta 2p = .049$) as well as for the middle and the prominent cheekbones ($F(2, 556) = 14.47$, $p < .001$, $\eta 2p = .049$). Prominent cheekbones were rated as similarly attractive in females ($M= 3.98$; $SE=.10$) and males ($M=3.95$; $SE=.11$), while narrow cheekbones were perceived as less attractive in females ($M=4.46$; $SE=.10$), but increased ratings of the males ($M=3.61$; $SE=.11$)

Comparing the middle ($M=3.91$; $SE=.11$) and prominent cheekbones revealed that both manifestations are evaluated similarly in females, but that middle cheekbones enhance male's attractiveness ratings ($M=3.40$; $SE=.11$).

Moreover, we found an interaction effect for the size of the eyes ($F(1.92, 534.81) = 4.85$, $p= .009$, $\eta 2p = .017$). Simple contrasts showed a difference for the small and large eyes ($F(1, 278) = 9.51$, $p= .002$, $\eta 2p = .033$). Small eyes were evaluated as quite unattractive in males ($M=4.24$; $SE=.10$) and females ($M=4.35$; $SE=.10$), while large eyes increase ratings for males ($M=4.00$; $SE=.11$) and decrease them for females ($M=4.53$; $SE=.11$). Summarizing, analyses revealed that the middle single features, are attractive in female and male faces, while there are differences in the evaluations for the narrow and the prominent cheekbones and the small and large eyes.

RQ2: Which facial features will interact with the participant's culture?

Concerning RQ2 analyses revealed one interaction effect for the variation of the eyes and nationality ($F(1.92, 534.81) = 8.61$, $p < .001$, $\eta 2p = .030$). Simple contrasts detected a difference for the comparison of the small and the large eyes ($F(1, 278) = 8.34$, $p = .004$, $\eta 2p = .029$) and for the middle and the large eyes ($F(1, 278) = 14.51$, $p < .001$, $\eta 2p = .050$). There is a common thread that small and large eyes are equally attractive, but the Malaysian subsample gave higher ratings on attractiveness (German M_{small}=4.44; SE_{small}=.10; M_{large}=4.61; SE_{large}=.11; Malaysian M_{small}=4.15; SE_{small}=.11; M_{large}=3.91; SE_{large}=.11). The same trend is observable for the middle and the large eyes (German M_{middle}=3.69; SE_{middle}=.10; Malaysian M_{middle}=3.62; SE_{middle}=.10). Moreover, we found an interaction effect for the length of the chin and the figure's sex ($F(2, 556) = 8.80$, $p < .001$, $\eta 2p = .031$). Simple contrasts revealed an evaluation difference for the middle and the long chin ($F(1, 278) = 9.74$, $p = .002$, $\eta 2p = .034$). While the Malaysian subsample gave similar ratings towards the middle and the long chin (M_{middle}=3.86; SE_{middle}=.10; M_{long}=3.62; SE_{long}=.10). Germans perceived the middle chin to be more attractive than the long chin (M_{middle}=3.69; SE_{middle}=.10; M_{long}=4.10; SE_{long}=.10). Summarizing analyses detected Malaysian to generally give higher attractiveness ratings and that the attractiveness perception for the middle and long chin differ in dependence of culture.

H1: A smiling figure will be perceived as more attractive than a non-smiling figure.

The conducted ANOVA showed a main effect for smiling over all faces ($F(1, 285) = 53.06$, $p < .001$, $\eta 2p = .157$), displaying that smiling faces are more attractive than non-smiling faces ($M_{smiling}$=3.90; $SE_{smiling}$=.06; $M_{non\text{-}smiling}$=4.27; $SE_{non\text{-}smiling}$=.06). Referring to the ANOVAs with repeated measurements the smiling effect was found the faces in which the cheekbones were varied ($F(1, 278) = 12.57$, $p < .001$, $\eta 2p = .043$; $M_{smiling}$= 4.02; $SE_{smiling}$= .07; $M_{non\text{-}smiling}$= 3.74; $SE_{non\text{-}smiling}$= .07) as well as in the faces with manipulated size of the eyes ($F(1, 278) = 38.34$, $p < .001$, $\eta 2p = .121$; $M_{smiling}$= 3.84; $SE_{smiling}$= .07); ($M_{non\text{-}smiling}$= 4.30; $SE_{non\text{-}smiling}$= .07), and the length of the chin ($F(1, 278) = 25.22$, $p < .001$, $\eta 2p = .083$; $M_{smiling}$= 3.69; $SE_{smiling}$= .07; $M_{non\text{-}smiling}$= 4.08; $SE_{non\text{-}smiling}$= .07).

H2: Non-smiling female figures will receive lower attractiveness ratings than non-smiling male figures.

The analyses revealed two interaction effects for the faces with varied sizes of the eyes ($F(1, 556) = 9.80$, $p = .002$, $\eta 2p = .034$) and the faces with a manipulated length of chin ($F(1, 278) = 8.83$, $p = .003$, $\eta 2p = .031$) indicating the same pattern of attribution. It hardly makes a difference in the attractiveness ratings for males of whether they laugh (M_{eyes}= 3.76; SE_{eyes}= .10; M_{chin}= 3.45; SE_{chin}= .10) or not (M_{eyes}= 4.00; SE_{eyes}= .10; M_{chin}= 3.61; SE_{chin}= .10) whereas the attribution changes for smiling (M_{eyes}= 3.91; SE_{eyes}= .10; M_{chin}= 3.93; SE_{chin}= .09) and non-smiling (M_{eyes}= 4.61; SE_{eyes}= .10; M_{chin}= 4.56; SE_{chin}= .10) females. So do non-smiling females receive declining attractiveness ratings.

RQ3: Will the attractiveness ratings for a smile interact with the participant's culture?

The analyses did not detect any interaction effect for smiling and participant's culture.

4 Discussion

The presented study aimed at identifying what makes a virtual face attractive, because attractiveness is one of the most crucial prerequisites to induce (interpersonal) interaction and relationships. We suggested that characteristics of the virtual figures (physiognomy, nonverbal behavior, sex) as well as characteristics of the user (nationality) would influence the perception of virtual attractiveness. For that reason we systematically varied facial features of the figures.

Our results concerning the physiognomic features indicate that nearly the same facial features as in the human context are attractive in the virtual context. We found that moderately prominent cheekbones, middle sized eyes and a middle chin obtained the highest attractiveness ratings. This is comparable to the results by [14] and [15]. Referring to the effect sizes results indicate that the cheekbones seem to be very important for the attribution of attractiveness followed by the eyes, while the chin has only a weak influence. Thus, to achieve an attractive virtual figure it is more advisable to manipulate the cheekbones than the length of the chin.

Moreover, the influence of the feature's manifestation can depend on the sex of the figure. We found that prominent cheekbones are attractive for virtual females and males, but narrow and middle cheekbones even increase attractiveness ratings for males, while ratings for females decrease. Participants agree that small eyes are unattractive for all figures, but large eyes are attractive in males and unattractive in females. However, these results are not consistent with findings by Cunningham [14, 15], who found positive correlations for the prominence of the cheekbones and the size of the eyes and a gender difference for the length of the chin. Altogether, our findings indicate that the manifestations of the features are not of equal importance for females and males. Thus, when aiming to construct an attractive virtual face, the sex of the figure should be considered: for example, female virtual characters should not have too narrow cheekbones and eyes should not be too large. However, future research would have to show at what point ratings turn from attractive to unattractive in order to have benchmark criteria on what too narrow or too large actually means.

As a consequence of the intercultural study by Cunningham et al. [16], we asked whether the attribution of virtual attractiveness differs across cultures. For that reason we focused on a European and an Asian subsample. Analyses demonstrated that there is a common tendency for what is attractive, as for instance both subsamples perceive a middle size of the eyes as attractive and the small and large eyes as much less attractive. However, the Malaysian sample still attributed more attractiveness to the smaller version of the eyes. Moreover, the Malaysian participants rated the long and middle chins to be attractive, whereas the Germans prefer the middle chin and dislike the long chin. The chin and the cheekbones determine the form of face, for instance the long chin makes the face more oval. Referring to the finding by [31], who revealed that the preference for a hair color increases the more seldom the color is, this tendency might also explain the long chin preference. Because an oval face is not common in the Asian area, the oval face might be exclusive and attractive. These findings suggest that when designing virtual faces for different parts of the world (if there is, for example, the chance to use different virtual agents on consumer websites

like ebay or IKEA) cultural preferences for attractiveness should be considered. These preferences must not necessarily entail similarity with the observer and his/her features.

Besides the physiognomic facial features we varied smiling behavior (smiling/non-smiling) and found a strong effect showing that smiling faces are more attractive than non-smiling faces. This is in line with former results achieved in the human context (e.g. 15, 18, 19). Moreover, analyses revealed interactions with the figure's sex. A smile is less important for the attractiveness ratings of a male, but very important for that of females. Non-smiling females are less attractive than their smiling counterparts. This is also consistent with results yielded in the human context [e.g. 21] and might be interpreted as an indication that gender stereotypes are also applied in the virtual context. Indeed, smiling is performed more frequently by women and is also expected of them [32]. Not behaving in the expected way can cause a penalization [22], what our results also indicate. Additionally, we investigated if the smiling attributions interact with the participants' culture. We did not find a difference in the attractiveness attribution, Germans and Malaysians gave similar ratings for the smiling and non-smiling persons. This finding is in contrast to results by Matsumoto and Kudoh [24], who did not detect any increase in attractiveness induced by a smile, but perfectly in line with the general finding that smiling compared to non-smiling enhances attractiveness ratings [14, 15,17,18].

Aside from the theoretical extension concerning attractive virtual features findings have immediate consequences for the applied context, because these findings give worthwhile indications how to design an attractive virtual figure. We assume that attractiveness is not an end in itself, but evoking attractiveness can positively influence users´ perception in the sense of associating beneficial characteristics [8-12] or even influence users´ behavior for instance in the gaming, , e-learning or online-consumer's context.

In the gaming realm, Yee [33] have already found that females are more likely to select elves as gaming characters than ogresses. This could indicate that females or probably also a broader range of gamers like to use attractive avatars more than unattractive ones. In addition, Yee et al. [2] demonstrated that tall attractive avatars outperform their less attractive counterparts in World-of-Warcraft. Tall attractive avatars were suggested to have researched higher levels in the game than tall unattractive characters. Thus, knowing how to create an attractive avatar might enhance playing performance and entertainment experience, what in turn can lead to frequent gaming behavior. Attractiveness could also have a direct effect in the context of digital personal assistances. For instance interfaces like Siri by Apple could get an attractive facial representation, which could be individualized for different user groups. Interfaces should differently look and perform (smiling/non-smiling) in dependence of their sex and possibly in dependence of the country for which they are created. Interacting with an attractive interface might enhance frequency of use and pleasure. In addition to possible direct effects virtual attractiveness might indirectly influence user's behavior with regard to the beneficial attributions caused by the attractiveness stereotype [8, 12]. Attractiveness is for instance associated with integrity and sociality [e.g. 9]. For instance in an online shopping context in which virtual agents are employed as customer service agents this could lead to the

perception of trustworthiness and afterwards results in increases purchases. First research in the online shopping context indicated that attractive agents are more result-producing than their unattractive counterparts [34]. Indirect effects might also have an impact in the gaming context, especially for health games or e-learning tutorials. Van Vugt [3] found that perceived attractiveness and utility can indeed enhance the chance to use a fitness agent another time, what in turn can help the user to behave healthier. Furthermore, health games generally use agents which aim to support their players to learn more about a healthy living or more specifically to support diseased persons in their healing process. In addition Baylor states that "[t]ogether with motivational messages and dialogue (…), the agent's appearance is the most important design feature as it dictates the learner's perception of the agent as a virtual social model, (…)" [35, p. 291]. Thus, knowing how to design an attractive agent for a game might increase the chance that the agents is perceived and accepted as a social entity, which could support learners to improve their performance. Finally all kind of consulting could be supported by attractive agents, since they could evoke trustworthiness and anonymity. The latter might be important for sensitive consultations like in the medical context. Although more variables than the attractiveness, like entertainment or perceived usefulness [3] determine whether the user might use an agent or system again, attractiveness might be one of the most important influencing factors – as it has been shown for the human context. Summarizing, our results give a first answer on the question which facial features are attractive in a virtual face and that the figure's sex certainly is an important moderating variable (for static as well as for dynamic cues) while the observers´ culture was not equally decisive. However, more cross-cultural comparisons should be conducted in the future to also analyze for other countries and cultures whether differences or similarities in the evaluation of attractiveness prevail. It has to be acknowledged that, certainly, the study has its limitations. For instance the varied manifestations might have been too weakly or strongly manipulated resulting in partially incongruent data to for instance Cunningham [14]. Moreover, it would be desirable to test more facial features than the selected three, like the size of the nose or to manipulate more than one feature in each face to derive assumptions on the interactions of features [34]. In sum, the study gives evidence that attractiveness of virtual faces is evaluated based on mechanisms similar to those of the human-human context and thereby a) extends theory concerning virtual figures with regard to physical attractiveness and b) gives valuable advice for the wide field of application, because it provides information on the question what should be considered when creating an attractive virtual figure.

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